Situated Professional Learning Communities in Radiography: A Proposed Learning Framework for Bridging the Theory–Practice Gap

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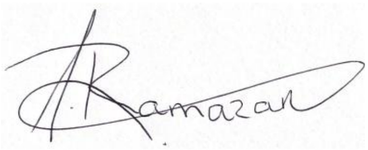
Declaration

I declare that the content of this work is my own, and all data collection and analyses reported herein were conducted by me. Where required, all sources and previous research have been cited and acknowledged.

The total word count for the thesis is 72,601 words, excluding the introductory pages, references and appendices.



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‘’What we call the beginning is often the end.

And to make an end is to make a beginning.

The end is where we start from.’’

—T.S. Eliot, *Little Gidding*, *Four Quartets*, 1942

Abstract

Radiography is undergoing significant changes and challenges, including rapidly advancing technology, ongoing role development, and increasingly quality-conscious service users that require efficient, high-quality imaging services. In response to these evolvements, radiographers are increasingly expected to engage in Evidence-based Practice (EBP) and Continuing Professional Development (CPD) to effectively navigate these emerging demands.

The aim of the research was two-fold: i) to explore and critically analyse the theory of Communities of Practice (CoPs) in radiography; and ii) to develop strategies for cultivating CoPs in radiography as an alternative approach to facilitating EBP, CPD and knowledge dissemination and sharing within the profession. The study was conducted within an independent imaging organisation. Observations were carried out across seven sites varying in setting (e.g., mobile units, static departments, integrated diagnostic centres) and imaging modalities (e.g., PET-CT, MRI). Additionally, 30 semi structured interviews were undertaken with diagnostic radiographers, technologists, assistant practitioners, and clinical assistants. Data analysis was performed using the grounded theory approach of Strauss and Corbin, following the stages of open, axial and selective coding to support the systematic development of conceptual categories.

The findings were organised around three main themes, reflecting the core categories developed during the analysis: i) EBP and CPD in radiography; ii) future of radiography and iii) CoPs in radiography. Although participants generally expressed awareness of EBP, most were unable to articulate its meaning, and

overall engagement with both EBP and CPD was limited due to barriers including insufficient motivation, inadequate support, lack of time and resources, and modality- or site-specific constraints. Notably, higher levels of engagement were observed among individuals in senior positions, those with advanced qualifications, or those particularly invested in improving radiography services. Strong leadership and the cultivation of a workplace culture that values EBP and CPD were considered essential for enhancing engagement in clinical practice. Participants emphasised the growing influence of artificial intelligence and emerging technologies, noting their potential to alter core professional responsibilities, and the possibility to reshape role dynamics within radiology departments. Neither, observations nor data from the semi structured interviews revealed engagement in learning communities, or any active or established CoPs in radiography. Once the concept was described, most participants had a positive attitude towards fostering CoPs, recognising the potential benefits of sharing knowledge, ideas, and EBPs with peers or other (healthcare) professionals either virtually or in-person.

Grounded in a set of assumptions regarding the nature of learning and knowledge in a healthcare context, this thesis culminates in the development of an alternative learning framework that is responsive to the profession's current evolvements, challenges and constraints in engaging with EBP and CPD. Building on the theory of CoPs, Situated Professional Learning Communities (SPLCs) is introduced as a practical, context-specific approach to bridging the theory-practice gap, aligning (collective) knowledge with individual competence and practice. Supported by organisational endorsement, leadership and active involvement of key stakeholders, SPLCs may serve as a strategy to enhancing EBP, supporting CPD, and promoting knowledge dissemination across radiography workforce.

List of outputs

Peer-reviewed journal articles

Ramazan, F., Graham, Y. and Hayes, C. (2024) 'Communities of Practice: An alternative approach to bridging the theory-practice gap in radiography?', Radiography, 30(4), pp. 1167–1172. Available at: https://doi.org/10.1016/j.radi.2024.05.015.

Ramazan, F. and Graham, Y. (2025) 'Economic, ethical and legal implications of Evidence-based Practice and Continuing Professional Development in radiography: A narrative review', *Radiography*, 31(2), p. 102886. Available at: https://doi.org/10.1016/j.radi.2025.102886.

Presentations

Ramazan, F. (2025). *Communities of Practice: An alternative approach to bridging the theory-practice gap in radiography?* Oral presentation at UK Imaging and Oncology Congress, Liverpool, UK.

Ramazan, F. (2025). *Evidence-based Practice and Continuing Professional Development in radiography*. Oral presentation at University Hospital of North Tees, Stockton-on-Tees, UK.

Posters

Ramazan, F. (2025). *Communities of Practice: An alternative approach to bridging the theory-practice gap in radiography?* Poster at UK Imaging and Oncology Congress, Liverpool, UK.

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List of abbreviations

AI	Artificial intelligence
AML	Alliance Medical Limited
CDC	Community Diagnostic Centre
CE	Continuing Education
CHI	The Commission for Health Improvement
CoPs	Communities of Practice
CPD	Continuing Professional Development
CQC	Care Quality Commission
CT	Computed Tomography
EBM	Evidence-based Medicine
EBMgt	Evidence-based Management
EBP	Evidence-based Practice
GT	Grounded Theory
HCPC	Health and Care Professions Council
IDC	Integrated Diagnostic Centre
IR(ME)R	Ionising Radiation (Medical Exposure) Regulations
LoPs	Landscapes of Practice
MRI	Magnetic Resonance Imaging
NASA	National Aeronautics and Space Administration
NCPHSBBR	The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research
NEN	NASA Engineering Network
NoPs	Networks of Practice
NHS	National Health Service

NICE	The National Institute for Health and Care Excellence
NIH	The National Institutes of Health
PET-CT	Positron Emission Tomography–Computed Tomography
PIS	Participant Information Sheet
RIS	Radiology Information System
SPLCs	Situated Professional Learning Communities
SoR	Society of Radiographers
SIGs	Specialist Interest Groups
UK	United Kingdom

Chapter 1: Introduction

In the United Kingdom (UK), healthcare professionals are increasingly confronted with significant changes and rising demands. A major challenge is the ongoing shortage of healthcare staff, which places additional pressure on the existing workforce, contributes to increased workloads, and limits capacity (National Health Service (NHS), 2019; Ham, 2020). These workforce constraints are exacerbated by increasing healthcare demands, driven by demographic shifts such as an ageing population and a rising number of individuals with complex healthcare needs, further stretching the available resources (Khan, 2023). Alongside the operational and clinical pressures, there is an intensified focus on clinical governance, including quality assurance, documentation, and accountability to ensure the delivery of safe, effective, and high-quality care (Health and Care Professions Council (HCPC), 2018; Shaheen *et al.*, 2019; Woznitza *et al.*, 2021). This has led to increased expectations for accurate, detailed and timely record-keeping, as well as continuous monitoring of performance (Brooks, 2021; Willmington *et al.*, 2022). Moreover, health services are required to demonstrate ongoing improvements in accessibility, service organisation and overall quality of care, such as reducing waiting times, promoting equitable and inclusive services, enhancing multidisciplinary coordination of care, and improving patient experience (Care Quality Commission, 2023b; Alderwick, Hutchings and Mays, 2024; Alhabib, Almutairi and Alqurashi, 2024; Endalamaw *et al.*, 2024). In addition to these challenges, rapid medical, technological, and digital advancements are changing how care is delivered. Innovative solutions such as artificial intelligence (AI), electronic health records, telemedicine, and advanced diagnostic tools offer new opportunities to respond to some of these challenges and improve patient outcomes (Fazakarley *et al.*, 2023; Okwor *et al.*, 2024; Sussex *et al.*, 2024).

However, these innovations necessitate continuous training and adjustment to everyday practice, intensifying the pressures and demands on healthcare organisations (Okwor *et al.*, 2024).

The challenges facing healthcare services have also had an impact on the field of radiography. For example, the profession has undergone a significant role development in response to systemic pressures including the widespread shortage of radiologists, prolonged waiting times, and the requirement to streamline patient pathways to improve efficiency and patient outcomes (Field and Snaith, 2013; Woznitza *et al.*, 2021; Carlier *et al.*, 2025). This evolution includes the expansion of radiographers' scope of practice, incorporating advanced clinical responsibilities, increased expertise, and an extended repertoire of professional attributes (Carlier *et al.*, 2025). Consequently, radiographers are now required to assume greater levels of professional responsibility and accountability for their clinical decisions and contributions to patient care (Hardy and Snaith, 2006; Mitchell and Lockwood, 2023). Concurrently, radiography continues to be shaped by the rapid emergence of new imaging technologies, diagnostic and therapeutic procedures, and increasing expectations from service users who anticipate timely, effective, and high-quality imaging services (Snaith, 2016). To actively respond to the changes within the profession, radiographers are increasingly expected to engage in Continuing Professional Development (CPD), and to integrate Evidence-based Practice (EBP) in daily practice (Hafslund *et al.*, 2008; Davis and McMahon, 2018).

EBP is a structured approach to professional decision-making, which requires practitioners to integrate best available research evidence, their clinical expertise and patient preferences and values in daily practice (Dusin, Melanson and Mische-Lawson, 2023). To facilitate EBP, practitioners require diverse range of skills that extend beyond technical radiography competencies, enabling the successful application of the EBP process (Di Michele *et al.*, 2024). CPD, on the other hand, represents the ongoing commitment to lifelong learning mandated by healthcare regulatory bodies to ensure practitioners consistently update their knowledge and skills (Karas *et al.*, 2020). Despite the widespread recognition of the importance of EBP and CPD in improving patient outcomes, organisations and individual practitioners, literature consistently demonstrates their irregular application within radiography. Several barriers have been identified contributing to this variability, including limited research knowledge and skills, inadequate organisational support, and restricted access to time and resources (Brettle, 2020; Ramazan, Aarts and Widdowfield, 2022). The inconsistencies pose a risk to the quality, safety, and effectiveness of care, and may also result in missed opportunities for financial efficiency and service improvement (Kristensen, Nymann and Konradsen, 2015; Al Balushi, Watts and Akudjedu, 2024). Therefore, it is essential to promote continuous engagement with both EBP and CPD to minimise the persistent theory-practice gap, improve the quality of radiography services, and ensure the profession remains responsive to the evolving challenges within healthcare.

Considering the ongoing challenges associated with the implementation of EBP and CPD in radiography, the thesis examines the potential of the social learning theory Communities of Practice (CoPs) to facilitate knowledge dissemination, knowledge sharing, EBP and CPD in radiography. CoPs are explored as it provides a more flexible and collaborative approach to learning and knowledge dissemination in practice, which may be particularly valuable in the high-stakes, complex, and resource constrained environment such as radiography. Hence, the thesis is guided by two overarching aims: i) to explore and analyse the theory of CoPs in radiography; and ii) to formulate strategies to cultivate CoPs in radiography.

The chapters of this thesis are structured to build a coherent argument and demonstrate the study's contributions to research and practice. Chapter 2 presents a comprehensive review of EBP and CPD, with a particular emphasis on their relevance to radiography. It critically examines the application of EBP and CPD in the field, including commonly reported barriers and the economic, ethical and legal implications of limited or inconsistent implementation in practice. The chapter also considers the ongoing efforts to bridge the theory-practice gap, reviewing key frameworks including Implementation Science, Translational Science and knowledge diffusion theories. Finally, it discusses the potential of CoPs as an alternative approach to addressing the persistent theory-practice gap in healthcare and radiography practice.

Chapter 3 outlines the aims and objectives of the study, discusses the underlying philosophical and methodological foundations, and details the methods adopted. It justifies the adoption of a critical realist ontology and post-positivist epistemology, and briefly considers the study's axiological position. The chapter also discusses the study's adoption of critical theory and symbolic interactionism, selected to provide a comprehensive and nuanced understanding of the phenomena. Given the limited knowledge on CoPs in radiography, a grounded theory (GT) methodological approach is used to generate theory from data, rather than merely understanding and describing phenomena. The chapter reviews the main four types of GT (traditional, evolved, constructivist, and situational analysis), and justifies the choice of Straussian GT applied to this research. In line with the principles of GT, observations and semi structured interviews were conducted to allow for in-depth exploration of the subject under investigation.

Chapter 4 presents the findings of the research study, reflecting the core categories identified in chapter 3 as part of the analysis process: i) EBP and CPD in radiography; ii) future of radiography and iii) CoPs in radiography. Observations were undertaken at seven sites differing in context and modality, and a total of 30 clinical staff were interviewed. The chapter provides a detailed overview of the characteristics of the participants, including job role, age, practice setting, years of clinical experience and highest obtained qualification level to identify any differences in perceptions across these groups. The findings are extensive; therefore, to maintain clarity and flow for the reader, all quotes include key participant characteristics (job role, modality and practice setting) to provide some initial contextual background as reading each quote.

Chapter 5 interprets and contextualises the findings related to the categories identified in the previous chapters, and situates them within existing literature. The chapter is structured around the core categories, namely, i) EBP and CPD in radiography; ii) future of radiography and iii) CoPs in radiography. Each core category is examined independently, as they represent distinct and equally significant phenomena. Nonetheless, the chapter also highlights and discusses the interconnections and interdependencies that exist among these core categories.

Importantly, the chapter provides the foundations for theory development, establishing the conceptual basis for the theory proposed in the following chapter.

Chapter 6 briefly revisits the theory of CoPs, and examines its applicability within the specific dynamics of radiography. Building on the foundational elements of CoPs, the chapter mainly focuses on developing a contextually adapted theoretical model, while integrating the insights of the study's findings. Grounded in a revised set of assumptions concerning the nature of learning and knowledge, the theory of Situated Professional Learning Communities (SPLCs) is proposed, offering a more responsive framework for professional learning within the realities of healthcare. The chapter also provides a set of principles to cultivating SPLCs in radiography, with a clear focus on a top-down approach of its application, ensuring SPLCs are not only supported, but also legitimised, resourced and sustained in practice.

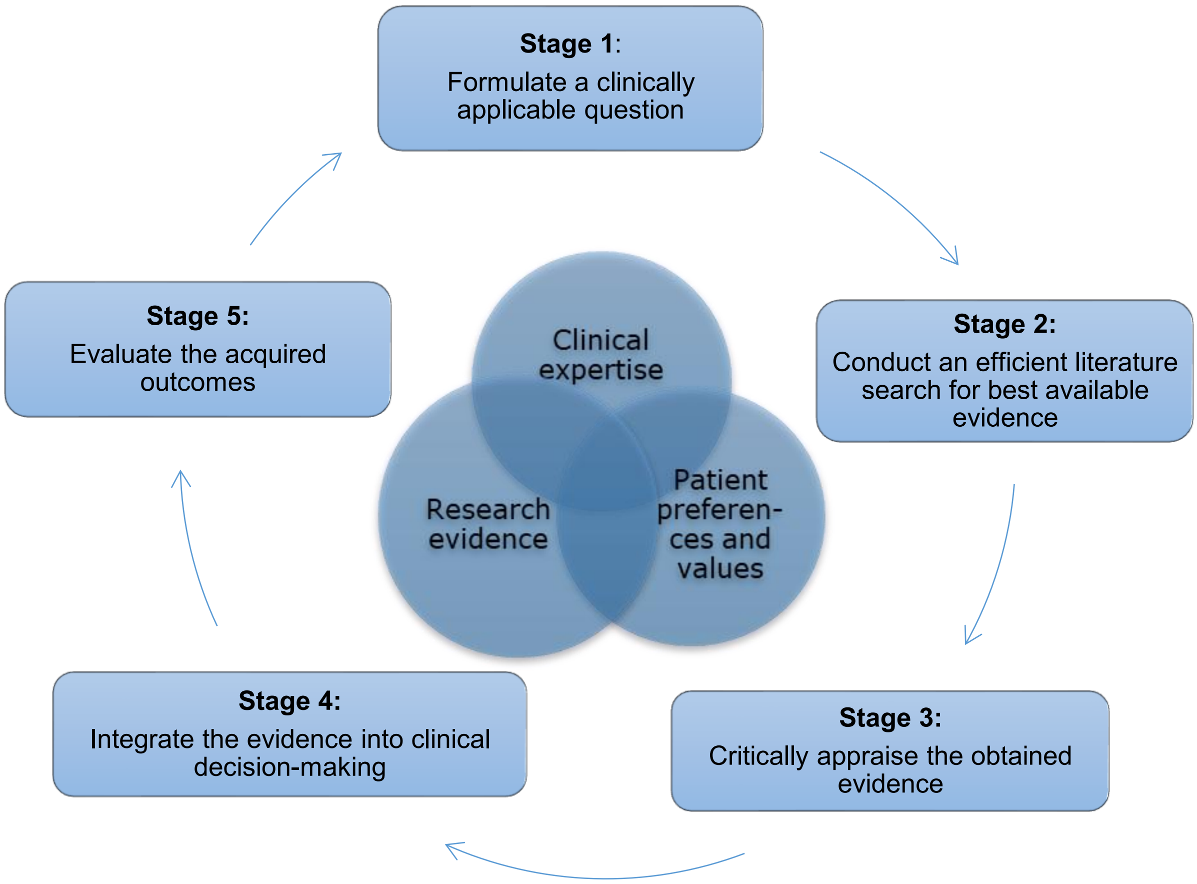
Chapter 7 provides a comprehensive set of recommendations and practical implications for practice and Alliance Medical Limited (AML), and outlines directions for future research. The chapter also critically examines the study's limitations, providing context for the scope and transferability of the results. Additionally, it highlights the thesis's originality and unique contributions, demonstrating how it advances knowledge in the field of radiography, and concludes with a reflection on the PhD journey. Due to the extensive recommendations and detailed strengths and limitations, the chapter is presented as a stand-alone chapter instead of being merged with the conclusion. Finally, chapter 8 summarises the key points of the PhD, providing a coherent synthesis of the study's core findings and contributions.

Chapter 2: Background

This chapter provides a review of the historical evolution and conceptual development of EBP and CPD within healthcare, with a particular focus on their significance in the radiography profession. It further examines the application of EBP in radiography practice, including a critical review of the commonly reported barriers to both EBP and CPD, as well as the economic, ethical and legal implications associated with limited or inconsistent implementation of these principles. Additionally, the chapter discusses the ongoing efforts to bridge the persistent theory-practice gap, discussing key models including Implementation Science, Translational Science, and knowledge diffusion theories. Finally, the chapter examines the theory of CoPs, a social learning theory, and evaluates its potential as an alternative and/or complementary solution to the persistent theory-practice divide within healthcare contexts, including radiography.

2.1 Evidence-based Practice

EBP is derived from evidence-based medicine (EBM), which was outlined in various publications by American and Canadian researchers and physicians since the 1980s (Thoma and Eaves, 2015). In the early 1990s, Canadian physician Gordon Guyatt coined and introduced the term EBM into the literature (Guyatt, 1991). Guyatt *et al.* (1992) aimed to shift the emphasis in clinical decision-making from ''intuition, unsystematic clinical experience, and pathophysiologic rationale'' to scientific, clinically relevant research. Initially, the approach was mainly concerned with critical appraisal of research, and Guyatt *et al.* (1992) acknowledged that there is little emphasis on patient values. Sackett *et al.* (1996) distinguished EBM from critical appraisal and defined EBM as ''the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients''. They discussed that the practice of EBM is the combination of best available research evidence, clinical expertise and individual patient preferences and values (Sackett *et al.*, 1996) (see Figure 2.1).



Adapted from Ramazan, Aarts and Widdowfield, 2022

Figure 2.1 Principles and process of Evidence-based Practice

Sackett worked to spread the EBM approach in the UK, Europe and beyond, showing junior physicians EBM in action. Historically, medical decisions in practice were dependent on the habits and expertise of individual senior physicians (Hajjaj *et al.*, 2010). Therefore, EBM was ''liberating and democratising" as it allowed junior physicians to challenge their seniors by treatment recommendations based on valid arguments and latest scientific knowledge (Smith and Rennie, 2014). Generally, EBM quickly became popular as it was supported by senior clinicians who embraced a challenge. It empowered junior physicians and subsequently nurses and other healthcare professionals (Smith and Rennie, 2014). Moreover, as EBM gained recognition, its application extended beyond clinical practice into the realm of health policy and administration. Originally developed to integrate the best available research evidence into individual clinical decision-making, the concept was increasingly interpreted as a mechanism for addressing the challenges of scarce healthcare resources and rising costs, as policymakers sought transparent and justifiable criteria for funding interventions and services (Saarni and Gylling, 2004). In several European countries and the United States, evidence hierarchies developed for clinical purposes were applied to macro-level decisions, guiding the allocation of resources and the restriction of access to interventions lacking robust empirical support (Nunes, 2003; Baron, 2018). By embedding these hierarchies within policy and administrative processes, resource rationing was aligned with the ostensibly objective scientific criteria, linking clinical standards to the broader economic and political objectives (Nunes, 2003; Saarni and Gylling, 2004). Consequently, the rhetoric of scientific evidence emerged not only to enhance quality and accountability in clinical practice, but also to advance fiscal and political priorities, positioning EBM from a primarily clinical methodology into a tool for policy making with systemic governance implications (Robinson *et al.*, 2012). Hence, EBM also produced some criticism including an unsigned, critical editorial in *The Lancet* in 1995, considering EBM “impossible to practice”, a “cookbook medicine”, the creature of managers and purchasers to cut costs of health care, or only concerned with randomised trials. Among other responses, Sacket et al. carefully refuted the complaints in their editorial titled “evidence-based medicine, what it is and what it isn’t”, emphasising that EBM integrates the best available research evidence with clinical expertise and patient values, rather than replacing practitioners’ judgements or ignoring patient needs (1996). Moreover, the authors responded to the claims regarding EBM serving as a as a cost-cutting or rationing tool, arguing that its central aim is to improve patient care. Today, EBM and EBP are integrated into (inter)national clinical guidelines, and supported by various regulatory and professional bodies within healthcare to promote and assess professional conduct, quality of care and accountability (Connor *et al.*, 2023; Ramazan and Graham, 2025).

For successful application of EBP, healthcare professionals are expected to continuously question the current ways of practice (Booth and Brice, 2004). This may occur during consultations with patients or during the provision of care leading to generating questions regarding the effects of a treatment, the choice of diagnostic tests, and the outcome and background of a disease or condition (Dang and Dearholt, 2018). For example, radiographers may question: ‘is the radiation dose optimised for this x-ray projection?’. The process is then continued by accessing, appraising, and applying the evidence (see Figure 2.1).

The aim of EBP is to deliver the most effective healthcare and maximise the use of finite healthcare resources, improving healthcare services and service users’ health outcome (Bick and Graham, 2010). Research evidence, however, has shown an extensive delay in translation of evidence-based interventions into every day practice (Morris, Wooding and Grant, 2011; Lau *et al.*, 2015). Additionally, studies have recorded challenges in sustaining innovations over time (Dilling *et al.*, 2013). This delay and inconsistent use of evidence is critical as service users may fail to receive the best available treatment and care. Moreover, healthcare organisations may potentially miss out on financial value gains and returns on investments (Kristensen, Nymann and Konradsen, 2015).

2.2 The theory-practice gap in radiography

Practice in healthcare may initially be understood as the exercise of a profession; however, it extends beyond this to encompass situated, socially and materially mediated activities through which professionals apply, adapt, and generate knowledge in response to the complexities of the clinical contexts (Salter and Kothari, 2016). In contrast, theory represent a structured system of concepts and relationships that provides an explanatory framework for understanding phenomena and guiding action (Dadich and Doloswala, 2018). Rather than existing as separate or opposing domains, practice and theory are dynamically interconnected, with theory informing practice and practice, in return, shaping and refining theory. This relationship is underpinned by different, yet interrelated, forms of knowledge. Theoretical knowledge is formal, structured and typically derived from research, offering general principles to guide decision-making (Kothari *et al.*, 2011). Practical knowledge is experiential, often tacit, and context-dependent, developed through professional engagement and interaction (Brockmann and Anthony, 2002; Kothari *et al.*, 2011). The tacit dimension of knowledge, as conceptualised by Polanyi (2009), highlights that not all knowledge can be explicitly articulated, but is instead embodied in action and expressed through practice. Similarly, Schön (1984) emphasises the role of reflection-in-action in shaping professional knowing, whereby practitioners continuously adjust their actions and responses as situations evolve. These forms of knowledge do not operate independently; instead, professional practice relies on their continuous integration and adaptation within context-specific situations.

In healthcare, this integration is reflected in EBP, which involves combining the best available research evidence, clinical expertise, and patient preferences (Guyatt et al., 1992). As previously discussed, this process goes beyond accessing and interpreting research; it requires translating evidence into practice in a manner that takes account of clinical judgement and the specific context. However, this translation is not always consistent. Delays in applying research evidence, along with differences in how evidence is accessed and valued, can contribute to a theory-practice gap, where what is knows from research is not fully reflected in practice. This theory-practice gap has been widely discussed in the literature, and is often associated with individual, organisational, cultural, and contextual factors (Arteaga *et al.*, 2024). This section discusses the commonly reported barriers to EBP and research in radiography, relating to negative attitudes and beliefs, a lack of knowledge and skills, limited resources and a lack of support and authority.

2.2.1 Negative attitude and beliefs towards Evidence-based Practice and research

Studies have reported a negative attitude towards EBP including a lack of motivation (Ahonen and Liikanen, 2010; Nalweyiso *et al.*, 2019; Abrantes *et al.*, 2020). Moreover, studies show that radiographers believe that research is a task for researchers external to the profession, or alternatively performed in collaboration with other professionals such as peers or physicians (Ahonen and Liikanen, 2010; Abrantes *et al.*, 2020). Although these beliefs may be influenced by factors such as limited resources and time, it may also be caused by a lack of confidence or low professional self-esteem. Ultimately, radiography has not long been recognised as a profession and the role development is continuing (European Federation of Radiographer Societies, 2011; Society of Radiographers (SoR), 2021).

Studies have reported that radiographers' preferred sources of information are other professionals (e.g., peers, physicians), their clinical experience and previous training or education rather than research evidence (Ahonen and Liikanen, 2010; Hayre *et al.*, 2018). Additionally, research suggests reliance on peers, traditions and subjective beliefs (Hayre *et al.*, 2018; Rawle *et al.*, 2023). For example, radiographers may rely on 'word of mouth' of peers and construct personal ideologies towards applying EBP. This is evident in the study by Hayre *et al.* (2018), leading to sporadic and inconsistent application of lead shielding to protect service users from ionising radiation. This suggests the possibility that radiographers may often implement an *ad hoc* approach to applying EBP in general.

2.2.2 A lack of knowledge and skills to research and apply Evidence-based Practice

A lack of knowledge and skills to evaluate research findings is highly reported among healthcare professionals including radiographers (Ahonen and Liikanen, 2010; Dagne and Beshah, 2021). Accordingly, radiographers have previously indicated that their initial training did not prepare them sufficiently to undertake research, and have identified the need for formal training in research concepts and skills (Elliott *et al.*, 2009; Ooi, Lee and Soh, 2012). For example, appraising evidence seems to be a challenging task, which is essential to successfully applying EBP.

Some studies show that involvement and knowledge of research and EBP appears to be more pronounced among younger and higher qualified radiographers (Ahonen and Liikanen, 2010; Ooi, Lee and Soh, 2012; Nalweyiso *et al.*, 2019). An explanation for this may be that evidence-based healthcare is more anticipated and appreciated as a change from diploma to degree level equipped radiographers with concepts of research and EBP. This suggests that the principles of research and EBP should be further encouraged during radiographers' initial training and maintained through official training post qualification.

2.2.3 Limited resources

A lack of resources such as time and access to literature has been a point of discussion within many healthcare professions including radiography (McArthur *et al.*, 2021; Ramazan, Aarts and Widdowfield, 2022). It is arguable that a lack of resources may be the result of reduced implementation of EBP (Ahonen and Liikanen, 2010). Furthermore, limited resources may possibly be a threat to acquired research skills as infrequent use may result in a loss of knowledge and expertise (Elliott *et al.*, 2009).

Ahonen and Liikanen (2010) show that radiographers do not perceive any personal or professional benefit (i.e., in terms of pay or professional development) to undertaking research to implement EBP. A lack of incentive may promote a negative attitude, which has also been recorded among other healthcare professionals such as nurses and midwives (Dagne and Beshah, 2021).

2.2.4 Lack of support and authority

Research evidence has shown a lack of support from peers, immediate superiors, physicians, and physicists to implementing EBP. Managers are considered least supportive when support is most required from this group by, for example, allocating protected time and making training opportunities available (Ahonen and Liikanen, 2010; Watts and Snaith, 2023). Previous studies suggest that encouragement and facilitating research opportunities by management may promote a positive attitude and an evidence-based culture (Ooi, Lee and Soh, 2012; Watts and Snaith, 2023). This has also been indicated in a study by Worum *et al.* (2020) involving physiotherapists.

Time, increased workloads and workforce shortages are considered significant obstacles among healthcare professionals including radiographers (Ooi, Lee and Soh, 2012; McArthur *et al.*, 2021; Ramazan, Aarts and Widdowfield, 2022; Watts and Snaith, 2023). There is a nationally acknowledged shortage of healthcare professionals which has been predicted to escalate over the years (Iacobucci, 2018). Therefore, particularly if no support is provided, implementing EBP or undertaking research may become increasingly challenging due to a lack of time and increased workloads promoted by staff shortages.

Previous studies have shown a lack of authority and autonomy to implementing EBP among radiographers (Rawle *et al.*, 2023; Watts and Snaith, 2023). For example, in the study by Rawle *et al.* (2023), radiographers have reported a lack of autonomy to implement new evidence-based x-ray projections as ‘’radiologists are responsible for the image interpretation’’. Correspondingly, a recent UK study by Ramazan, Aarts and Widdowfield (2022) suggest a hierarchical control mindset in radiology departments, leading to possible discouragement of implementing EBP.

Overall, the above discussion shows that the theory-practice gap in radiography is a result of multiple practical, environmental, and individual barriers which are connected and interlinked. Researchers have made various recommendations to remove these barriers and promote EBP in practice (Mathieson, Grande and Luker, 2019). However, the gap between theory and practice remains, and its importance has especially been highlighted during unforeseen circumstances such as the recent COVID-19 pandemic (Gómez-Sánchez *et al.*, 2022). There is an increasing interest in employing theories such as Translational Science, Implementation Science and knowledge diffusion theories to bridge the theory-practice gap (McArthur *et al.*, 2021; Tucker *et al.*, 2021). These theories are further discussed in section 2.6, 2.7 and 2.8.

2.3 Continuing Professional Development

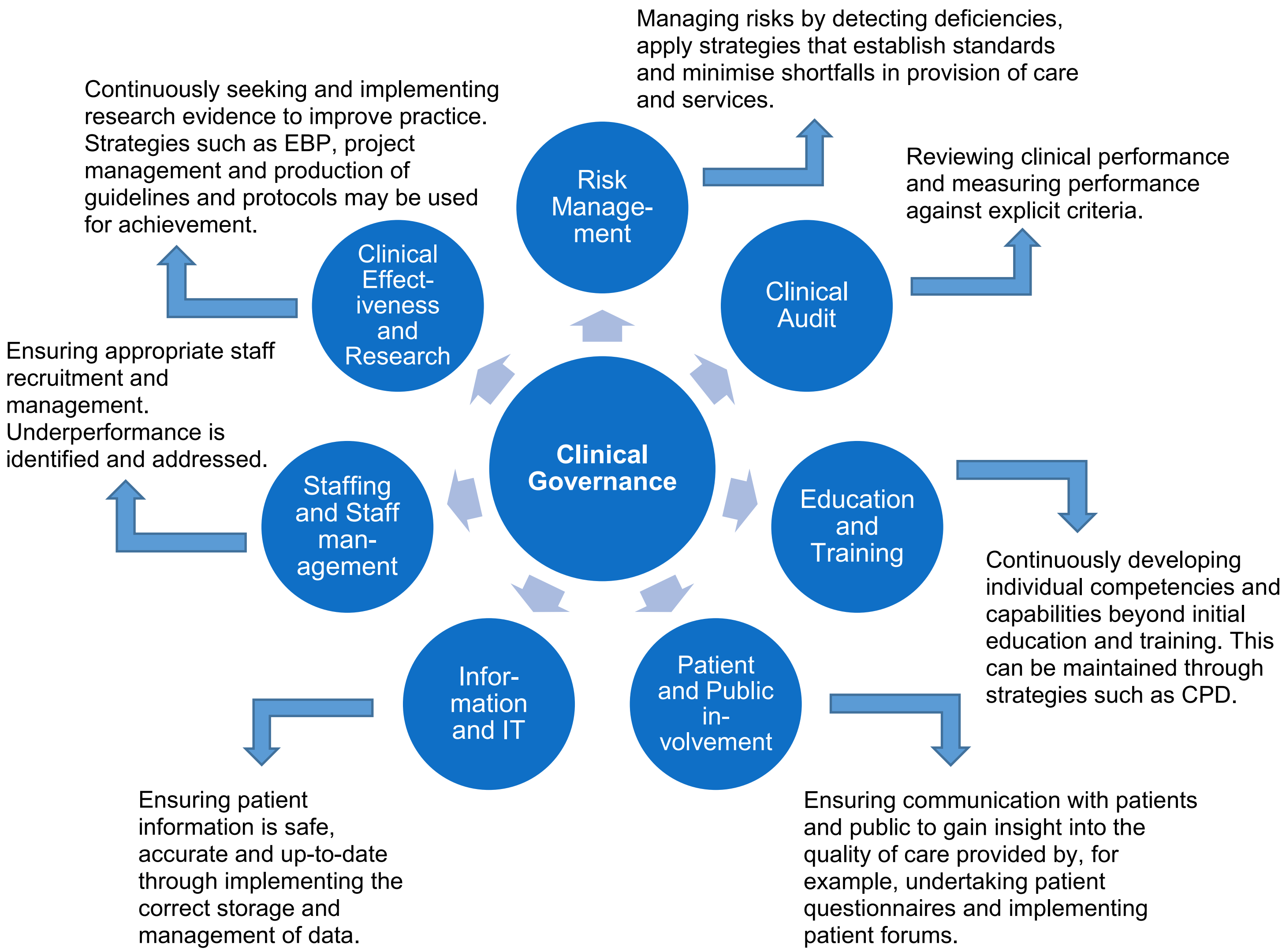
CPD emerged from continuing education (CE), which refers to ‘’lifelong learning’’ associated with didactic learning methods, such as lectures and seminars, with the purpose of updating and reinforcing knowledge to ultimately improve patient care (Institute of Medicine, 2010). CE began with Nightingale, who encouraged nurses to continue to learn after their initial training, with the first recorded continuing nursing education course dating back to 1894 (Stein, 1998; Gallagher, 2007). In medicine, CE was often confused with graduate medical education to address the issue of improperly trained physicians in the 1920s and 1930s (Institute of Medicine, 2010). This ended with the advent of internship and residency, which extended physicians’ formal training. After World War II, institutional bodies identified the need for structured further learning post formal qualification, as opposed to a casual or voluntary approach to learning and development previously (Institute of Medicine, 2010). The need for a more disciplined and structured approach to further learning became apparent due to healthcare becoming an increasingly litigious and professional environment, with rapid technological advancements (Gallagher, 2007; Filipe *et al.*, 2014). Over the past two decades, continuous learning and development has been considered a fundamental element to the role of any healthcare professional including radiographers (HCPC, 2018b; Health Education England, 2023).

CPD is a broader concept referring to the process of engaging in learning activities to develop and enhance abilities in a specific field (Kennedy, 2005). Unlike CE, it includes any formal and informal activities beyond professionals' initial training such as attending courses and conferences, reflective practice, teaching and engaging in (recent) literature in their field (HCPC, 2019; Institute of Medicine, 2010). It is a mandatory requirement for radiographers to engage in CPD to develop and maintain skills, knowledge, and attributes to practice safely, effectively, and legally within their evolving scope of practice (HCPC, 2018b).

The above discussions show a clear link between CPD and EBP: engaging in EBP can be considered CPD, and CPD is an essential component for the successful application of EBP. CPD involves continuously identifying areas of knowledge and/or skills that require updating, extending, and applying to practice, and EBP provides the tools to successfully implement the new evidence-based skill or knowledge to practice. Journals are crucial sources of recent, evidence-based information and vital to CPD as research literature is continuously changing. However, not all evidence from journal articles should be implemented as this depends on the research quality, especially with respect to validity, reliability, relevance, and applicability (Craig and Dowding, 2020). Assessing the research quality is a key stage of the process of EBP discussed in section 2.1.

2.4 Clinical governance

Continuing development and integrating best available evidence in daily patient care practices and decision-making is also emphasised within the principles of clinical governance. Clinical governance is the overarching framework through which healthcare organisations and its healthcare providers are accountable for continuously improving their quality of services and maintaining high quality of care (McSherry and Pearce, 2007; NHS, 2021). The framework is composed of seven elements including audit, education and training, and research and clinical effectiveness (see Figure 2.2).



Based on literature of NHS, 2021; McSherry and Pearce, 2007

Figure 2.2 Main elements of clinical governance

A system of clinical governance was adopted to all NHS Trusts after 1997 to guarantee patient safety and quality of care on a local level. Health organisation became responsible for quality of care and were expected to establish quality improvement programmes including audit, clinical risk reduction programmes and processes that identified good practice as well as poor clinical performance (Gottwald and Lansdown, 2021). Moreover, health organisations were expected to have procedures in place to identify adverse events and patient complaints, and quickly investigate, resolve, and learn from it (Fenn and Egan, 2012).

To ensure successful application of clinical governance strategies, CPD and EBP became crucial for healthcare professionals. Professionals are expected to engage in professional development to facilitate leadership skills and understanding of clinical governance strategies (Gottwald and Lansdown, 2021). Additionally, the rapid developments in research, technology and demographics demands professionals to adopt an evidence-based approach to their care delivery and participate in lifelong learning to achieve excellence in healthcare (Alsop, 2013).

Several national structures were established by the Department of Health to ensure the quality of care was effective, efficient and of high standard. The two key organisations were the National Institute for Health and Care Excellence (NICE) and The Commission for Health Improvement (CHI) (later known as Healthcare Commission) (Gottwald and Lansdown, 2021). NICE provides healthcare professionals with evidence-based guidelines, including National Service Frameworks on various conditions such as mental health, diabetes, coronary heart disease and cancer care (NICE, 2023). One of the main responsibilities of CHI was monitoring and reviewing local clinical governance provisions and to provide advice on ameliorating and preventing adverse events. CHI's responsibilities were taken over by the Care Quality Commission (CQC) in 2009 (Healthcare Commission, 2009).

The CHI, Mental Health Act Commission, and the Commission for Social Care were amalgamated to become the CQC, an independent regulator of health and social care in England (Healthcare Commission, 2009). The CQC ensure standards are met through monitoring, inspecting, and regulating health and social care services (CQC, 2023a). NHS organisations and social care providers must register with the CQC and get audited against a framework of standards. The five key standards consider whether an organisation is safe, effective, caring, responsive to people's needs and well-led (CQC, 2023b). The CQC inspect clinical governance arrangements to make judgements on how effective and well-led healthcare providers are (CQC Compliance, 2022). Therefore, addressing good clinical governance should be of high priority to healthcare providers.

2.5 Economic, ethical and legal implications of Evidence-based Practice and Continuing Professional Development

An evidence-based approach to practice was introduced with the aim to provide improved outcomes for patients, ensuring care that is effective, safe, and efficient (Youngblut and Brooten, 2001; Lehane *et al.*, 2019). This section discusses EBP and CPD from an economic, ethical, and legal perspective.

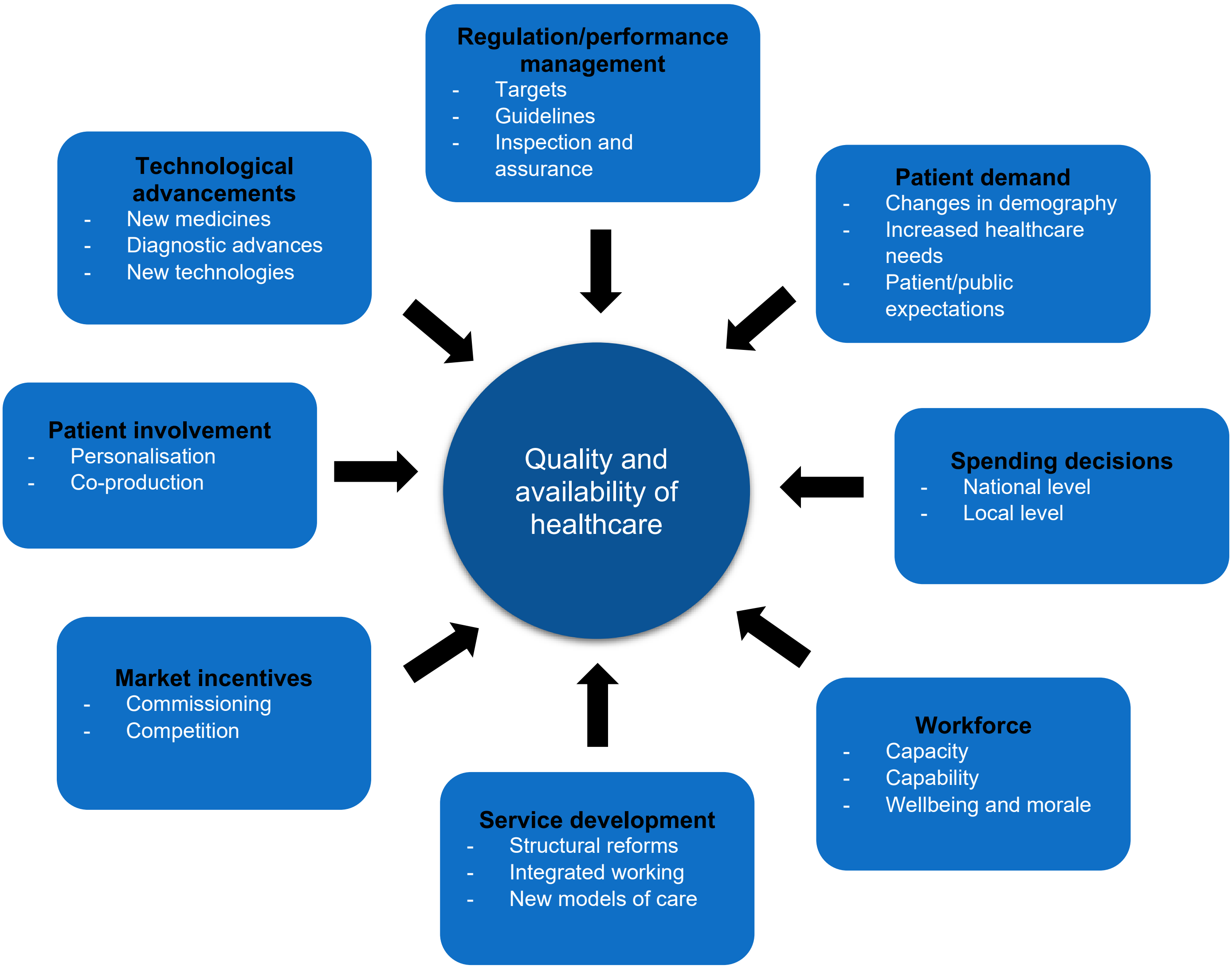
2.5.1 Economic implications of Evidence-based Practice and Continuing Professional Development

In the UK, healthcare spending has historically increased significantly yearly (Office for National Statistics, 2023). This is due to a combination of factors including a growing and ageing population with increasingly complex healthcare needs, increasing patient expectations and the introduction of progressive and continuous medical and technological advancements (Watt, Charlesworth and Gershlick, 2019). The growth in health funding over the past decade was below long-term average and could not keep pace with the demand (Cowper, 2018). This resulted in pressures on services including staff shortages, increasing waiting times and reduced performance standards (British Medical Association, 2023; Wise, 2020). In response to these pressures, reform programmes aimed at improving efficiency, expanding capacity, and modernising service delivery was set out, most notably through the NHS long term plan (Department of Health & Social Care, 2025). This strategy focuses on workforce expansion and retention, service integration, prevention, and the increased use of digital and innovative models of care. Alongside this, the NHS continues to seek greater involvement from private and third sector providers to support service delivery, particularly in areas such as elective care, diagnostics, and infrastructure development, with the aim to reducing waiting times and alleviating capacity constraints while maintaining publicly funded access to care (Dutton, Humphrey and Qualter, 2023; Department of Health & Social Care, 2025).

In modern medicine, diagnostic tests, including laboratory tests, imaging and more invasive procedures, are prominent in clinical decision-making. The overuse of tests in healthcare, especially within systems such as the NHS, is increasingly a topic of concern (Thurm *et al.*, 2021; Müskens *et al.*, 2022). Imaging is identified as a highly overused test (Tung *et al.*, 2018; Sharma *et al.*, 2020; Müskens *et al.*, 2022; Panchal and Hendrick, 2023). Factors associated with this overuse include the practice of ‘‘defensive medicine’’ in which healthcare professionals fear missed pathology and litigation, patient expectations and demands to validate or legitimise their concerns, and systemic pressures such as clinical guidelines and hospital protocols (Sharma *et al.*, 2020; Kjelle *et al.*, 2022; Panchal and Hendrick, 2023; Kwee, Toxopeus and Kwee, 2024). This can have several negative implications, such as unnecessary patient anxiety (e.g., false positives, incidental findings leading to ‘‘cascade effect‘‘), strain on healthcare resources (e.g., cost, reduced availability and access of services), and adverse health effects from unnecessary procedures (e.g., unnecessary exposure to radiation) (Tung *et al.*, 2018; Mandrola and Morgan, 2019; Thurm *et al.*, 2021).

With services already under severe strain and functioning at maximum capacity, healthcare services across the UK entered the COVID-19 pandemic unprepared (Goyal *et al.*, 2021; Lloyd *et al.*, 2023). In order to increase capacity to respond to the pandemic, non-COVID services such as elective procedures, urgent cancer referrals and outpatient appointments were reduced (BMA, 2020). Consequently, initial assessments and diagnosis for health problems have been missed or delayed affecting the population’s health. Patients’ safety has also been comprised by the knock-on effects of the unprecedented disruption to healthcare services. For example, waiting times for treatment have further increased due to the backlog of unmet needs during the pandemic (Lloyd *et al.*, 2023). As a response to the pressures facing the health and care services, various plans are proposed to improve the services and the quality of care the upcoming years, including a greater focus on preventive care (NHS, 2022b).

Lack of funding is not the only challenge facing the healthcare system. Various factors affect the availability and quality of care, which may be intensified by the financial challenges (Robertson *et al.*, 2017) (see Figure 2.3). Hence, implementing strategies such as EBP and CPD is not only beneficial to appropriately respond to the continuous changes such as the increasingly complex healthcare needs and rapid medical advancements, but also to reduce costs whilst providing quality healthcare. This is shown in a study by Walewska-Zielecka *et al.*, (2021), in which the implementation of evidence-based care reduced the number of unnecessary medical procedures and healthcare costs while not affecting patient satisfaction. These results are in line with a recent scoping review by Connor *et al.*, (2023) in which many reviewed articles showed improved patient outcomes and return on investments as a direct result of implementing EBPs. Therefore, as previously discussed, although EBP has been criticised as a cost-cutting tool, it may serve as an effective means to optimising and guiding healthcare services and scarce resources when implemented judiciously, ensuring that the quality of care and patient values and preferences are not comprised (Robinson *et al.*, 2012; Connor *et al.*, 2023).



Adapted from Robertson *et al.*, 2017

Figure 2.3 Factors affecting the quality and availability of healthcare

2.5.2 Ethical implications of Evidence-based Practice and Continuing Professional Development

To understand ethics in healthcare, it is important to briefly describe morality and ethics. Morality refers to '' traditions or beliefs about right and wrong conduct'' and is influenced by factors such as social and cultural practices, whereas ethics is ''the study of social morality'' (Burkhardt and Nathaniel, 2014, p. 35). In addition to personal moral philosophies that guide ethical decision-making, there are also ethical theories which provides individuals with general guidelines to make decisions (Bosswell and Cannon, 2018). For example, most healthcare occupations have a code of ethics to provide a more formal process for applying moral philosophy and to ‘’govern professional behaviour’’ (Burkhardt and Nathaniel, 2014, p. 35). In radiography, both the SoR and the professional regulator HCPC provide guidelines on codes of conduct, performance and ethics (SoR, 2013; HCPC, 2018c).

The four basic principles of ethics; beneficence, non-maleficence, autonomy and justice, are commonly used within healthcare to guide professionals’ behaviour and support decision-making, particularly when facing ethical dilemmas (Varkey, 2020). These principles also apply to research involving human subjects (The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (NCPHSBBR), 1979). Ethics codes in research stress respect for both, individuals from the perspective of individual autonomy and ‘’by emphasising the rights of those with diminished autonomy to the same protections’’ (Bosswell and Cannon, 2018, p.93). Autonomy refers to respecting individuals’ choices, which also links to the importance of consent, informed decision-making, truth-telling and confidentiality (Varkey, 2020). The principles of beneficence and non-maleficence relate to maximising benefits while minimising risk of harm to individuals (Bosswell and Cannon, 2018). In terms of research, this should be beneficial and provide value that outweighs any risk or harm, and any potential risks and harm requires mitigating by robust precautions (NCPHSBBR, 1979). Finally, justice obliges to ‘’equitably distribute benefits, risks, costs, and resources’’ (Jahn, 2011). In research, this includes avoiding bias and exposing individuals to a disadvantageous research protocol (NCPHSBBR, 1979).

As previously mentioned, since EBP is underpinned with the belief that practice should be based on best available evidence, it has received criticism relating to ethics. It is argued that EBP may result in unethical practice where: i) it overrides decisions of practitioners with clinical experience and knowledge; ii) it disempowers the ability of patients to choose based on personal ideas and values; iii) it results in preference given to treatments subject to randomised control trials; and iv) rationing and allocation decisions tend to ‘’favour existence of evidence over the presence of need’’, thus can be unjust (Allmark, 2015, p. 5). Hence, research emphasises the importance of professionals integrating their clinical expertise in decision-making, and to empower patients to discuss their preferences and values (Ahuja, 2013; Stone, 2018). Additionally, it is suggested that EBPs, similar to research, should be ethical in all areas including the design, implementation and evaluation (Bosswell and Cannon, 2018).

Although there are limitations, EBP is generally considered best practice in a sense that we all prefer to be treated with the best proven interventions; therefore, healthcare professionals are expected to practice their profession by combining their individual expertise with EBP (Ahuja, 2013). This being executed in an ethical manner with best interest of the patient. A similar statement is argued in the book by Gupta (2014), who discusses ethics and EBM. Gupta argues that an evidence-based approach to practice may be an ethical responsibility towards patients:

1. In order to practise medicine ethically, we must have the best evidence possible for recommending the interventions that we recommend.
2. EBM produces the best evidence possible (or at least produces better evidence than what came before it) for recommending the interventions that we recommend.
3. Therefore, in order to practise medicine ethically, we must practise EBM.

(Wieten, 2015)

2.5.3 Legal implications of Evidence-based Practice and Continuing Professional Development

To maintain and improve professional standards, practice should be evidence-based. Furthermore, in case where knowledge is limited, knowledge needs creating by conducting research (Lehane *et al.*, 2019). Therefore, healthcare professionals including radiographers are required to engage in EBP, including research and audit to meet regulatory and professional body's expectations, and to fulfil the Health Education England Allied Health Professions' Research and Innovation strategy (HCPC, 2018d; Health Education England, 2022; SoR, 2022). To reflect this demand, research methods and statistics are included in undergraduate and postgraduate curricula for healthcare professionals' education including radiographers (Gambling, Brown and Hogg, 2003).

As previously discussed, clinical governance makes explicit references to the use and implementation of EBP and CPD. Additionally, organisations such as NICE provide evidence-based guidelines to inform practice, and the CQC audits the evidence-based approaches in practice. Should the EBP be inadequate, or worse non-existent, the CQC will intervene (Gambling, Brown and Hogg, 2003). The regulatory and professional bodies including the HCPC and SoR promote EBP and require registrants to continue to learn and keep their knowledge and skills up to date. To ensure the standard is met, the HCPC selects and audits individual registrants (HCPC, 2018a).

There are also safety regulations in relation to radiographers' practice. For example, radiographers working with ionising radiation must adhere to the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R), 2017). IR(ME)R aims to protect patients and the public from the risk of harm when being exposed to ionising radiation. The regulation sets out responsibilities of duty holders (the employer, referrer, IR(ME)R practitioner and operator). As practitioners and operators, radiographers are responsible for: i) minimising unintended, excessive, and incorrect exposures; ii) justifying each exposure to ensure benefits outweigh risks; iii) and optimising diagnostic doses to keep them ''as low as reasonably practicable'' for their intended use. To meet these responsibilities, radiographers can apply EBP to consult the best available research evidence for optimisation strategies (e.g., lead shielding and positioning strategies) or other best practices that decrease the use of ionising radiation examinations including unjustified requests or unintended exposures (García Villar, 2011; Ramazan, Aarts and Widdowfield, 2022).

IR(ME)R only applies to radiographers using ionising radiation in imaging modalities including x-ray and computed tomography (CT). Other modalities such as magnetic resonance imaging (MRI) and ultrasound also encounter safety concerns, and radiographers are expected to adhere to guidelines to ensure safe practice. For example, an MRI environment carries the risk of missile effects, and health and safety risks related to radiofrequency energy and acoustic noise (Medicines and Healthcare products Regulatory Agency, 2021). Risks in ultrasound include thermal and mechanical bio-effects such as tissue heating and cavitation (The British Medical Ultrasound Society, 2020). In addition to implementing EBPs to reduce safety risks, research evidence can also be consulted to improve patient experience. For example, to improve the experiences of patients undergoing medical imaging procedures such as MRI, which is a modality commonly experienced as claustrophobic and anxiety-provoking (Hudson, Heales and Meertens, 2022).

In summary, the above argues that EBP is best practice, and discusses the importance and benefits of integrating EBP in daily practice and ensuring CPD from an economic, legal, and intellectual point of view. Morally and ethically, although it has some conflicting views to EBP, it explains why an evidence-based approach may be viewed as a professional's responsibility to ensure the provision of prime quality care and treatment. This must, however, be performed in an ethical manner in combination with patient preferences and values.

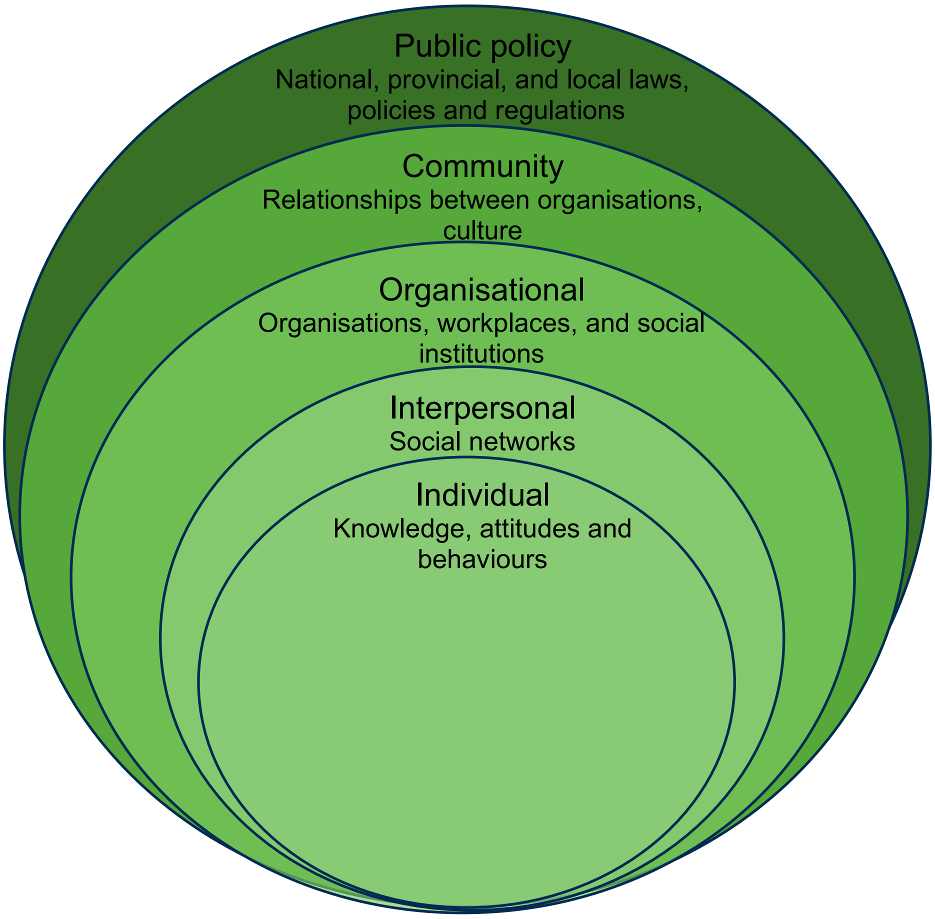
2.6 Implementation Science

Implementation Science is a relatively new field of study that is concerned with the application of research findings and other evidence-based knowledge into practice (Bauer and Kirchner, 2020). There are various definitions of this concept that are consistent with the definition proposed in the inaugural issue of the journal, *Implementation Science*: "…the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice and, hence, to improve the quality and effectiveness of health services” (Eccles and Mittman, 2006). Therefore, the purpose of Implementation Science is not to determine clinical effectiveness or the health impact of innovations, but rather to identify factors that affect its uptake into routine use (Bauer and Kirchner, 2020).

Implementation Science was introduced as a response to poorly, or not implemented valuable EBPs and interventions. Moreover, even if successfully implemented, interventions or practices do not always produce the expected health benefits if the effectiveness is lost during implementation, or if the intervention or practice never demonstrated improved outcomes in general (Bauer *et al.*, 2015). Therefore, the crux of Implementation Science is two-fold: i) to identify barriers and facilitators across multiple levels including patients, providers, the organisation and other stakeholders, ii) and to develop and implement strategies that remove these barriers and enhance the facilitators to increase the uptake of EBPs and interventions (Bauer and Kirchner, 2020).

2.6.1 Applying implementation research

Implementation research can target determinants at any level of the social ecological model (see Figure 2.4). This may include the institutional setting and the social, economic, political, and physical environment, comprising numerous stakeholders and their interactions (Peters *et al.*, 2013). A range of implementation outcomes can be assessed. For example, Proctor *et al.*, (2011) list eight implementation outcome variables that can serve as indicators of the success of an implementation to practice or clinical context: acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability.



Adapted from McLeroy et al., 1988

Figure 2.4 Social ecological model

Various research methods can be utilised in implementation research including qualitative, quantitative, and mixed methods. Alternatively, some research methods are specifically developed, or are more suitable for implementation research such as effectiveness-implementation hybrid trials (Peters *et al.*, 2013). Implementation strategies are the actions undertaken to improve adoption, implementation, and sustainability of an EBP or intervention (Curran *et al.*, 2012). The Expert Recommendations for Implementing Change study compiled and defined 73 strategies that can be used to support implementation research and practice (Powell *et al.*, 2015). A strategy can be singular (e.g., training), or multiple strategies to address various barriers (e.g., use of reminders and role revisions), or blended strategies which are linked and branded for use (e.g., the Leadership and Organisational Change Intervention).

2.6.2 Implementation research in healthcare

Despite the rapid growth and interest in Implementation Science, designing implementation research remains a complex task, especially for health researchers who have not received specialist training in the field (Hull *et al.*, 2019). This is demonstrated in the study by Crable *et al.*, (2018) in which most submitted proposals performed poorly on Proctor *et al's.*, (2012) recommended ten criteria for writing implementation research grant proposals. For example, 67% of the proposals failed to identify the implementation strategies required and/or incorrectly described the intervention as an implementation strategy. Moreover, 70% of the proposals failed to describe implementation or improvement science-related outcomes and/or failed to link outcomes to the study aim and/or reported an inappropriate unit of analysis for the proposed study.

Another key challenge of implementation research is the continuous changing landscape affecting the implemented practice or intervention (McAlearney *et al.*, 2016). Therefore, health researchers must find ways to account for unmeasured effects of the implementation post hoc (i.e., changing policies over time). This suggests that applying this theory to a healthcare setting is more challenging due to healthcare being a highly regulated and fast-evolving industry. Additionally, the previously discussed challenges facing healthcare (e.g., shortage of resources such as time and staff) may also affect the successful application of implementation research.

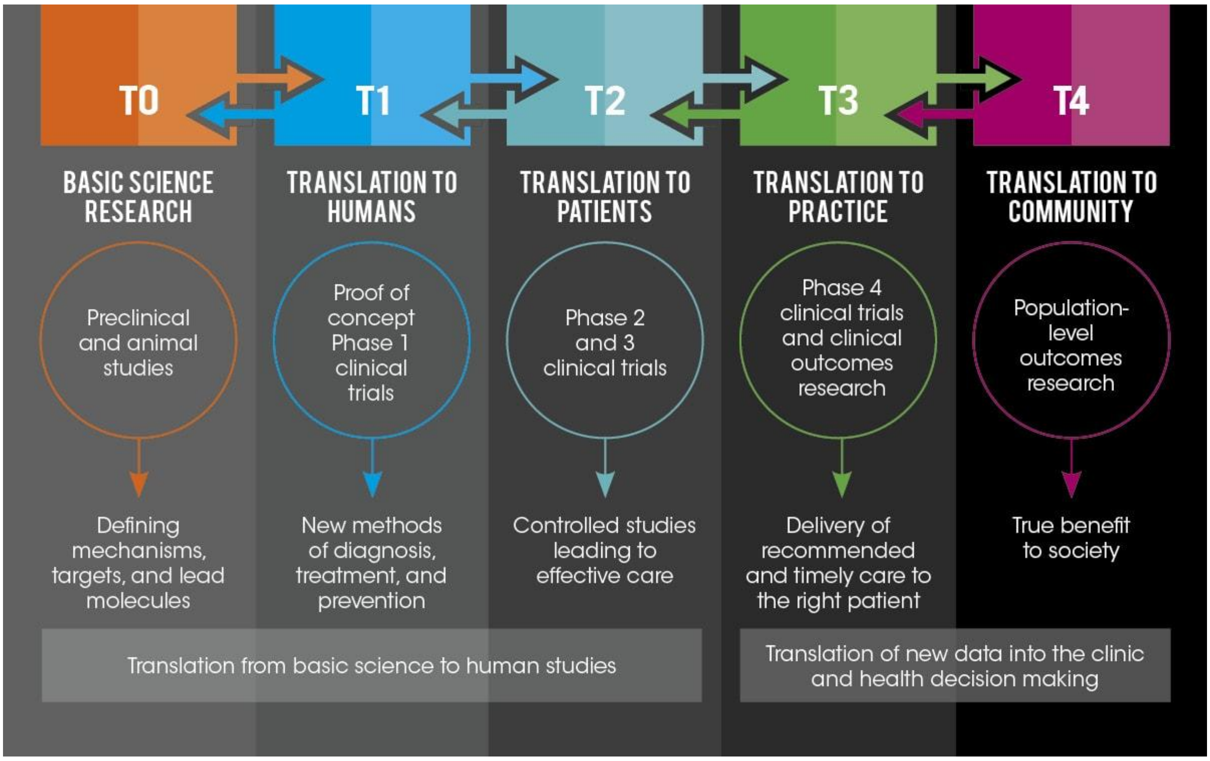
2.7 Translational Science

Like Implementation Science, Translational Science aims to bridge the gap between research and practice. However, unlike Implementation Science, it refers to the ‘’bench-to-bedside’’ process that retrieves knowledge from basic scientific research into clinical research for optimal delivery of care and treatment (Seyhan, 2019). Basic scientific research focuses on understanding the underlying mechanisms and biological processes, whereas clinical research refers to direct application of knowledge to improve patient care and treatment (Röhrig *et al.*, 2009). Translational Science entered the literature in the 1990s, but only became prominent after The National Institutes of Health (NIH) implemented its Roadmap (Grzywacz and Allen, 2017). The Roadmap is a strategic plan intended to overcome challenges that hinder the ability to understand and promote human health through three strategies: i) developing new pathways to discovery, ii) creating research teams of the future, iii) and reengineering the clinical research enterprise (Zerhouni, 2003). The drive to develop The Roadmap initiates from the gap between basic research findings and the tools utilised by healthcare practitioners to treat disease and alleviate human suffering (Grzywacz and Allen, 2017).

Translational Science and its primary tool, translational research, is often defined nominally (Grzywacz and Allen, 2017). For example, a frequently cited definition refers to a general process: “effective translation of the new knowledge, mechanisms, and techniques generated by advances in basic science research into new approaches for preventing, identifying and treating disease is essential for improving health” (Fontanarosa and DeAngelis, 2002). Another definition describes the concept as: “activities designed to transform ideas, insights, and discoveries generated through basic scientific inquiry and from clinical or population studies into effective and widely available clinical applications” (Mitchell *et al.*, 2010). Hence, the available definitions typically refer to Translational Science as a process in which discoveries generated through basic scientific enquiry are applied to treat and prevent human disease, thus playing an important role between basic and clinical research (Seyhan, 2019).

2.7.1 Applying translational research

The process of translational research aims to translate basic scientific research more quickly and efficiently into practice. According to Translational Research Institute (2023), translational research encourages and promotes collaboration among laboratory and clinical researchers, incorporates preferences of the public through involving communities to determine their needs for health innovations, and identifies and promotes adoption of best health innovations. There are five phases of translational research indicated by *T* (for ‘’Translational Phase’’), including one phase reserved for non-human studies (T0) (Translational Research Institute, 2023) (see Figure 2.5). To support and foster the process, translational scientists work collaboratively and innovatively to identify and eliminate barriers in the translation process and ultimately increase the efficiency and efficacy of translations (Gilliland *et al.*, 2019).



Adopted from Translational Research Institute, 2023

Figure 2.5 Phases of translational research

2.7.2 Translational research in healthcare

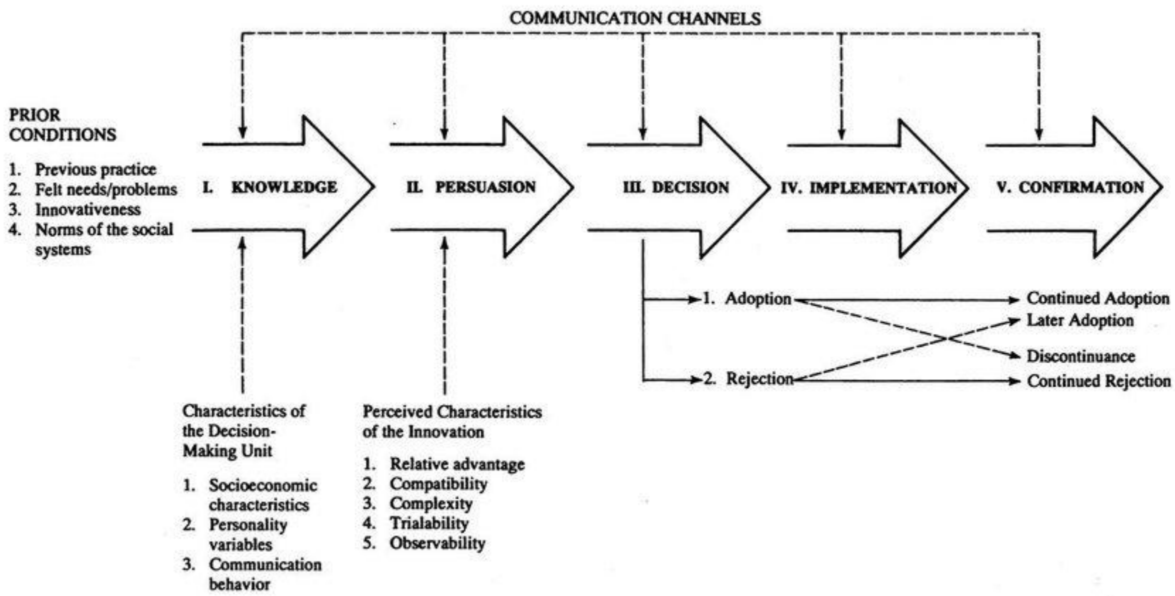
Despite the efforts of Translational Science, translation of research findings into practice remains limited and a slow process (Seyhan, 2019). The article by Seyhan (2019) discusses challenges, potential 'weak links' that might contribute to failure of translations and provides strategies to mitigate the challenges. Seyhan (2019) suggests that the process of Translational Science is not a linear process with a beginning and an end (as demonstrated in Figure 2.5) but is rather complex and involves many feedback loops with the T0-T4 phases being interdependent and requiring continuous data gathering, analysis, dissemination, interaction, and consideration of overcoming barriers in the translational process. Moreover, the article identifies roadblocks such as the long process of the approval and development of a health innovation, and barriers relating to reproducibility and applicability of research findings into a clinical context. Other potential barriers include a lack of funding, incentives and expertise and insufficient institutional and organisational support for translational research (Seyhan, 2019; Senecal *et al.*, 2021; Abu-Odah *et al.*, 2022). These findings align with translational research barriers relating to ionising radiation research in radiology (Bockhold *et al.*, 2022).

2.8 Knowledge Diffusion

Whilst implementation and Translational Science are more recent theories, knowledge Diffusion has a long history of theoretical and empirical attempts to understand the spread of ideas, practices and actions within social systems (Green *et al.*, 2009). In the 19th Century, two French social theorists proposed conflicting theories on how diffusion occurs. Tarde outlined three processes suggesting that individuals learn about an innovation through copying or ‘’imitating’’ someone else’s adoption of the innovation: i) repetition, in which there is an inventor and imitator; ii) opposition, in which there are various interpretations to the mimicry, particularly with diverse or changing circumstances; and iii) adaptation, in which a new balance is achieved by the imitators after interpretations are reconciled (Kinnunen, 1996; Green *et al.*, 2014). Le Bon argued that diffusion is a result of a herd instinct or ‘’collective behaviour’’ with minimal room for interpretive nuance (Le Bon, 1895; Green *et al.*, 2014). These early theories might explain current tensions between the demand for fidelity to EBP and professionals’ need for adaptability. The professionals’ resistance and adaptation may not be viewed as infidelity to EBP, but as a logical and natural adjustment of the innovation to suit diverse and evolving situations (Green *et al.*, 2014).

2.8.1 Diffusion of Innovation

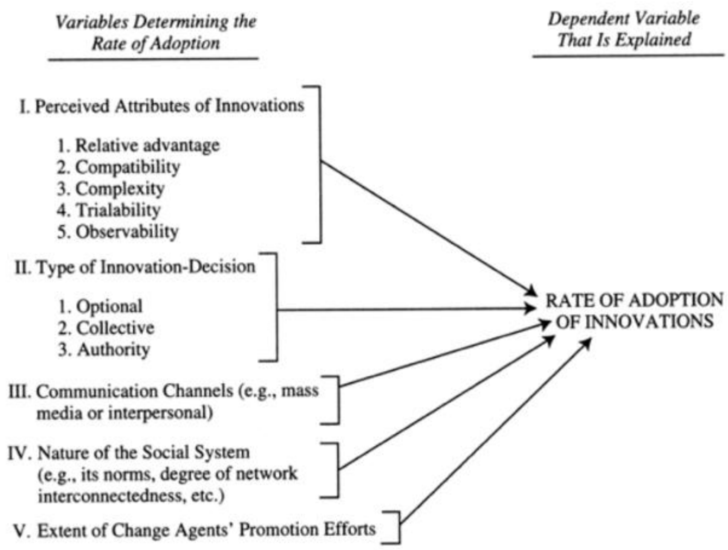
Knowledge Diffusion became particularly popularised by a communication theorists and sociologist Everett Rogers (Rogers, 1962). Rogers defines diffusion as ''… the process in which innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that messages are concerned with new ideas'' (Rogers, 2003, p.21). Rogers suggests that diffusion occurs through a five-step innovation-decision process: i) *knowledge* occurs when an individual or a unit is exposed to an innovation and gains an understanding of its functions; ii) *persuasion* occurs when an individual or unit creates a favourable or unfavourable attitude towards the innovation; iii) *decision* occurs when an individual or unit engages in activities that leads to a choice to apply or reject the innovation; iv) *implementation* takes place when and individual or unit puts a new idea into use; v) *confirmation* occurs when an individual seeks reinforcement of an innovation-decision, but may require to reverse this decision if exposed to conflicting messages regarding the innovation (see Figure 2.6).



Adopted from Rogers, 2003

Figure 2.6 Stages of innovation-decision process

Rogers (2003, p. 208) suggests that the rate of adoption is ''the relative speed with which an innovation is adopted by members of a social system''. This is measured as the number of individuals adopting an innovation in a specified period, such as a year. The more individuals involved in the innovation-decision process, the slower the rate of adoption, hence one means of accelerating the adoption rate is to involve fewer individuals in the innovation-decision process. Additionally, Rogers (2003) proposes other variables that may determine the rate of adoption of innovations, including the attributes of an innovation, the communication channels diffusing the innovation, and the nature of the social system in which the innovation is diffusing (see Figure 2.7).



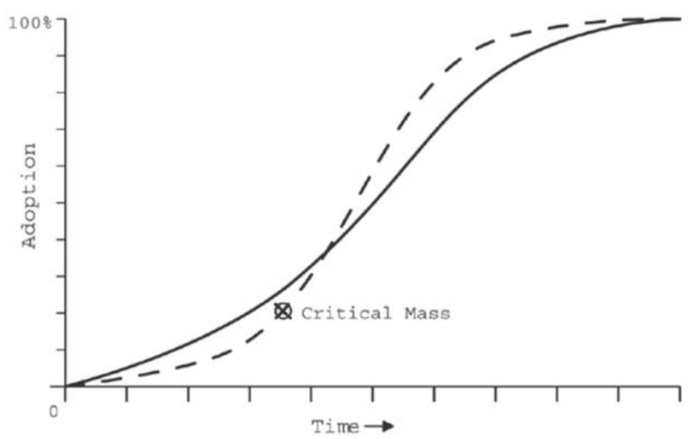
Adopted from Rogers, 2003

Figure 2.7 Variables determining the rate of adoption

Within an adoption curve, an innovation may reach a critical mass. A critical mass is created when there are sufficient number of adopters in a social system so that the rate of adoption becomes self-sustaining and drives further growth (Rogers, 2003) (see Figure 2.8). Rogers (2003) outlines several strategies to reach the critical mass including targeting highly respected individual within the systems, positively shaping individuals' perceptions and expectations regarding the innovation and introducing the innovation to a group within the system whose members are relatively more innovative (e.g., research and development units).

2.8.2 Diffusion of Innovation in healthcare

Roger's systemic theory on innovation has been applied to many fields including healthcare (Lien and Jiang, 2017). Studies apply the theory slightly differently; this lack of cohesion may suggest that the theory is stagnant and difficult to apply with consistency (Andrews, 2022). The theory has been critiqued for its challenging application in healthcare settings as it does not account for the organisational and economic complexities associated with healthcare settings, potentially limiting timely uptake of EBPs and innovations (Barnett *et al.*, 2011; Dearing and Cox, 2018). The theory has also been criticised for pro-innovation bias, and only considers latest innovations as ''progress'', thereby ignoring alternatives (Botha and Atkins, 2005). This perspective arguably conflicts with the principles of EBP, which emphasise the integration of practitioner's clinical expertise and consideration of patients' preferences and values in decision-making, rather than relying solely on research evidence.



Adopted from Rogers, 2003

Figure 2.8 The rate of adoption for an interactive innovation showing the critical mass

2.9 Communities of Practice

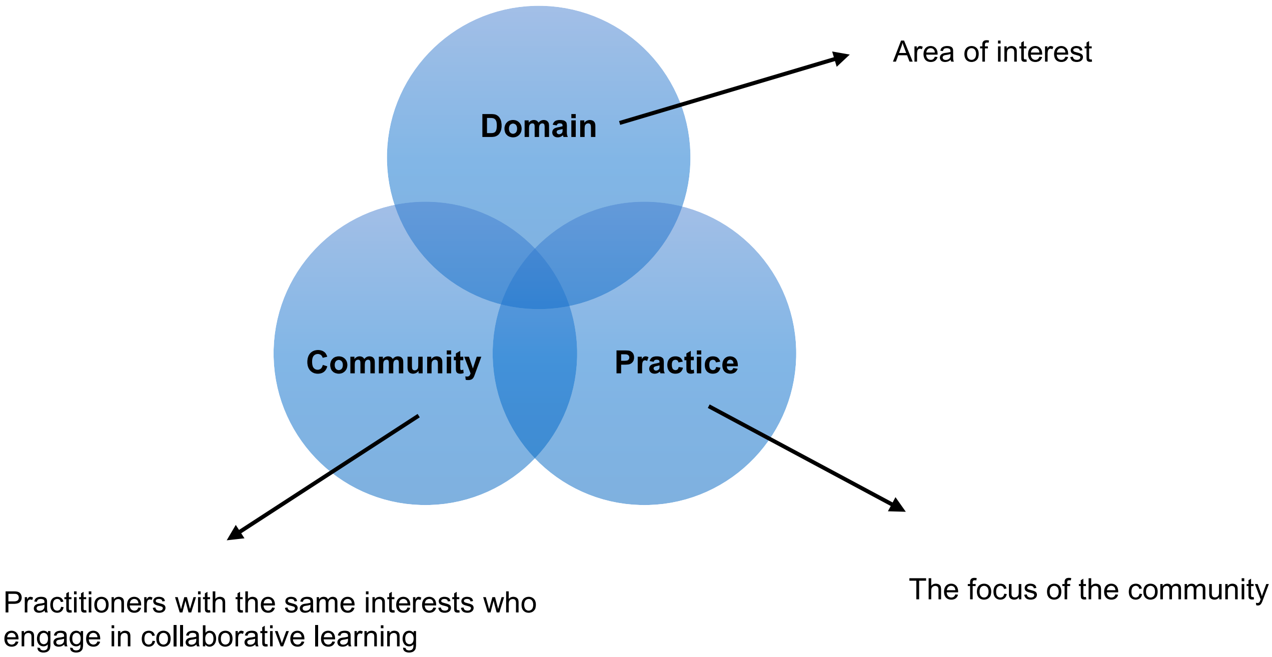
CoPs was first introduced by anthropologist Lave and social learning theorist Wenger (Lave and Wenger, 1991). They proposed that learning ''is a process of participation in Communities of Practice'' – participation that is at first peripheral but may gradually increase in engagement and complexity. Wenger significantly expanded on the concept in the book *Communities of Practice* published in 1998 (Wenger, 1998). CoPs refer to groups of individuals who share a concern or passion for a topic, craft and/or profession, and expand their knowledge and/or expertise through regular interaction (Wenger, 1998). Therefore, CoPs act as a ''living curriculum'' that engages individuals in a process of ''collective learning'' (Wenger-Trayner, 2015).

2.9.1 What is considered a Community of Practice?

A Community of Practice can evolve naturally due to individuals sharing a common interest in a domain or area, or can be created deliberately to exchange knowledge and expertise in a specific field (Wenger-Trayner, 2015). Wenger, McDermott and Snyder (2002) emphasise that not all communities are CoPs. For example, a neighbourhood is often considered a community, but is not CoPs (Wenger-Trayner, 2015). CoPs must have three distinct characteristics to be considered a 'Community of Practice' (see Figure 2.9):

1. *The domain:* Involves individuals with an identity defined by a shared domain of interest, competence, and commitment (i.e., practitioners). This domain creates a common ground, guides learning and provides meaning to participants' actions.

2. *The community:* The community creates the social structure that facilitates learning through interactions and relationships with others. Participants pursue their interests through joint activities, discussions, problem-solving opportunities, information sharing and relationship building.
3. *The practice:* The practice is a set of shared repertoires of resources such as ideas, experiences, and information. In essence, the practice is the specific knowledge which the community aims to develop, share, and maintain.



Based on literature of Wenger, McDermott and Snyder, 2002, p.27.

Figure 2.9 Characteristics of Communities of Practice

2.9.2 Learning in Communities of Practice

Wenger argues that learning is an intrinsically social process which occurs in CoPs. In his 1998 book (p. 4), he proposes four premises regarding learning and the nature of knowledge, knowing and knowers: i) humans are social beings which is a central aspect of learning; ii) knowledge is a matter of competence relating to valued enterprises (e.g., discovering scientific facts, singing in tune etc.); iii) knowing is a matter of participating in activities relating to such enterprises, and actively engaging in such a world; iv) meaning relates to our ability to experience the world and experience engagement with it as 'meaningful' – this ultimately is learning, and therefore producing. Hence, the focus of the theory is learning as social participation. Specifically active participation in social communities' *practices*, and construct *identities* in relation to these communities (Wenger, 1998). For example, participating in a work team is both, an action, and a form of belonging to the team. According to Wenger (1998) such participations not only shape what we do, but also who we are and how we interpret what we do. He further expands on these arguments by proposing elements of social participation as a process of learning and knowing (p.5):

1. *Meaning:* our (changing) ability – individually and collectively – to experience and view life and the world as meaningful.
2. *Practice:* the shared historical and social resources, frameworks, and perspectives that allow sustaining mutual engagement in action.
3. *Community:* the social configurations in which our enterprises are valued, and our participation is recognisable as competence.
4. *Identity:* learning changes who we are and ''creates personal histories of becoming in the context of our communities''.

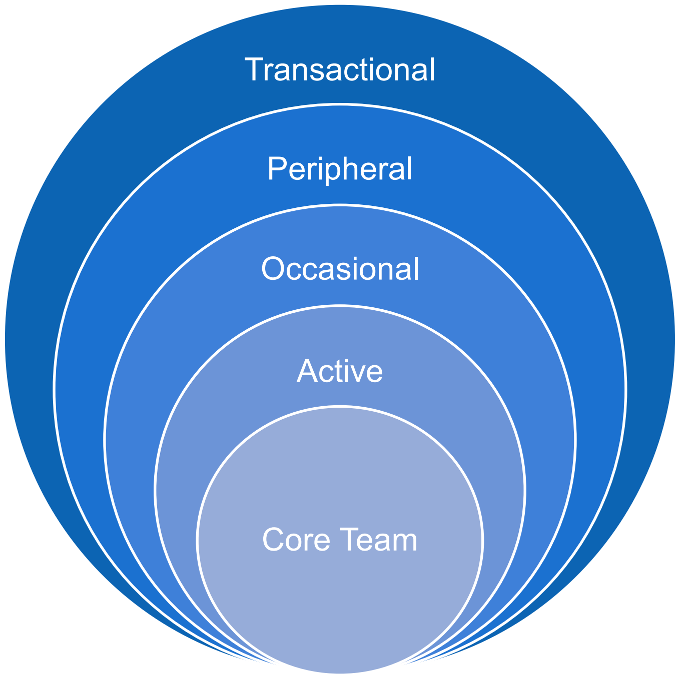
To illustrate the above, Wenger (2013) presents an example regarding appreciating a glass of wine in terms of its visual characteristics, smell, and taste in the presence of a friend, who is an experienced wine taster. The friend attends a ‘club’ in which the members discuss types of wines. The friend passionately explains what makes a ‘good’ bottle of wine, using terms only wine tasters would be familiar with (a practice). A human practice, such as wine tasting, gives rise to an experience of the world. Learning must be an experience of meaning, an interpretation of the world and the ability to interpret the world in a new manner. If one is a member of this ‘club’ or community, they can hear and understand their terminology (i.e., thus, there is competence). Therefore, Wenger felt a disconnect between him and his friend in terms of how they experience the same wine differently; one who is a member of a community who has developed a practice and particular knowledge compared to himself who is not part of the community, nor obtains this practice or knowledge. Knowing is embedded in a practical experience of the world that is interpreted in respect to certain social practices. Finally, identity refers to participating in the wine tasting community as part of a trajectory, which shapes one and leads to who one wishes to become (i.e., becoming a sommelier, or simply developing a wine palate).

2.9.3 Levels of participation

Wenger-Trayner (2012) argues that CoPs involve members with different levels of participation due to their different overall perspectives and ambitions. Additionally, participants can move freely across the levels depending on their evolving interests and needs. As the domain has different levels of relevance to participants, the boundaries of CoPs are more flexible. This flexibility and movement across the levels may be considered beneficial as it allows natural flow of interaction and information-sharing which creates opportunity for learning and uptake of (new) knowledge. Wenger-Trayner (2012) distinguishes five levels of participation (see Figure 2.10):

1. *Core team* – participants form the heart of the community. The participants organise, market, nurture, and operate the community.
2. *Active* – participants operate directly with the core team to shape the definition and direction of the CoP, including defining the community's shared vision, purpose, roles, and strategies.
3. *Occasional* – participants engage when topics of interest are addressed or when there is knowledge or a practice to contribute to the community. This often is the largest group of the community.
4. *Peripheral* – participants feel connected to the community but with less engagement or authority. For example, newcomers or individuals with less personal commitment to the practice (e.g., to network). These individuals may be more active elsewhere and carry the learning to different communities.
5. *Transactional* – participants are least connected to the community and may only access the CoP for resources or to provide a specific service to the community (e.g., website support, a guest speaker).

The different levels may become a problem if the levels reflect a distinction that comes from outside the community (i.e., a hierarchy). For example, if the core team consists of senior managers and participants at the peripheral level are individuals in the field. An additional threat is if there is no movement across levels, and no (new) individuals moving in the periphery. This would result in reduced creation or dissemination of (new) knowledge (Li *et al.*, 2009). Therefore, Wenger-Trayner (2012) emphasise the importance of inviting individuals in the community.



Based on literature of Wenger-Trayner, 2012

Figure 2.10 Levels of participation in a Community of Practice

In the book *Cultivating Communities of Practice*, Wenger, McDermott and Snyder (2002) shifted their focus on tools to engineer and cultivate CoPs to enhance an organisation's competitiveness. Wenger, McDermott and Snyder (2002) introduce the roles of leaders/champions and facilitators of CoPs. A leader/champion is often a leader who is well-respected within an organisation and is responsible for communicating the CoPs to others, recruiting participants, and providing resources for group activities. Facilitators organise and manage day-to-day activities, often assumed by a senior manager who has great understanding of the mission and vision of the organisation, is resourceful and is well-connected to members and potential members of the CoP (Li *et al.*, 2009). These roles, however, have been shown to vary or even merged across studies depending on the size of the CoP and availability of human resources (Li *et al.*, 2009). In addition to these roles, Wenger, McDermott and Snyder (2002) identify seven principles for cultivating successful CoPs (see Table 2.1).

Table 2.1 Principles for cultivating successful Communities of Practice

Based on literature of Wenger, McDermott and Snyder, 2002, ch.3.

Seven Principles for Cultivating Successful Communities of Practice	
1. Design for evolution	The nature of a community is dynamic due to participants' and the community's changing interests, ambitions, and focus. Therefore, design the community to evolve naturally to respond to these changes.
2. Create a dialogue between in- and outside perspectives	The participants' knowledge within the community is a valuable resource. Nevertheless, it is also beneficial to consider perspectives from outside the community to appreciate different possibilities for achieving the learning goals.
3. Invite and allow different levels of participation	Levels of participation and movement between the levels is natural as participants have (changing) levels of interest in the community.
4. Develop public and private community spaces	Communities typically operate in public spaces (in-person or electronically). Nevertheless, participants could coordinate an individualised approach to discuss specific needs (e.g., phone call, e-mail exchange or problem-solving conversation).
5. Focus on value	Communities deliver value to the organisation, teams, and individual participants. Participants should be encouraged to be explicit regarding the value of the community throughout its lifetime.
6. Combine familiarity and excitement	Communities of Practice are ''neutral places'' that provide both familiarity, and interesting and varied events to cycle new ideas and individuals in the community.
7. Create and maintain a rhythm for the community	Communities of Practice require a thriving cycle of activities that enables participants to regularly meet, reflect and evolve. The rhythm should be maintained at an anticipated level of engagement to sustain vibrancy of the community, yet not be highly fast paced to become overwhelming.

2.9.4 Networks of Practice and Landscapes of Practice

The original formulation of CoPs focuses on describing how learning, meaning and identity within a community can translate into a sustained practice. This prompted the concept of Networks of Practice (NoPs), which was originated by Brown and Duguid (2000). NoP posits that individuals who share the same practices can share knowledge despite a lack of relational ties and high geographic dispersion (Marques, Yan and Matthews, 2020). Similarly, Wenger-Trayner *et al.*, (2015) elaborated on the concept of CoPs proposing Landscapes of Practice (LoPs). The authors argue the complexities of CoPs, and how different CoPs may interact and belong to a broader Landscape of Practice, rather than solely rely on their own local situated practices. Both, NoP and LoP are looser and broader concepts compared to CoPs. However, in contrast to NoP, LoPs are the totality of practitioners that includes all CoPs, encompassing a “living and emerging body of knowledge” (Pyrko, Dörfler and Eden, 2019) (see Table 2.2). Thus, LoPs do not entail a network, and the communities within the landscape may not exclusively be oriented toward the same practice. Instead of concentrating on the plurality of social formations to sustain a practice, in LoPs the emphasis is “… on the multiplicity of practices involved, the importance of boundaries among them, and with problematising identification and knowledgeability across these boundaries” (Wenger-Trayner *et al.*, 2015, p.27). Wenger (1998, p. 118) first described LoP as follows:

> ‘’[…] Communities of Practice differentiate themselves and also interlock with each other, they constitute a complex social landscape of shared practices, boundaries, peripheries, overlaps, connections, and encounters. I want to conclude with two points […]. First, the texture of continuities and

discontinuities of this landscape is defined by practice, not by institutional affiliation; second, the landscape so defined is a weaving of both boundaries and peripheries''.

'Boundaries' and 'peripheries' refer to the ''edges'' of CoPs, which represents the negotiable points of contact with the rest of the world, the areas of overlap and allows possibilities of participation for 'outsiders' or 'newcomers' (Wenger, 1998, p. 119). Thus, the concept of LoP entails that individuals develop competence in their CoP to promote problem-solving solutions in their practice and evolve as practitioners. Competence is the socially negotiated curriculum of the required knowledge to perform work and act as a recognised member in a specified CoP (Pyrko, Dörfler and Eden, 2019). However, in addition to being competent within a CoP, practitioners also require developing and maintaining their knowledgeability of the broader LoP that is relevant to them (Wenger-Trayner *et al.*, 2015).

Table 2.2 Multiple levels of practice

Adopted from Pyrko, Dörfler and Eden, 2019

Level of practice	Scope	Structural properties	Epistemic properties
Community of practice	Local communities	Practitioners are connected and mutually engaged	Negotiated local practice
Network of practice	Network across local contexts	Practitioners are connected but not necessarily mutually engaged	Orientation toward the same practice
Landscape of practice	Totality of local communities	Weaving of boundaries and peripheries between related communities	Identification with the same "body of knowledge" as an emerging totality of local communities

2.9.5 Communities of Practice in healthcare

Since its introduction, the concept of CoPs has been applied to various disciplines and sectors including government, business and education (Omidvar and Kislov, 2014; Wenger-Trayner, 2015). However, its application to healthcare has been limited and the structures may be inconsistent (Morley, 2016). Some of these ‘communities’ resemble informal networks in which the aim and structure of the community is loosely defined, and others are similar to support groups with the aim to improve self-efficacy (Li *et al.*, 2009). Nevertheless, the available literature in healthcare has shown positive outcomes of CoPs. This includes improved expertise, efficiency, knowledge dissemination, performance, problem-solving and decision-making in everyday workplace, and benefits in acclimating new members or novices to their new roles (Seibert, 2015). Therefore, it may be beneficial to further investigate CoPs in healthcare, especially in radiography, a discipline in which the theory is not yet investigated. The theory could potentially promote knowledge dissemination, EBP and CPD to ultimately improve personal and organisational performance in radiography.

Chapter 3: Philosophical and methodological foundations

The purpose of this chapter is to identify and justify the methods applied in the research underpinned by the philosophical and methodological foundations. Figure 3.1 provides an overview of the research design applied to the research. The chapter utilises Saunders, Lewis and Thornhill's (2012) research onion to guide the chapter in a structured manner.

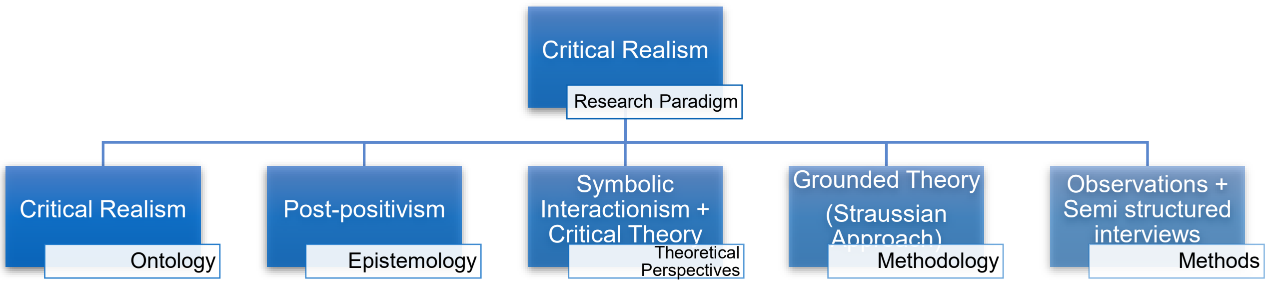
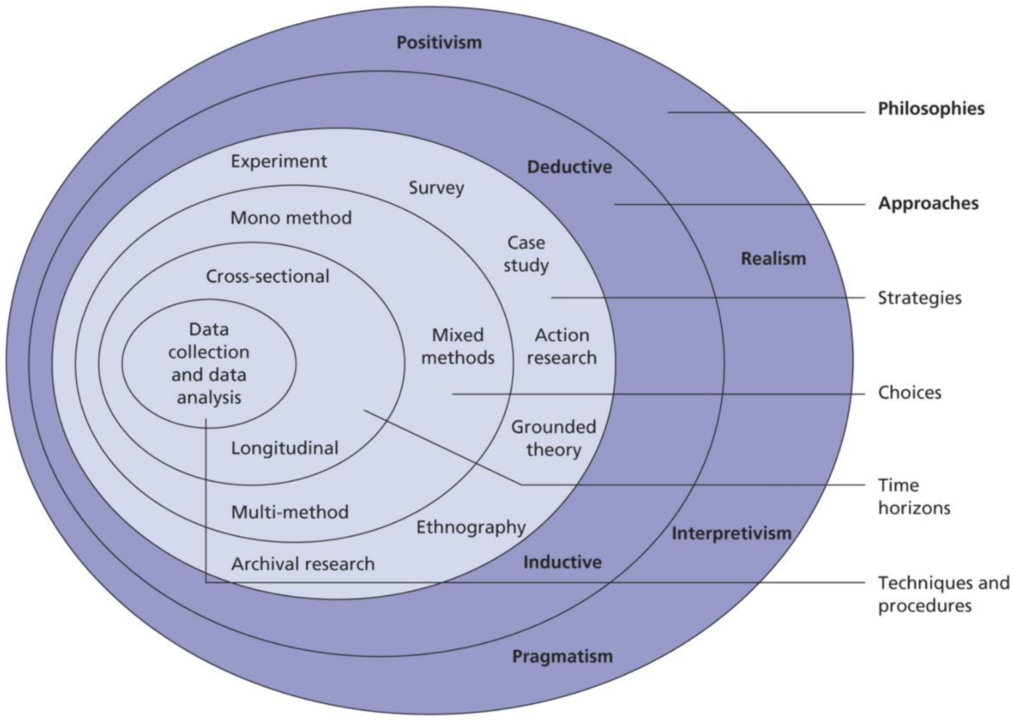


Figure 3.1 Overview of the research design

The research onion is widely used in social sciences for constructing a coherent theoretical framework (Melnikovas, 2018). The onion consists of six layers, representing stages of the research process, considering philosophy, approach, strategy, choices of methods, time horizons and data collection and analysis (see Figure 3.2). Each of these layers are discussed starting from the outside layer, working inwards with careful consideration and justification of the choices made for this study.



Adopted from Saunders, Lewis and Thornhill, 2012, p.128

Figure 3.2 Research onion

3.1 Aims and objectives

The study focused on understanding the possibilities of promoting knowledge dissemination and/or sharing, EBP and learning in radiography through the theory of CoPs. Therefore, the aim of the study is two-fold: i) to explore and analyse the theory CoPs in radiography; and ii) to formulate strategies to cultivate CoPs in radiography. The following objectives were set out to achieve the aims:

- To understand the barriers and facilitators of learning in practice, EBP and knowledge dissemination and/or sharing
- To investigate the theory of CoPs in radiography
- To understand the impact of CoPs in radiography
- To provide a set of recommendations to improve and/or cultivate a CoP in practice and AML
- To construct a conceptual framework to cultivate and promote learning, knowledge dissemination and/or sharing in radiography

Prior to proceeding, it is essential to clarify the difference between knowledge diffusion and knowledge dissemination, and to justify the terminology adopted throughout this thesis. Although related, the concepts represent distinct processes. Knowledge diffusion refers to a passive and informal process in which knowledge spreads naturally overtime in an unstructured manner, and often without targeting a specific audience (Chapman *et al.*, 2021). In contrast, knowledge dissemination is an active, deliberate and planned process involving targeted communication of information or evidence using defined strategies and channels (Turon *et al.*, 2023). The thesis applies the term 'dissemination' to reflect its focus on the spread of information and knowledge within radiography, specifically examining CoPs as a potential learning strategy for the deliberate dissemination and exchange of EBPs, knowledge and information. As discussed in chapter two, healthcare including radiography operates within a high-stakes, complex and resource constrained environment; consequently, reliance on passive knowledge diffusion alone may result in delayed, inconsistent or inequitable uptake of evidence in clinical practice.

Such contexts may necessitate a proactive and targeted approach to knowledge dissemination to support timely uptake in clinical practice.

3.2 Researcher positionality statement

Positionality refers to a researcher's world view and the position one adopts regarding research and its social and political content (Holmes, 2020; Wilson, Janes and Williams, 2022). The researcher's world view concerns ontological assumptions, epistemological assumptions, and assumptions on human nature and agency (one's assumptions on the way one interacts with the environment and relates to it) (Holmes, 2020). The world view is affected by an individual's values and beliefs that are shaped by factors such as gender, religious faith, historical and geographical location, ethnicity, and social class (Holmes, 2020; Kassan *et al.*, 2020). This section applies a reflexive approach to recognise and state any personal characteristics and perspectives that may influence this study.

Growing up, although mainly exposed to Dutch culture and values, I had the opportunity to explore various countries and cultures which has provided me with increased cultural awareness and language skills. Due to disconnect with extended family, my parents' focus has mainly been on supporting my siblings and I in our success, with great emphasis on independence through education and general work ethic. Perhaps shaped by my upbringing and introvert tendencies, I often tie happiness to a goal rather than people or objects. This is not to say that I find relationships unimportant, on the contrary, I am of the opinion that humans are born with an innate capacity for forming social connections, and the relationships we form are vital to our mental and emotional well-being and survival. I believe that such social connections and relationships contribute to the formation of different environments and cultures that we operate in, which in turn shapes one's reality that may differ from the objective or generally agreed reality.

I do not consider myself spiritual or religious. I most relate with the principles of agnosticism which, in sum, posits that ''it is wrong for a man to say that he is certain of the objective truth of any proposition unless he can produce evidence which logically justifies that certainty'' (Huxley, 1889). I believe that human reason is unable to provide sufficient rational grounds to justify the belief that God exists or does not exist. Thus, I equally do not refute the existence of God, the divine or the supernatural as I believe that any ultimate reality is unknown, unknowable, or perhaps in some cases better left unknown with humanity (e.g., the existence or non-existence of an afterlife).

I am naturally well-organised and find efficiency and certainty highly important in all aspects of life. To create a sense of security and predictability, I often find myself planning most (day-to-day) tasks and attempt to reframe the environment to 'fit' the efficiency and certainty criteria when faced with unexpected situations. This personality trait has likely influenced my career and education choice pursuing radiography, which has a great emphasis on mastery of technology, patient safety and precision, and healthcare management considering efficiency, quality and careful allocation of scarce resources (Niemi and Paasivaara, 2007; Figueroa *et al.*, 2019).

The above description of my upbringing, beliefs, personality traits and career choice are indicative of an ontology and epistemology aligning with critical realism, in which an objectivist position is held, while acknowledging the roles of perception and cognition (Grix, 2004).

3.3 Interpreting the radiographer's role through philosophical and methodological lenses

Prior to detailing the philosophical and methodological perspectives applied to this study, it is essential to describe the core role of the radiographer and relate this to the selected perspectives, as this underpins and supports the chosen philosophical and methodological approaches.

Radiographers are professionals who have the skills and knowledge to use technologies to capture patients' anatomy and/or physiology to aid in diagnosis and treatment plans (Hardy *et al.*, 2016). Therefore, the basis of radiographers' identity is argued to include mastery of technology (i.e., image quality, technique, equipment), ensuring patient safety (i.e., from radiation) and precision (Niemi and Paasivaara, 2007). As previously noted in the background chapter, the radiography profession has further evolved over the years from merely assisting, to working in collaboration with radiologists which includes advanced practice radiographic reporting (Hardy *et al.*, 2016). This suggests that for many radiographers there is a further disconnect from the caring aspect of the role as they ''live in a "virtual" cave'' in a dark reporting room, with their attention fixed on flickering shadows of the PACS (picture archiving and communication systems) monitors that are created by a distant source (Wang, 2012). This is indicative of a mechanistic, natural-scientific mindset and work philosophy. Nevertheless, the safety aspect of the radiography role may also be argued humanistic as radiographers place high importance on protecting patients and the public from, for example, radiation (Niemi and Paasivaara, 2007; Ramazan, Aarts and Widdowfield, 2022). Additionally, the importance of ethics, patient care and compassion are integrated in the radiography curricula and are fundamental elements of radiographers' professional code of conduct (SoR, 2013; Bleiker *et al.*, 2016; Kammies and Archer, 2022). The scientific-technological mindset combined with elements of person-centred care suggests that a critical realist philosophy is appropriate for radiography research, in which the focus is also on understanding, rather than merely describing (Cassell, Cunliffe and Grandy, 2018). Consequently, the Straussian approach of GT was deemed suitable to apply, in which objectivity (i.e., through unbiased data collection) and standardisation (i.e., prescriptive analysis process) is pursued, yet allows for description and interpretation for theory generation (Strauss and Corbin, 1994; Rieger, 2019).

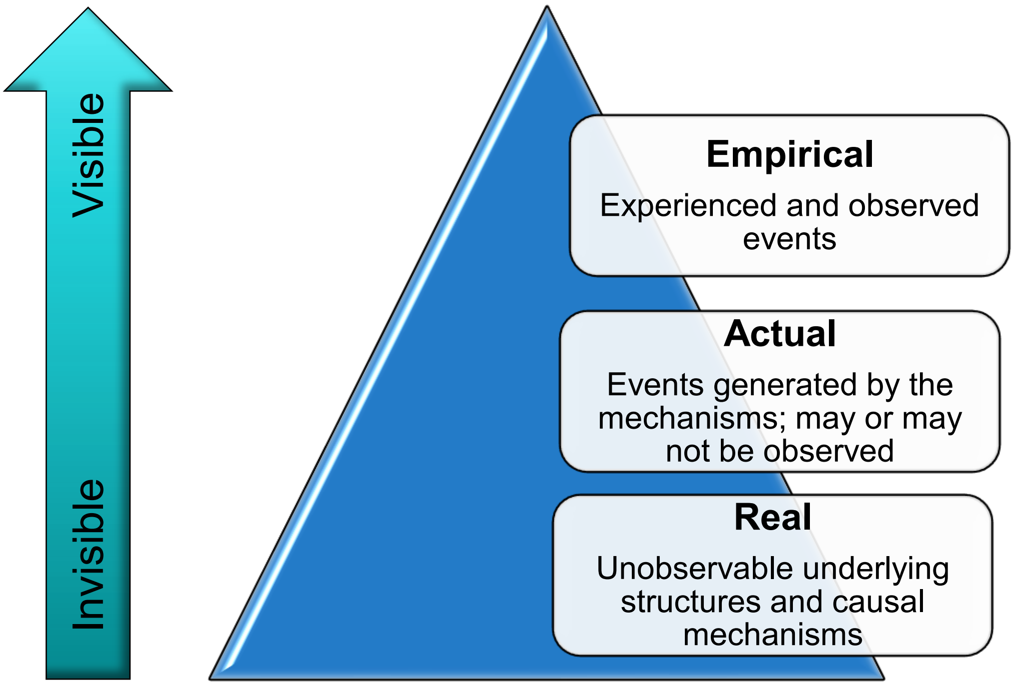
On a different note, it is important to consider the nature of this study in which its primary focus is not the technical, nor patient aspect of the radiography role, rather knowledge dissemination and cultivating CoPs among radiographers. A key facilitator of knowledge dissemination is communication among individuals and communities, which reasons for applying a symbolic interactionist perspective (Wenger, McDermott and Snyder, 2002; Gainforth et al., 2014; Green et al., 2014). Critical theory, based on a critical realist philosophy, allows a macro-level perspective that considers and critiques factors such as social structures, power relations, and cultural norms (Crotty, 1998; Burbank and Martins, 2010). Combining symbolic interactionism and critical theory allows both, a micro and macro focus providing a more comprehensive understanding of the complex and multifaceted factors of the theory-practice gap in radiography (Burbank and Martins, 2010). Corbin and Strauss' (1996) conditional/consequential matrix can be applied to support the researcher identify and make connections between the micro and macro conditions that influence the phenomenon under investigation.

3.4 Philosophy

Philosophy is concerned with the nature of knowledge, reality, and existence (Hughes and Sharrock, 2014). The following section discusses and justifies the critical realist ontology and post-positivist epistemology that underpins the design and execution of this research study (Saunders, Lewis and Thornhill, 2012). Additionally, it briefly discusses the value of axiology with respect to this study.

3.4.1 Ontology

Ontology is a branch of research philosophy that is concerned with assumptions regarding existence and the nature of reality (Saunders, Lewis and Thornhill, 2012). A critical realist approach is applied, which is a variant of realism originated by philosopher Roy Bhaskar (Archer *et al.*, 2013). Critical realism is ‘’an alternative to both positivism, with its search for regular laws, and interpretivism, with its emphasis on the interpretation of meaning’’ (Grix, 2004, p.85). The key features of critical realism posit that: i) reality exists independent of personal interpretations and beliefs, and while observations increase confidence of what exists, existence itself is not dependent on observations; ii) reality is stratified into three distinctive domains, which are part of an interacting whole: the real, the actual, and the empirical. The real refers to objects, their structures, and properties with causal potentials. The actual refers to resulting happenings or consequences of such objects, structures and properties that generate change, and the empirical understood as actual events-effects that are observed and experienced by actors (see Figure 3.3); iii) knowledge is transitive – the understanding of a phenomenon can change. While entities exist independent of our ability to perceive them, we attempt to construct knowledge about them. The construction of knowledge is not infallible; therefore, misconceptions or mistaken theories can be constructed; iv) and the social world is highly complex, layered, and an open system consisting of multiple entities, types of entities and entities subsuming and/or depending on other entities (Haigh *et al.*, 2019; Holmén, 2020).



Based on literature of Haigh *et al.*, 2019; Stutchbury, 2021

Figure 3.3 The three domains of reality in critical realism

While critical realism, similar to positivism, acknowledges objective realities and agreements regarding those realities, it also allows for interpretation to understand underlying causal mechanisms (Grix, 2004). Therefore, critical realism is compatible with a range of research methods, and suggests that the choice of method depends on the nature of the object of study (Sayer, 2000). The interpretive aspect of critical realism is crucial to generate insight into the extent of knowledge dissemination and/or sharing, implementation of EBP and CoPs in radiography due to the complexities associated with studying human (social) behaviour (Sanbonmatsu, Cooley and Butner, 2021).

3.4.2 Epistemology

Epistemology is a branch of philosophy that is concerned with the nature and scope of knowledge (Creswell, 2013). In epistemology, positivism adopts an etic approach, assuming that knowledge can only be generated through valid conceptualisation and reliable measurement, independent of researchers' perceptions and those participating in research (Saunders, Lewis and Thornhill, 2012). In contrast, interpretivism adopts an emic approach, asserting that humans construct knowledge through personal perceptions and interpretations; rejecting the objectivist notion that knowledge unambiguously exists to be identified and collected (Slevitch, 2011).

The research reported in this thesis adopted a post-positivist approach, which assumes that ''social reality is measurable and knowable, albeit difficult to access'' (Bisel and Adame, 2017). Post-positivism considers the subjectivity of reality, and attempts to distance itself from the purely objective stance adopted by positivists: i) post-positivism accepts the social construction of social reality – the notion that humans' interpretations and meaning influence the definition and experience of their reality; ii) a post-positivist approach retains the belief of a singular reality, however, makes a distinction between reality and subgroups' beliefs on their reality (i.e., intersubjective agreement); iii) post-positivism acknowledges that an aspect of reality is that groups of individuals can converge on intersubjective truths among themselves; iv) post-positivism discards the ideal of separating the knower from the known (i.e., the researcher from the participants). Instead, it employs method-based techniques to reduce researcher bias, while remaining cognisant that results must be interpreted; vi) and post-positivism values knowledge creation that ‘’identifies causal explanations and patterns observable among social relationships’’ (Howell, 2013; Bisel and Adame, 2017). This epistemological approach aligns with the ontological critical realist approach, allowing for subjectivity and interpretation in the research, a point that is especially important for the topic of investigation in which insight and understanding of phenomena is required (Grix, 2004).

3.4.3 Axiology

Axiology is a branch of philosophy that is concerned with the nature of value (Saunders, Lewis and Thornhill, 2012). A researcher’s understanding of values and their role in the project affects the research study. Therefore, making the axiology explicit aids in setting and clarifying the guiding tone and rigour of the research study (Heron, 1996). For example, researchers applying a positivist epistemology assume that the researcher and participants or object of study are separate entities, thus aim to study the object without influencing or being influenced by it (Bryman, 2012). The axiological assumption in this doctrine is that objectivity is superior, and view subjectivity as inherently misleading and preventative of the pursuit of the truth (Given, 2008).

The research aimed to create understanding of phenomena and investigate occurrence of phenomena in a subgroup within the medical field. To achieve the aim, it required researcher observations and in-depth interviews with participants to generate this understanding. Qualitative research inherently relies more on the experience and judgements of the researcher. Therefore, concepts such as rigour, trustworthiness and reflexivity are more pertinent to the subjective nature of qualitative research (Galdas, 2017).

The research applies a post-positivist epistemology; therefore, the belief is that true objectivity cannot be achieved but is approachable. Post-positivist pursue objectivity by recognising the possible effects of biases (Panhwar, Ansari and Shah, 2017). Firstly, as previously discussed, a possible effect of bias lies in the qualitative nature of the study. However, considering the ontological critical realist approach applied, the belief is that although there are objective realities, and agreements on those realities, one cannot merely rely on positivist reasoning to understand phenomena (Grix, 2004). Secondly, a possible bias is related to my background knowledge and experience as a radiographer studying other medical imaging teams in the field. Nevertheless, considering the limitations of a qualitative approach including the Hawthorne effect, I view my background as a radiographer advantageous allowing me to fully participate and immerse in clinical staff’s day-to-day tasks, gaining their trust to facilitate full and honest discourse.

3.5 Theoretical perspective

A theoretical perspective refers to a set of assumptions, concepts, and principles that forms a framework or lens to guide the research process and interpretation of phenomena (Crotty, 1998). This study adopts critical theory and symbolic interactionism to offer a comprehensive and nuanced approach to understanding and addressing phenomena (Burbank and Martins, 2010). This section further discusses and justifies the theoretical perspectives applied to this research study.

3.5.1 Critical theory

Critical theory is a theoretical framework that emerged in the mid-20th century, primarily associated with the Frankfurt School of thought (Crotty, 1998). It is a multidisciplinary approach that critiques and seeks to transform social structures, ideologies, and power relations. The key elements of critical theory include: i) a strong emphasis on critique, questioning existing social structures, norms, and power dynamics. It seeks to uncover concealed assumptions and challenge the status quo; ii) consideration of historical context and the way in which historical developments influence contemporary phenomena; iii) concerned with understanding and addressing social inequalities including economic, political, and cultural factors; iv) reveals and critiques ideologies – sets of beliefs, values and cultural norms that shape societal perspectives; v) and an emphasis on praxis, which involves integration of theory and practice (Crotty, 1998; Thompson, 2017).

As discussed in the background chapter, the theory-practice gap in radiography is suggested to be a result of multiple social and structural factors including practical, individual, and environmental factors which are connected and interlinked. Critical theory is useful as it embraces the complexity of factors, encourages a holistic understanding of phenomena, and challenges the status quo. Additionally, critical theory is suggested to be based on a critical realist philosophy, which aligns with the critical realist approach adopted (Burbank and Martins, 2010).

3.5.2 Symbolic interactionism

Emerged in the early 20th century, mainly associated with theorists including Mead, Cooley and Blumer, symbolic interactionism is rather concerned with phenomena on a micro-level in which the focus is on the subjective meanings that individuals attach to experiences, actions, and symbols (Aksan *et al.*, 2009). Within symbolic interactionism, reality is viewed as social developed in interaction with others. Nevertheless, most symbolic interactionists believe a physical reality exists independent of individuals' social definitions, and that social definitions and meanings can change overtime in relation to the 'real' or physical (Burbank and Martins, 2010). Humans do not directly respond to this reality; however, they define situations as it exists. Therefore, humans exist in a physical objective reality, a social reality, and a reality created from the social reality, entailing a unique interpretation of the reality that is demonstrated to the individual by others (Charon, 2007).

According to Blumer (1969), symbolic interactionism is based on three basic propositions: i) human beings develop their attitude towards things based on the meanings that things propose to them; ii) the meaning of things derives or emerges from social interaction that one has with others; iii) and meanings are handled in, and modified through an interpretive process when dealing with things one encounters. Therefore, symbolic interactionism is especially useful in understanding and cultivating CoPs as learning and knowledge dissemination in this theory relies on groups of individuals interacting regularly and sharing their experiences to improve their skills and advance their knowledge of a domain (Wenger, 1998).

Historically, symbolic interactionism and critical theory have been considered divergent theoretical perspectives with dissimilar philosophical underpinnings. While their underlying philosophies differ, combining symbolic interactionism and critical is beneficial to allow both, a micro and macro focus (Burbank and Martins, 2010). Therefore, as the factors related to the theory-practice gap in radiography is complex, combining the perspectives considers and provides insight into multiple factors (i.e., individual, organisational, societal) to gain a more comprehensive understanding of phenomena.

3.6 Methodology

Methodology is the theoretical and conceptual aspect of research, considering the overarching approach that guides the research process (Grix, 2004). The five main qualitative approaches include narrative research, phenomenology, GT, ethnography and case study. Table 3.1 summarises and contrasts each approach.

Table 3.1 Contrasting characteristics of five main qualitative approaches

Adapted from Creswell, 2013; Chigbu, 2019

	Narrative Research	Phenomenology	Grounded Theory	Ethnography	Case Study
Research Focus	To explore human experience as it is represented in textual form	To explore and understand the essence of a phenomenon as experienced by individuals	To develop a theory grounded in the study data	To explore and interpret social grouping or cultural situation	To develop an in-depth description and analysis of a case or multiple cases
Unit of Analysis	Studying one or more individuals	Studying individuals who share(d) the same experience(s)	Studying a process, action, or interaction involving many individuals	Studying interactions and behaviours of individuals within their natural cultural context	Studying an event, programme, activity, or individuals
Data Collection Methods	Interviews and documents	Interviews, observations, and surveys	Interviews, observations, and surveys	Interviews and observations	Interviews, observations, documents, and physical objects
Nature of Disciplinary Origin	Humanities disciplines including anthropology, literature, history, psychology, and sociology	Philosophy, psychology, and education	Sociology	Anthropology and sociology	Psychology, law, political science, and medicine

GT methodology is applied to this research as little is known regarding CoPs in radiography; hence, the focus is to generate a theory from data, rather than merely understanding and describing phenomena (Chun Tie, Birks and Francis, 2019). Founded by Glaser and Strauss in 1967, GT can be described as ''a general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate inductive theory about a substantive area'' (Glaser, 1992, p.16). While this definition is generally accepted among researchers, the approach and rigour in the data collection, handling and analysis created several distinct methodological genres: i) traditional (Glaserian) GT (associated with Glaser); ii) evolved (Straussian) GT (associated with Strauss and Corbin); iii) constructivist GT (associated with Charmaz); iv) and situational analysis (associated with Clarke) (Clarke, 2005; Chun Tie, Birks and Francis, 2019). This section discusses the four main GT versions and justifies the choice of Straussian GT applied to this research.

3.6.1 The discovery of grounded theory

In 1967, sociologists Glaser and Strauss developed GT as a response against the extreme positivism that had permeated most social research (Masoodi, 2017). Glaser and Strauss (1967) explain generating theory from data inductively, challenging the traditional deductive reasoning to testing and refining theory, and the outlook that only quantitative methodology can provide valid and unbiased truths. The theory developed from GT would be specific to the context in which it had been developed and 'grounded' in the data from which it emerged (i.e., substantive theory). Glaser and Strauss (1967) suggest that the substantive theory developed can subsequently be compared with existing theories and linked to the existing body of knowledge. Through comparisons with existing theories, a substantive theory may ''become a spring-board or stepping stone to the development of grounded formal theory'' (Glaser and Strauss, 1967, p.79). After the introduction of this seminal work, Glaser and Strauss expressed divergent viewpoints in the application of GT methods (Chun Tie, Birks and Francis, 2019).

3.6.2 Traditional (Glaserian) grounded theory

Known as the traditional or Glaserian GT, is an extension of the original work developed in 1967. First published in 1978, Glaser states that GT ''is a general inductive method possessed by no discipline or theoretical perspective or data type'' (p. 141). Nevertheless, Glaser is suggested to adhere to a positivist ontological approach proposing GT as ‘’free from ties to any theory of science and [attempted to avoid] philosophical conceptions of what is ‘truth’” (Berthelsen, Lindhardt and Frederiksen, 2017). Additionally, Glaser suggests that GT should remain a purely inductive and flexible methodology (Sebastian, 2019). In this approach, the theory is strictly derived from empirical data emerging through data collection, coding (open, selective and theoretical coding) and analysis (i.e., no priori defined research question or literature search) (Masoodi, 2017). Glaser (1978) describes that the grounded theorist enters the field with an open mind, must remain neutral and eliminate inclusion of prior knowledge. These claims may sound provocative, as discussions on objectivity within qualitative research has previously been rejected, instead intersubjectivity is argued as the goal of qualitative studies (Levitt *et al.*, 2021). Therefore, Glaser moderates this notion by recognising that *tabula rasa* is impossible to achieve, nevertheless a grounded theorist must attempt to enter the field openly and free of preconceived knowledge to avoid influencing the emerging theory (Berthelsen, Lindhardt and Frederiksen, 2017). Additionally, Glaser utilises the word ‘discover’ to describe the researcher’s focus indicating that data exists in the field, ready to be collected through the method of constant comparison (Berthelsen, Lindhardt and Frederiksen, 2017). Although he himself claims that the method is developed in a critique of a positivistic approach, this declared objectivistic and inductive position may explain the assumption of a positivist stand (Glaser, 1978).

Glaser’s version of GT is an effective and rigorous approach, suitable for researchers who aim to limit personal bias and apply a true inductive approach (i.e., research question(s) and literature review are strictly delayed until after data analysis) to the research (Masoodi, 2017; Singh and Estefan, 2018; Mohajan and

Mohajan, 2023). However, this version is not applied to this study as eliminating inclusion of prior knowledge (i.e., *tabula rasa*) is impractical and restrictive for the following reasons: i) being a radiographer by background allows an improved understanding of radiographers' actions, language and terminology use which may result in the collection of detailed data and a more in-depth data analysis; ii) being a radiographer by background may provide participants the feeling of a safe space to speak as they may feel more understood by a 'fellow radiographer', facilitating full and honest discourse; iii) and safety (e.g., radiation and MRI safety) is of upmost importance in radiography, this prior knowledge allows me to safely operate in a medical imaging environment during the data collection phase.

3.6.3 Evolved (Straussian) grounded theory

As a result of the professional difference of opinion between Glaser and Strauss, Strauss elaborated on the original work alongside nurse researcher Juliet Corbin, creating evolved or Straussian GT published in 1990 (Strauss and Corbin, 1990). Similar to Glaser, Strauss and Corbin (1990) did not articulate an initial philosophical orientation. The philosophical perspective of this version of GT has been considered ambiguous, with influences of symbolic interactionism, pragmatism, interpretivism and post-positivism (Rieger, 2019; Sebastian, 2019). Symbolic interactionism is an interpretive theoretical approach ''derived from pragmatism which assumes that people construct selves, society, and reality through interaction'' (Charmaz, 2014, p. 344). Symbolic interactionists do not deny that there is a reality, however, assert that reality ''is socially interpreted, and that understanding these constructions is important to comprehend human behaviour'' (Rieger, 2019). Similarly, the Straussian GT is argued to have an interpretivist influence due to the emphasis placed on individual perspectives to generate valuable data for the development of a theory

(Strauss and Corbin, 1994; Sebastian, 2019). In contrast, Straussian GT is considered to align with post-positivism as Strauss and Corbin ‘’did not contradict the realist idea that an independent reality exists’’, however, acknowledge implausibility of viewing reality as it ‘’really’’ is (Singh and Estefan, 2018). Nevertheless, Strauss and Corbin aim to depict a close representation of reality by striving impartiality during data collection and analysis, while acknowledging and disclosing the inevitable influence of the researcher’s subjectivity in the research process (Kenny and Fourie, 2015; Singh and Estefan, 2018). Additionally, the (post-)positivist influence may also be assumed due to the fastidious coding and analysis structure associated with the Straussian GT (i.e., open, axial and selective coding) (Evans, 2013; Kenny and Fourie, 2015). The (post-)positivist influences have also been argued by constructivist grounded theorist Charmaz asserting that both, Straussian and Glaserian GT retain a methodology ‘’imbued with positivism with its objectivist underpinnings” (Charmaz, 2000, p. 510). Although Charmaz acknowledges nuances of pragmatism and symbolic interactionism associated with Straussian GT, she concluded that “both [Straussian and Glaserian GT] endorse a realist ontology and positivist epistemology, albeit with some sharp differences” (Charmaz, 2000, p. 513).

The Straussian GT is applied to this study as it aims to maintain an objectivist perspective by controlling the inquiry and systemising it. However, it recognises the human, practical and pragmatic limitations and seeks to reduce personal bias (Singh and Estefan, 2018). Section 3.6.6 further justifies the application of Straussian GT in detail.

3.6.4 Constructivist grounded theory

The constructivist GT was first developed by a former student of Glaser and Strauss, Kathleen Charmaz (Charmaz, 2006; Mills *et al.*, 2007). Constructivism theory denies the existence of an objective reality, "asserting instead that realities are social constructions of the mind, and that there exist as many such constructions as there are individuals (although clearly many constructions will be shared)" (Guba and Lincoln, 1989, p. 43). In contrast to the Straussian GT, Charmaz refuted ''a concrete, rule-bound, prescriptive approach to coding'', arguing that it supresses the researcher's creativity (Kenny and Fourie, 2015). Instead, she proposed highly adaptable, two-staged coding guidelines (i.e., initial or open, and refocused coding), which endorsed an "imaginative engagement with data'' (Charmaz, 2008, p.168). Charmaz (2008) particularly emphasises the principle of flexibility, stating that researchers must ''learn to tolerate ambiguity'' and ''become receptive to creating emergent categories and strategies'' (Charmaz, 2008, p. 168). Similar to Straussian GT, constructivist GT allows a literature review prior to data analysis, unlike Glaserian GT in which data collection is strictly to be conducted following data analysis (Evans, 2013). However, the timing and approach to literature differs in that constructivist GT has no prescribed time restrictions of when literature is consulted (Sebastian, 2019).

The constructivist school of GT is suggested to be more interpretive, intuitive, and impressionistic compared to the Glaserian or Straussian GT (Kenny and Fourie, 2015). Charmaz particularly emphasises in-depth, intensive interviews to purposely yield an intimate exploration of meanings that participants relate to their experiences (Charmaz, 2006; Kenny and Fourie, 2015). Although these interviews are analysed through the proposed constructivist coding framework, the analysis rarely concludes into a prognostic or predicative theory (Hallberg, 2006). Instead, the constructivist GT study ''concludes with the researcher's interpretative understanding (rather than explanation) of the studied social process which is presented in the form of a ''story'''' (Kenny and Fourie, 2015). Charmaz's reconstruction of GT is strongly criticised by Glaser, arguing that the emphasis on descriptive capture ''denies and blocks'' the ''true conceptual nature'' of GT (Glaser, 2002). Glaser (2002) asserts that the objective of GT is conceptualisation, rather than faithful descriptions of participants' experiences. Therefore, he argues that Charmaz is misleading in considering her methodology to be a GT as a more accurate classification would be Qualitative Data Analysis (Glaser, 2002). In contrast, Strauss and Corbin acknowledge the value of description and shared sense of obligation to provide their participants a voice and ''tell their stories'' (Strauss and Corbin, 1994, p. 281). However, Strauss and Corbin applied this value within a robust and rigorous coding procedure which highly contrasts Charmaz's flexible coding guidelines (Kenny and Fourie, 2015).

To conclude, constructivist GT holds the belief that reality is dynamic, and that human beings construct local meaning on reality to comprehend and act on it within their immediate context (Charmaz, 2014). Additionally, constructivist GT applies a reflexive design to a study and allows the researcher to co-construct meaning with the participants in the generation of data (Mills *et al.*, 2007). Thus, constructivist GT is a useful approach to understand local and contextual knowledge on phenomena, and for researchers who will benefit from remaining close to their personal and professional experiences (Singh and Estefan, 2018). However, this study seeks objectivity and data transferability to align with the philosophical and methodological design. Therefore, the constructivist GT was not deemed to be appropriate for this study.

3.6.5 Situational analysis

Based on Charmaz's constructivist GT with its influences from the Straussian GT, sociologist Adele Clarke developed situational analysis GT (Uri, 2015). Underpinned by a postmodernist philosophy, Clarke's situational analysis provides the tools to ''draw together studies of discourse and agency, action and structure, image, text and context, history and the present moment – to analyse complex situations of inquiry broadly conceived'' (Clarke, 2005, p. xxii). Clarke's postmodernist turn was developed in response to the criticisms of the first generation GTs which includes the limited reflexivity of research practices, excessive generalisation of cultural meanings into schematic categories and, the rigidity of the analytical procedures, with a fixation on human actions and behaviour (Kalenda, 2016). Instead, Clarke departs from the GT methodology with a focus on human action to the broader situation as the unit of analysis (Uri, 2015). Significantly, such a situation can include nonhuman actors (i.e., technologies, buildings) (Morse, 2021). Situational analysis is based on pursuing mapping strategies: i) situational maps to articulate the major (non)human elements, and the relations among them in the situation, ii) social worlds/arenas to articulate the major collective actors (i.e., organisations, social worlds), commitments and the sites of action, iii) positional maps to plot positions articulated and not articulated in discourses around the situation of inquiry (Clarke, 2005; Mills *et al.*, 2007). According to Clarke (2005), the maps serve as beneficial constructions to present ''the social'' in compelling and complex manners that can allow appreciation of ''complications, messiness, and denseness of actual situations and differences'' (p. xxviii). Although situational analysis has only developed significantly in the last decade, it is utilised successfully in a variety of fields including psychology, sociology and health sciences (Kalenda, 2016).

Clarke offers a radically different, highly flexible conceptual infrastructure for investigating complex situations of inquiry (Clarke, 2005). Situational analysis is an appropriate alternative to apply to this study as it embraces the previously discussed multifaceted factors associated with the theory-practice gap in radiography. However, the data gathered can be extensive and complex, complicating the analysis process. Consequently, it may challenge the situational analyst to make boundaries to avoid losing the study's focus, and to clearly display the data (Uri, 2015). For this reason, and to align with philosophical and methodological design, situational analysis was not applied to this study.

3.6.6 Justification of the methodology applied

Based on the discussions above, the version applied to this study is Straussian GT. Table 3.2 summarises and compares the versions of GT methodology. The Straussian perspective is suitable as (a) it aligns with the epistemological post-positivist approach in which there is commitment to the pursuit of truth, while acknowledging the limitations to obtain the truth; (b) accounts for a range of variables which is necessary considering the multifaceted factors associated with this study; (c) I accept the inevitability of personal bias as a radiographer by background, while also seek to limit personal bias; (d) attempt to maintain an objectivist perspective by controlling the inquiry and applying a systematic approach to the research process (i.e., analysis) to increase transferability of the data; and (e) although the research process is conducted in a systematic and rigorous manner, the value of description and sense of obligation to provide the participants a voice is acknowledged. This is beneficial in order to obtain a greater understanding of the barriers and facilitators of learning in practice, EBP and knowledge dissemination and/or sharing.

Table 3.2 Comparing versions of grounded theory

Based on literature of Clarke, 2005; Masoodi, 2017; Singh and Estefan, 2018; Sebastian, 2019

	Traditional (Glaserian) Grounded Theory	Evolved (Straussian) Grounded Theory	Constructivist Grounded Theory	Situational Analysis
Author(s) and Literature	Glaser 'Theoretical Sensitivity' (1978)	Strauss and Corbin 'Basics of qualitative research' (1990)	Charmaz 'Constructing Grounded theory' (2006)	Clarke 'Situational Analysis' (2005)
Philosophical influence	Positivism	Post-positivism	Constructivism	Postmodernism
Role of the Researcher	The researcher is distant and detached – the researcher and research must remain neutral.	The researcher controls and acknowledges personal influence to maximise objectivity.	The researcher is highly engaged – constructs rather than discovers.	The researcher focuses on identifying and analysing (non)human elements and their relationships in a situation.
Research Question(s)	No priori defined questions – questions emerge during data analysis.	Allows priori defined research questions (i.e., derived from literature) – questions are often broad and open-ended.	Research questions influence data collection – can be revisited and altered.	To answer 'how', 'what', 'who', 'where' and 'when' research questions.
Literature Review	Conducted following data analysis.	Literature is consulted (prior and/or during data analysis) to increase the researcher's theoretical sensitivity.	No prescribed location – it depends on the decision-making process of the researcher.	Literature can be consulted. The researchers' background and personal experiences are prominent in guiding the research – the researcher is considered 'the research instrument'.
Data coding and Analysis	Open, selective, and theoretical coding.	Open, axial, and selective coding.	Initial or open, and refocused coding.	Situational, social world/arenas, and positional maps.
Utility	Appropriate to develop a broader theory across substantive areas. Requires time to develop a theory applicable to an area of interest.	Appropriate to account for a range of variables to increase generalisability and predictive power of the theory. Prescriptive approach may develop a superficial description of the variables.	Appropriate to develop an in-depth theory of a phenomenon in its local context. May not be generalised beyond the context of origin.	Appropriate to capture and develop an understanding of the complexities and the relations in a situation within a field. Requires the researcher to be highly familiar and flexible with the data.

3.7 Methods of data collection and analysis

Congruent with a GT methodological approach, the study applied observations and semi structured interviews to allow for exploration of the subject under investigation. This section justifies the method choice within the critical realist research paradigm. Moreover, it provides a detailed description of the method strategies, procedure, and the data analysis process.

3.7.1 Method choice and strategies

Critical realism leverages from both, positivist, and interpretivist paradigms recognising the role of subjective information of social actors in a particular context, while acknowledging the independent structures that constrain and facilitate these actors to undertake certain activities in that context (Sayer, 2010). In the same vein, critical realism is considered a philosophy on social structures and human agency, and their interaction is utilised as a basis for the analysis of complex phenomenon for theorising the relative interplay of structures, culture, and agency (Lawani, 2021). As previously discussed, critical realism argues that reality is stratified into three domains: the real, the actual and the empirical (Haigh *et al.*, 2019). A pattern of behaviour that is directly observable (the empirical domain) can be studied in a closed experimental setting by investigating linear causal relationship between different variables (the actual domain) (Roberts, 2014). Quantitative researchers often operate in this domain. However, this study aims to offer a more nuanced approach to the complexities and factors related to knowledge dissemination and/or sharing, implementation of EBP and CoPs in radiography. Therefore, it intended to include and investigate social occurrences and behaviours produced by causal mechanisms that is not immediately observable at the level of appearances, and which can only be fully explored in open systems (the real domain) (Bhaskar, 1975). This suggests a more qualitative approach to the issue of causality as causal mechanisms in the social world are examined through open contexts where they interact with each other in often contingent and unpredictable manners (Roberts, 2014).

Critical realism recognises that the knowledge we obtain of social structures are subjective, relative and constructed by individuals; that is, a reality exists that is independent of our knowledge and that the nature of reality cannot be easily understood, characterised or measured (Stutchbury, 2021). As suggested by Bhaskar (1979), unlike the natural world, social structures are activity-dependent. In other words, causal mechanisms ''exist only in virtue of the activities they govern and cannot be empirically identified independently of them'' (p. 48). This denotes that causal mechanisms are social products that can be understood through – and exist within – phenomena at the empirical level (e.g., individuals' actions and ideas generated by the mechanisms) (Fletcher, 2017). Additionally, as previously mentioned, a key principle of critical realism is that reality is an open system, which is beyond one's ability to control (Stutchbury, 2021). Therefore, the study applied observations and semi structured interviews to understand and investigate knowledge dissemination and/or sharing, implementation of EBP and CoPs in radiography within the context in which participants operate.

3.7.1.1 Participant observation

Participant observation is a research method where the researcher is immersed in the day-to-day activities and dynamics of the participants, aiming to obtain contextual understanding and capture non-verbal cues for a more holistic understanding of the phenomena under investigation (McNeill and Chapman, 2005). Considering the subject of study, it was essential to immerse into participants’ daily activities to explore the extent of knowledge dissemination and/or sharing, implementation of EBP and CoPs in practice. Although not exhaustive, Bryman (2012) distinguishes six types of participant observation studies depending on the degree of involvement of the researcher (see Table 3.3). As the study considers multiple imaging modalities, therefore, I could not participate as a covert or overt member as a radiographer specialised in MRI only. Nevertheless, I interacted with the group and participated in activities such as the patient preparation process prior to the patients’ scan.

Table 3.3 Six types of participant observation studies

Based on literature of Bryman, 2012.

Participation and Involvement	Type of Role	Description
	Covert full member	Full membership of the group. Researcher's identity as researcher is unknown.
↑ High	Overt full member	Full membership of the group. Researcher's identity as researcher is known.
	Participating observer	Participates in group's core activities but not as a full member.
	Partially participating observer	Same as participating observer. However, observations are not necessarily the main data source. Data from interviews and documents can be as significant or in some cases more significant than observations.
Low ↓	Minimally participating observer	Observes but participates minimally in group activities. Observations may or may not be the main source of data. Interviews and documents are prominent data sources.
	Non-Participating observer with interaction	Observes but does not participate in group's core activities. Main sources of data are interviews and documents.

3.7.1.2 Semi structured interviews

Semi structured interviews are a research method involving both a mix of predetermined questions and open-ended exploration, allowing the generation of in-depth, contextually rich data while ensuring comparability across participants (Badache, Kimber and Maertens, 2023). Semi structured interviews support participant observation by providing a deeper insight into participants' interpretations, rationales, and reflections on observed practices, thereby clarifying meanings that are not directly observable. While observations capture behaviour and contextual dynamics, it is limited in its ability to reveal underlying beliefs, levels of understanding, intentions and participants' views on the subject under investigation. Additionally, observations alone would not have enabled exploration of all study objectives. For example, participants may engage in EBP, CPD or CoPs beyond their immediate work setting and outside the observation period. Therefore, in sum, I acted as a partially participating observer, and combined this with semi structured interviews to obtain the depth and insight required for the subject under investigation (Bryman, 2012).

3.7.2 Time horizon

The time horizon refers to the length of time over which a study is conducted, or the period covered by the data collected. Longitudinal studies gather data from the same subjects or participants over an extended period involving multiple data collection points (i.e., tracking the evolution of variables, to compare data pre and post application of an intervention etc.) (Saunders, Lewis and Thornhill, 2012). This study is exploratory, aiming to gain initial understanding of phenomena to generate hypotheses and guide further research. Hence, a cross-sectional study was more appropriate as it examines phenomena at one point in time involving multiple subjects or participants to explore and capture the diversity of perceptions, attitudes and behaviours (Saunders, Lewis and Thornhill, 2012).

Table 3.4 Inclusion and exclusion criteria

Inclusion	Exclusion
• PET-CT, CT, and MRI imaging modalities • All radiographers, technologists, assistant practitioners, apprentices and clinical assistants employed by AML • UK wide	• Ultrasound and x-ray imaging modalities in AML • Radiographers, technologists and assistants that work in ultrasound and x-ray imaging modalities only • Sites with NHS staff operating AML scanners

AML is a diagnostic and molecular imaging services provider who deliver diagnostic services to public and private healthcare organisations since 1987. UK clinical staff (diagnostic radiographers, technologists, assistant practitioners and clinical assistants) employed by AML were observed and interviewed considering MRI, CT, and positron emission tomography–computed tomography (PET-CT) imaging modalities (see Table 3.4). Ultrasound and x-ray imaging modalities were excluded as AML's clinical workforce is mainly in MRI, CT, and PET-CT modalities. Similarly, sites with NHS staff operating AML scanners were excluded as it would not generate sufficient data to represent the subgroup. The data collection took place at AML's static and mobile units, Community Diagnostic Centres (CDC) and Integrated Diagnostic Centres (IDC). Table 3.5 describes what each imaging modality and type of imaging unit entails.

Table 3.5 Types of imaging modalities and imaging units in Alliance Medical Limited

Descriptions of imaging modalities are based on literature of Jacques and Christe, 2020

Imaging Modalities	Description	Imaging Units	Description
CT	CT combines a series of x-rays and detectors to create images from multiple angles of internal structures in the body.	Static	Refers to permanent imaging units contained within a host site's infrastructure to provide long-term imaging services.
PET-CT	Using radioactive tracers, PET scans demonstrate typical and atypical metabolic activity in tissues and organs. Combined with CT, it provides both anatomical and physiological images at one time.	Mobile	Refers to imaging units built in a semi-trailer which can be transported to multiple locations or connected directly to a facility to provide short-term imaging services.
MRI	Images are created by exposing hydrogen atoms to magnetic fields and radio waves. MRI depicts anatomy and physiology as hydrogen atoms are associated with body chemistry in general.	Integrated Diagnostic Centre	Refers to a permanent imaging unit that houses multiple imaging modalities to serve a region.
		Community Diagnostic Centre	Refers to a single point of access to a range of elective diagnostics (e.g., scans, tests, and checks) in a community-based setting.

3.7.3 Research technique and procedure

Although the PhD is sponsored by AML, senior management did not have influence over the inclusion or exclusion of imaging units within the company. Nevertheless, six monthly debriefs between the researcher and senior management occurred to inform of the study's progress, and to discuss any feedback or suggestions to maximise the study's success. Additionally, methodological approaches were discussed with research and clinical colleagues to increase the credibility of the study (Lincoln and Guba, 1985). As the research process was a process of theory generation rather than hypothesis testing, sampling obeyed the principles of theoretical sampling (Strauss and Corbin, 1990). Initially, purposive sampling was applied to select the first four AML imaging sites (static MRI site, mobile MRI site, static PET-CT site, and an IDC site). Each site was observed from 9AM to 5PM, with pauses in observations throughout the day to engage in conversations with individual participants who had consented to the interview. A further three sites were observed, and a total of 30 interviews were completed for analysis. These sites were selected by convenience, access, and geographic proximity, with the aim to generate a greater understanding of phenomena, identify theoretically relevant data and subsequently refine observation strategies and the semi structured interview questions (Campbell *et al.*, 2020). As a theory began to emerge, theoretical sampling was applied to inform the sample selection and support further development of the emerging theory. Following Strauss and Corbin's (1990) guideline, control of variables, search for representatives, nor distribution of population was attempted; rather the search was to look for how concepts vary along their different properties. In other words, new evidence found at each stage was utilised to modify or confirm the emerging theory, which then pointed to an appropriate choice of instances in the next phase until theoretical saturation was achieved.

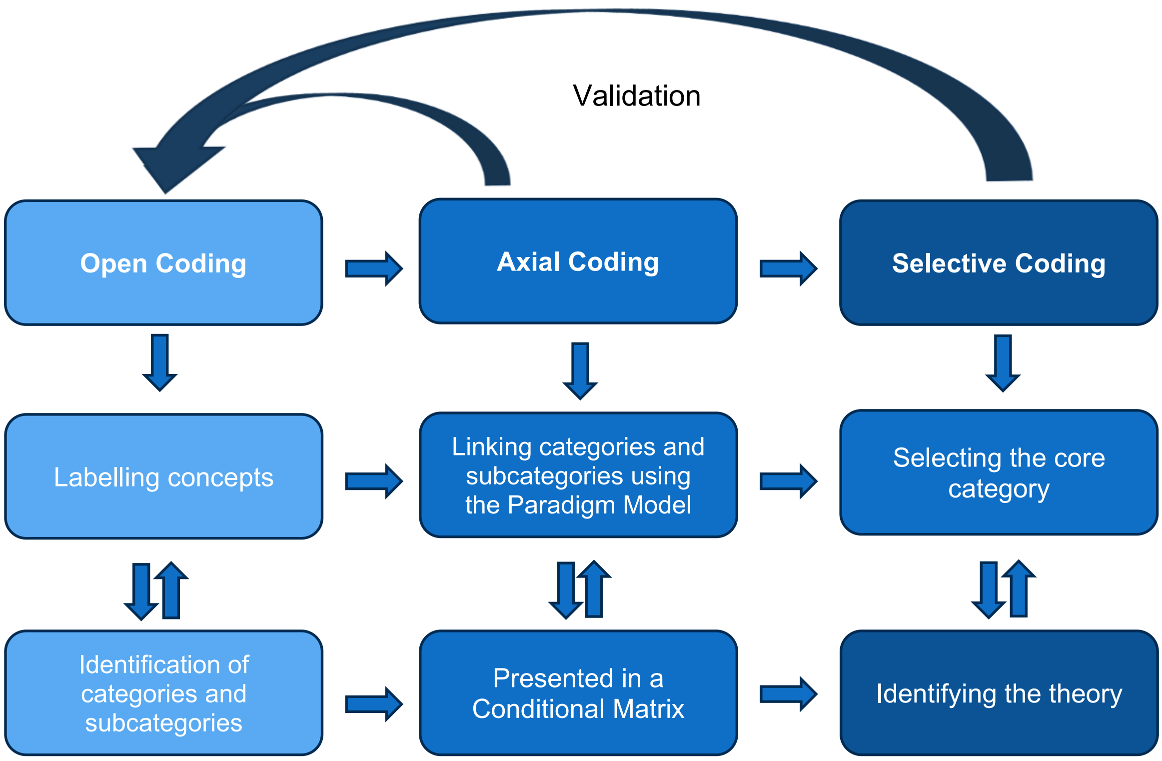
Approval to undertake observations at AML's clinical units was provided by senior management (Appendix A). The study was announced at the Quality and Operations meeting to brief all UK Unit Managers on the study ahead of possible selection of their unit(s). The briefing allowed Unit Managers to have a greater idea of the study's aims and objectives and what participation as a unit meant for them. Unit Managers were reassured that the data collected was confidential and not disclosed to senior management in the company. If a site was selected for observation, suitable dates and times were discussed with the Unit Manager and the participant information sheet (PIS) for observations was emailed to them (Appendix B). This allowed the Unit Manager of the imaging units to discuss their participation in the study with their clinical team ahead of my arrival at each unit.

As a researcher, I aimed to observe phenomena in its natural setting. To achieve this, participant comfort is of high importance (Charmaz, 2014). Therefore, on arrival at each unit for observations, I introduced myself and took time to get to know the clinical staff. I discussed the PIS for observations with the clinical staff and requested their consent to observe them (Appendix C). The individuals who did not wish to participate were not observed and were not asked any questions during the data collection. As a partially participating observer, I not only observed the clinical staff, but also participated in their tasks such as preparing and cannulating the patients for their scans. The field notes always started with a description of the physical setting and the participants roles in the setting (Appendix D). Field notes followed with descriptions of the social environment and the way in which interaction occurred within the clinical setting (e.g., frequency of interactions, communication patterns, patterns of specific behavioural events such as conflicts, decision-making, collaboration, and learning) and the meaning of what was observed from the perspectives of the participants. Any exact quotes or close approximation of comments or discussions related to the study's subject or objectives were recorded. Alongside the descriptive field notes in which accurate and factual data were recorded, a journal with reflective content was kept in which any thoughts, insights, interpretations, relationships in the data, and questions were recorded to foster reflexivity and analytical thinking (i.e., memoing) (Strauss and Corbin, 1990). The reflective notes were subsequently expressed in diagrams and adjusted when other information that were deemed remarkable emerged from additional observations, with the aim to inform and shape the analysis process (Strauss and Corbin, 1990). Appendix E provides an example of a reflexive diary. Section 3.7.4.4 demonstrates how the reflexive diary was utilised to guide analytical thinking, and how this supported the development of the diagrams, which in turn informed the later stages of the analysis process.

During the observations at each unit, all clinical staff were invited for an interview. There was an interview guide to structure the interview, starting with six non-identifiable demographical questions (i.e., job role; operating imaging modality or modalities; highest qualification obtained; years of clinical experience; participant's age; and based at a static, mobile, IDC or CDC unit) to understand learning and knowledge dissemination associated with these factors (Appendix F). During the data collection process, questions were reworded or added based on findings from previous cases. Moreover, additional questions stemmed from participants' responses or researcher's observations. The interviews were undertaken on the day of the observations in a private area within the unit (i.e., an office) or at a later date, depending on the participant's availability and preference. Participants who agreed to being interviewed were given a separate PIS form specific to the interviews (Appendix G). Additionally, participants were informed verbally and were asked to read and sign the consent form for interviews (Appendix H). To support a well-structured interview process and foster participant comfort, Charmaz's (2014) guide for interviewing was followed. This included strategies to retrieve, explore and validate the information from the participants to allow rich and detailed data. Upon completion, transcripts were returned to participants for member checking, allowing them to confirm the accuracy of their contributions and offer any clarifications or additional insights that may have arose after the interview. This process ensured that the participants' voices were authentically represented and respected within the analysis, enhancing the confirmability of the data.

3.7.4 Data analysis process

The collected data consisted of field notes and audio recorded semi structured interviews, which were then transcribed verbatim capturing each verbal sound. None of the participants requested amendments to their transcript or submitted further comments for inclusion in the data analysis. The GT approach of Strauss and Corbin (1990) was followed, performing a simultaneous and iterative process to data collection and data analysis to constantly compare, identify, and pursue emerging phenomena. Nvivo version 14 was used to analyse the data. Figure 3.4 illustrates the data analysis process.



Based on literature of Strauss and Corbin, 1990

Figure 3.4 Research analysis process

3.7.4.1 Open coding

Following Strauss and Corbin's (1990) analysis process, the first step to analysis was open coding. This involved reading the transcript multiple times to get a holistic sense of the data initially. Then, the data was segmented into discrete parts, and each part was examined systematically (i.e., line-by-line) to identify potential meanings or concepts. Any meaningful segments of the data (e.g., phrases or sentences) were assigned a ''code'' which captured the essence of the segment. Codes that were similar were grouped into categories to reduce redundancy and to provide a more abstract meaning. As new data was analysed, codes and categories were continuously refined and re-evaluated. During this process, patterns such as recurring behaviours, ideas and concepts were sought. Table 3.6 demonstrates examples of open coding.

Table 3.6 Examples of open coding

Raw data	Open codes	Emerging category
Participant 24030: ''Well, I think it should be maybe more enforced but actually allowed the time because you've seen what the scanner is like, we can't get on the laptop to do anything, and people don't have their own computers at home. For example, you know, one of the staff there doesn't so it's not enough time. I think they need to encourage you with either hubs in certain areas that you could go to or give you certain time off. So, I think it needs to be far more encouraged and not just, "By the way this needs to be read and signed off by a certain date."''	Lack of time, lack of resources, lack of support	Barriers of EBP and CPD
Participant 24017: ''We always share and chat and discuss and you'll go through periods where you'll know something really well and then you won't do that for a little while. And you might forget it. So you then go back to a colleague and they can remind you: ''Yeah, I remember that''. Just because there is so much in MRI. And that is you're doing it all the time, so you doing cardiac this day, you might be doing breast imaging tomorrow you might be doing this MSK 5 minutes later, so you're not always gonna know exactly what you need to know at the right time. So we refer to colleagues all the time. There's lots of lots of chatter. Which is great. And then if anybody goes off and or read something interesting. They'll share it with everybody else, or if they go off in the training course and come back with any really good little nuggets so share it with everybody else. Yeah, it's good team.''	Colleagues or peers, courses, articles	EBP source

3.7.4.2 Axial coding

The second step to analysis was axial coding. During this step, codes and categories from the open coding phase were examined, and connections between categories and subcategories were made to allow a conceptual framework to emerge. During this stage, some codes, categories, or subcategories were discarded or merged as there were similar or no connections. Although the process of open and axial coding seems a linear process, realistically, the process was highly iterative and interlinked. To aid and guide the axial coding process, Strauss and Corbin's (1990) paradigm model was utilised to identify patterns and relationships, focusing on causal conditions, context, intervening conditions, strategies, and consequences. Figure 3.5 illustrates the model starting with the phenomenon in the centre, which denotes the main event of study; that is, ‘engaging in EBP and CPD in radiography’. The phenomenon links to the causal conditions, which are the factors that influence the occurrence of the event. The causal factors include a lack of motivation, time and support. The context describes the environment wherein the phenomenon occurs, which involves CDC, IDC, static and mobile sites covering PET-CT, MRI and CT modalities. The intervening conditions relate to factors that affect the action or interaction such as resources, barriers and constraints. The intervening conditions and causal conditions overlap and interlink.

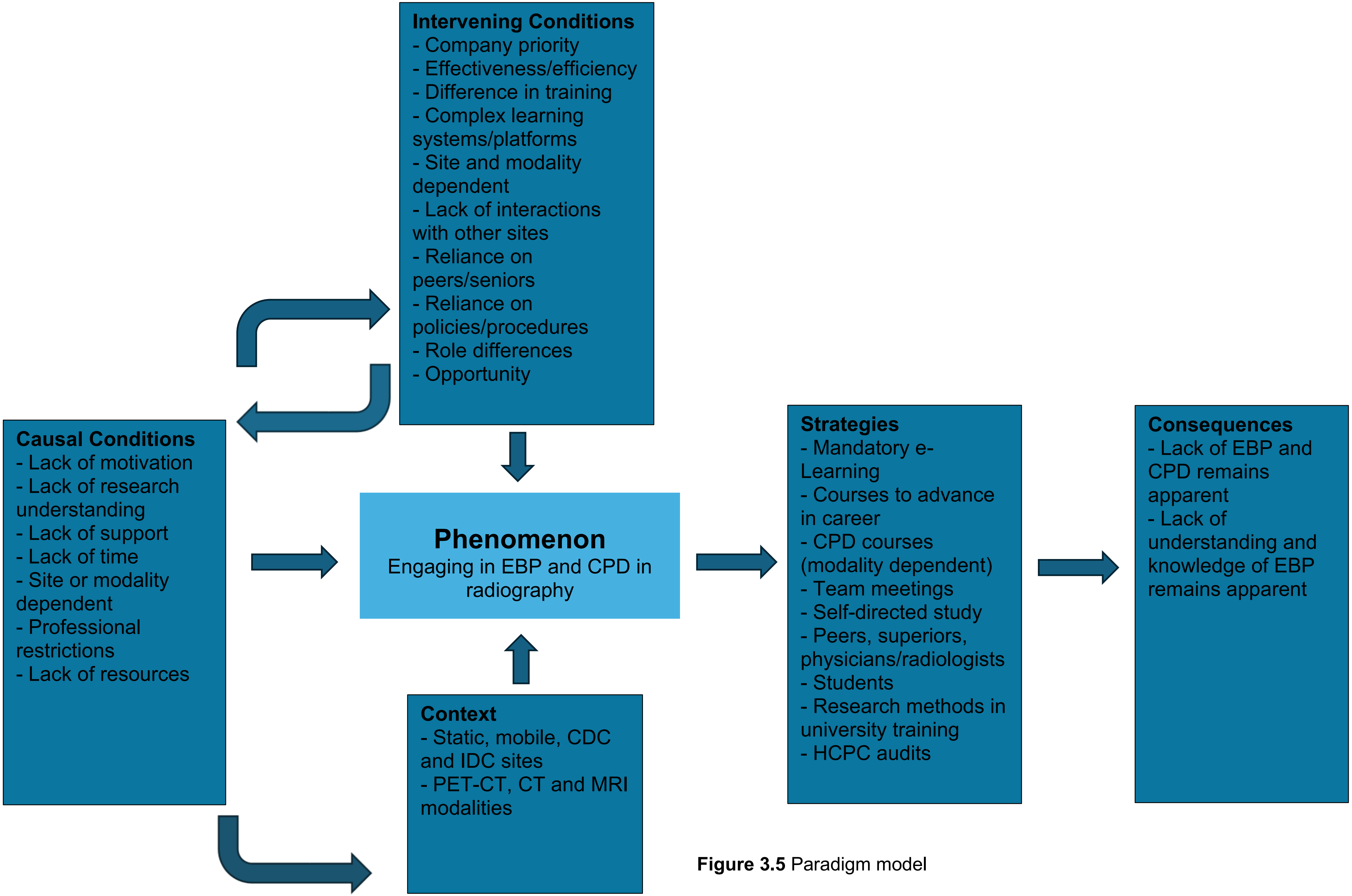


Figure 3.5 Paradigm model

For example, the lack of time may be related to, or intensified by other company priorities (i.e., patient throughput), and prioritising effectiveness and efficiency over implementing EBPs in practice. The strategies refer to actions or approaches taken in response to the phenomenon. Within the study's context, various intentional and unintentional approaches were taken, by either the organisation or the individuals. For instance, courses to advance in careers and CPD courses can be considered an intentional approach to CPD and EBP as it is a conscious decision to enrol onto a programme to advance in career, whereas conversations with peers, students or physicians/radiologists on an EBP may be considered a natural, unintentional approach to CPD as it can be part of day-to-day interactions. Additionally, the participants considered some approaches, such as mandatory e-learning, as a strategy to engage in CPD and EBP. Lastly, the consequences are the outcomes or results of the strategies, which can be positive or negative, intended or unintended. In this study's context, regardless of the already applied individual, organisational and legal (i.e., HCPC CPD audit process) strategies, a lack of engagement and understanding of EBP and CPD remains apparent. As an extension of the paradigm model, a conditional matrix was drafted to provide a holistic view of the relationships between micro (immediate), meso (organisational) and macro (societal) conditions that affect the phenomenon (see Figure 3.6). As proposed by Strauss and Corbin (1990), the conditional matrix is a framework aiding the researcher to i) ''be theoretically sensitive to the range of conditions that might bear upon the phenomenon under study''; ii) ''be theoretically sensitive to the range of potential consequences that result from action/interaction''; iii) and assist to ''systematically relate conditions, actions/interactions, and consequences to a phenomenon''. The conditional matrix is visualised as a series of concentric layers, each representing different levels of conditions and (possible) influences. The matrix highlights that the levels are interconnected, meaning that changes or influences in one level can cascade through others. For example, a macroeconomic downturn (macro) could lead to reduced availability of resources at an organisational level (meso), affecting allocated time and resources for EBP and CPD (micro). This is discussed in detail in the following chapters.

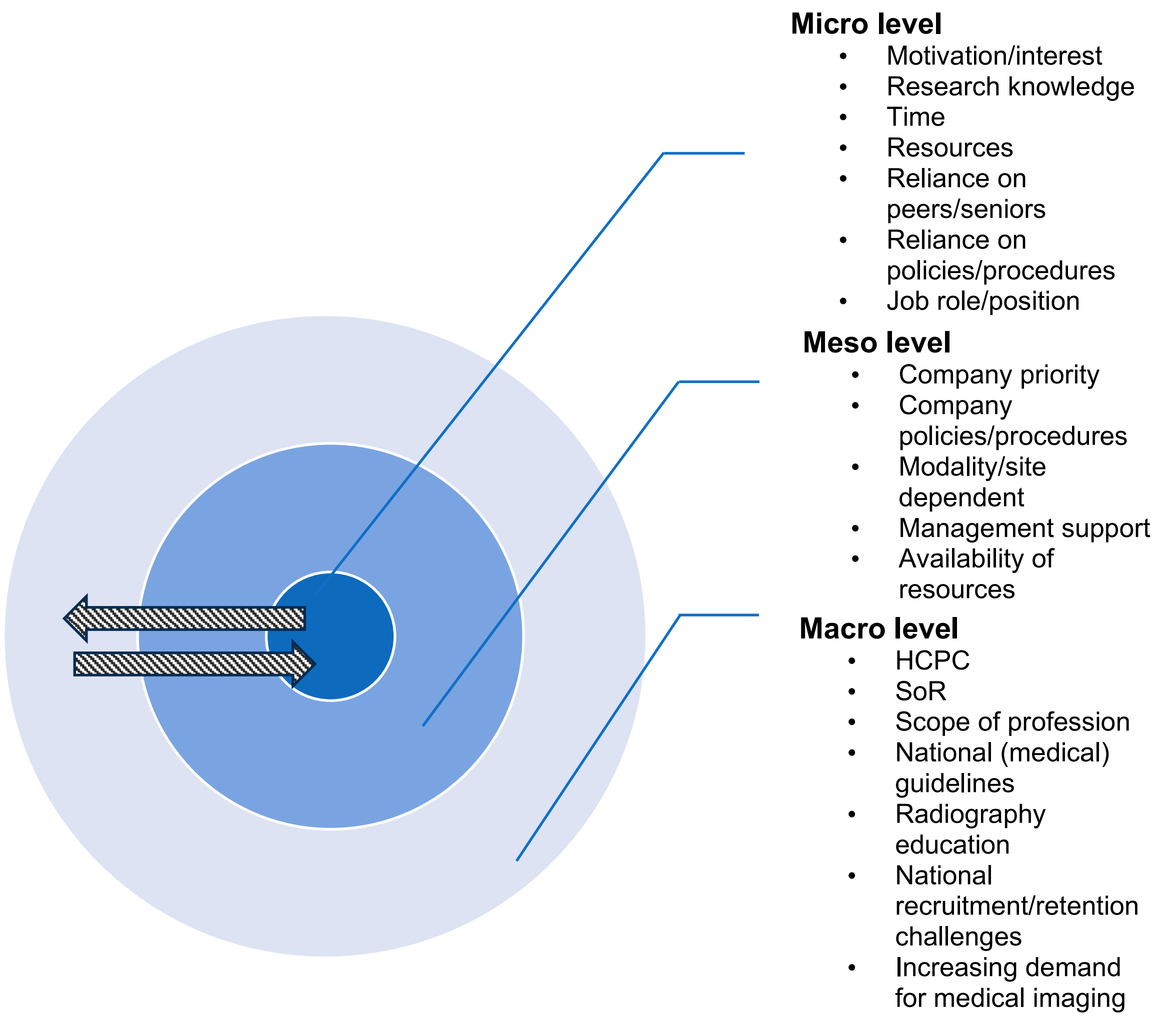


Figure 3.6 Conditional matrix applied to study phenomenon

3.7.4.3 Selective coding

The final stage of the analysis process was selective coding, which involved integrating, refining and formalising categories and sub-categories from the earlier phase. This facilitated three core categories which overlap and interlink, prompting a story line and emergence of the theory. A total of three core categories have been distinguished as they were all deemed separate but equally important, yet overlapping categories (see Figure 3.7). The core categories are central to and connects the data; providing a cohesive theoretical framework. Hence, it provides a theory to explain the (social) processes surrounding the phenomena. Integrating previous research further expands the theory (Bluff, 2005). These core categories are discussed individually, and also linked and explained in the next chapters.

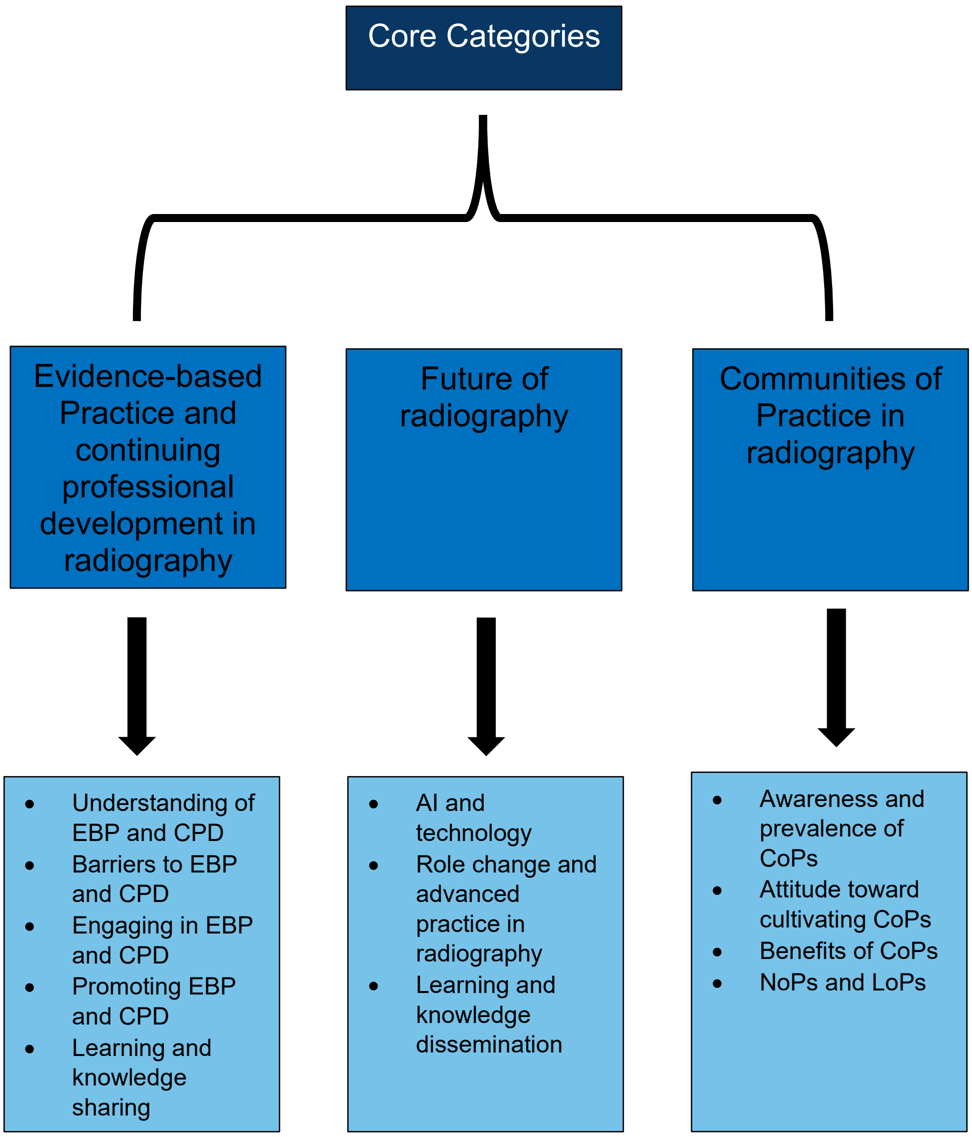


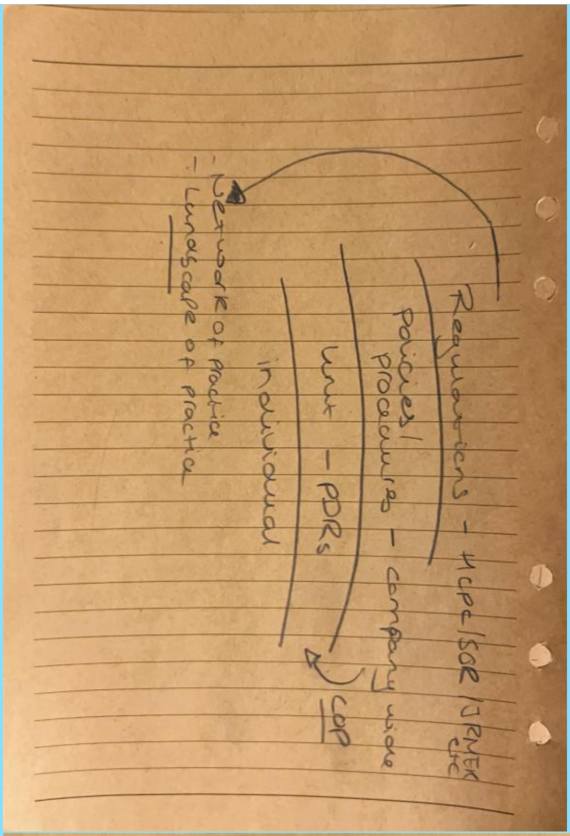
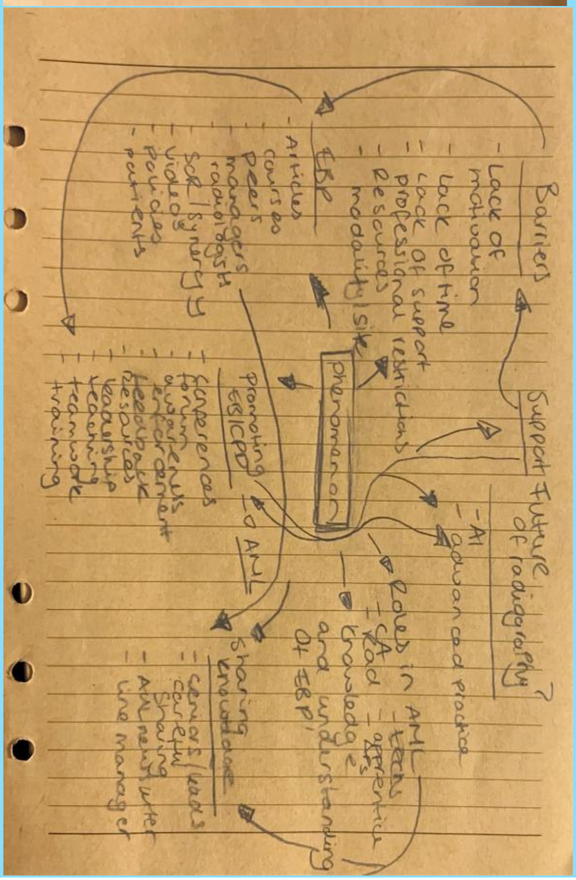
Figure 3.7 Selective coding: the core categories

3.7.4.4 Reflexivity and memoing

During the data collection process, a handwritten reflexive diary was held as a tool to document my personal reflections, thoughts and experiences. This reflexive diary aimed to consciously identify and acknowledge my personal beliefs, biases and judgements during the research process (Jamieson, Govaart and Pownall, 2023). The notes consisted of paragraphs, lines or words that came into mind during the process. The reflexive diary also guided the memoing process sparking words, lines or subjects to consider in the next interviews or observations and aided in the development of codes or categories in the analysis process. Some of these words or sentences were translated into diagrams, which later supported the development of the paradigm model, and the conditional matrix illustrated in the previous section. Table 3.7 demonstrates examples from the reflexive diary, initiating the memoing process and initial diagrams.

Table 3.7 Examples from the reflexive diary, memoing and diagrams

Location and date	Notes	Diagrams
MRI Static Unit 3/5/2024	*''I felt that the radiographers were more confident teaching the student, rather than teaching each other. The radiographers relied heavily on each other when faced with a difficult examination. One of the radiographers also asked for my opinion on an examination.''* *Radiographers rely on each other, insecurities, teamwork environment.*	
Mobile MRI Unit 15/04/2024	*''The mobile manager was made aware prior to first observations. The mobile radiographer was made aware that he was going to be observed in the morning. When he was asked, he seemed shocked and asked what the observations were for. I explained the purpose of the research and most importantly, confidentiality of the research. The next day (15/04/2024), he asked me to have a private chat in my office. He apologised and explained he feels unwell and prefers not to be observed. He proposed for me to observe the day after, with a different radiographer. I suspect this reaction was a fear of management observing bad practice, and for the information to be passed onto his manager?*	

	Leadership, fear of management, trust in management.	
IDC **5/06/2024**	*''The team appeared to get along well, and there was easy friendliness among them... Walking into the unit and the control rooms, I found my attention repeatedly drawn to the modern environment, the layout, the spacious rooms, a large staff break room, and particularly the high-spec equipment. The radiographers, clinical assistants, and assistant practitioners initially felt a little stand-offish. I sensed an initial subtle guardedness around me, which may be due to my managerial position. Once the team became used to me having there, conversations flowed more naturally, and the initial distance seemed to ease. Because the site is new, I had the impression that the team was still settling in, testing the waters, working out their roles, and slightly unfamiliar with how everything fits together. I noticed many inexperienced staff, and those who needed support as they were uncertain about scans or processes. … I became increasingly aware of the hierarchical structure in the unit. The clinical assistants and assistant practitioners looked to the radiographers for direction, and the radiographers, in turn, relied on the clinical leads and management.* Reliance on peers, training and education, effects of environment on learning, communication with others.	

3.7.5 Ethical approval

As the research did not involve patients in general, NHS staff or equipment, Health Research Authority approval was not required. The research was approved by the Research Ethics Committee of University of Sunderland (Appendix I).

Chapter 4: Findings

This chapter presents the findings of the research study, reflecting the core categories identified in the previous section: i) Evidence-based Practice and Continuing Professional Development in radiography; ii) future of radiography and iii) CoPs in radiography. Table 4.1 provides an overview of the categories, subcategories and analytical focus of the findings. A total of seven sites were observed over a course of 10 days (starting 9AM until 5PM approximately) including one IDC site (three days), one CDC site (two days), one static MRI site (one day), one mobile MRI site (one day), one PET-CT static site (one day) and two mobile PET-CT sites (one day per site). Additionally, a total of 30 clinical staff were interviewed either on the day of the observations, or at a day convenient for the participant. Table 4.2 details the characteristics of the participants interviewed.

Table 4.1 Overview of categories, subcategories and analytical focus of the findings

Category	Subcategory	Focus
4.1 Evidence-Based Practice and Continuing Professional Development in radiography		Exploration of how radiographers understand, engage with, and are supported in EBP and CPD within practice.
	4.1.1 Understanding of Evidence-Based Practice and Continuing Professional Development	Examines participants' awareness, definitions, and perceived importance of EBP and CPD in radiography practice.
	4.1.2 Barriers to Evidence-Based Practice and Continuing Professional Development	Identifies structural, professional, organisational, and individual challenges limiting engagement with EBP and CPD.
	4.1.3 Engaging in Evidence-Based Practice and Continuing Professional Development	Explores how participants engage in EBP and CPD activities.
	4.1.4 Promoting Evidence-Based Practice and Continuing Professional Development	Investigates perceived strategies, professional, structural and organisational efforts to enhance engagement.
	4.1.5 Learning and knowledge sharing in practice	Explores how organisational context, role differentiation, hierarchies, and imaging modalities condition and influence learning and knowledge sharing in practice.
4.2 Future of radiography		Examines anticipated developments shaping the profession, including technological advancements and changes in the roles and responsibilities of diagnostic radiographers.
	4.2.1 Artificial intelligence and technology	Investigates the perceived influence of AI and emerging technologies in radiography.
	4.2.2 Role change and advanced practice in radiography	Explores perspectives on the future role of the radiographer and role dynamics within radiology departments.
	4.2.3 Learning and knowledge dissemination	Examines perspectives on future approaches to improving training and knowledge sharing in practice.
4.3 Communities of Practice in radiography		Investigates the role of social learning structures in supporting EBP, professional development and practice.
	4.3.1 Awareness and prevalence of Communities of Practice	Assesses familiarity with and existence of CoPs within radiography settings.
	4.3.2 Attitude toward cultivating Communities of Practice	Explores perceptions, willingness, and cultural readiness to develop CoPs.
	4.3.3 Benefits of Communities of Practice	Identifies perceived advantages of CoPs for professionals, organisations, patients, and the radiography profession.
	4.3.4 Networks of Practice and Landscapes of Practice	Examines perceptions of broader professional networks and interconnected learning environments across contexts.

Table 4.2 Characteristics of participants

Participant	Job role	Age	Modality	Type of site based	Years of clinical experience	Highest obtained qualification	Face-to-face or videocall interview	Interview duration
24001	Clinical assistant	50	MRI	Static	4	Care certificate or the NVQ Level 2	Face-to-face	0:19:16
24002	Senior radiographer	47	MRI	Static	5	MSc Computational physics	Face-to-face	0:32:52
24003	Clinical lead and reporting radiographer	60	MRI	Static	30	PgDip in reporting	Face-to-face	0:45:19
24004	Clinical lead and reporting radiographer	56	MRI	Static	33	PgDip in reporting	Face-to-face	0:34:26
24005	Senior radiographer	35	MRI	Static	12	BSc in radiography	Face-to-face	0:13:45
24006	Clinical lead	35	PET-CT	Static	12	Diploma in nuclear medicine	Face-to-face	0:15:13
24007	Technologist	32	PET-CT	Static	8	PgDip in nuclear imaging	Face-to-face	0:20:33
24008	Graduate technologist	22	PET-CT	Static	3 months	Diploma in nuclear medicine	Face-to-face	0:19:33
24009	Apprentice radiographer	48	PET-CT	Static	8	Level 5 in radiography (assistant practitioner)	Face-to-face	0:21:17
24010	Senior radiographer	59	MRI	Static	20	BSc in radiography	Face-to-face	00:21:34
24011	Senior radiographer	36	MRI	IDC	7	BSc in medical imaging technology	Face-to-face	0:17:58
24012	Senior radiographer	52	CT	IDC	30	Diploma in radiography	Face-to-face	0:35:24
24013	Senior radiographer	33	CT	IDC	12	BSc in radiography	Face-to-face	0:17:04
24014	Senior radiographer	35	CT	IDC	14	BSc in radiography	Face-to-face	0:18:25
24015	Radiographer	37	MRI	IDC	14	BSc in radiography	Face-to-face	0:13:25
24016	Clinical assistant	53	Multimodality	IDC	6 months	Certificate in Education	Face-to-face	0:22:25
24017	Senior radiographer	51	MRI	Static	5	PgCert in MRI	Teams	00:32:33
24018	Senior radiographer	49	PET-CT	IDC	24	MSc in radiography and MSc in Ultrasound	Face-to-face	00:18:07
24019	Clinical assistant	22	Multimodality	IDC	6 months	In the process of obtaining a BSc in radiography	Face-to-face	00:16:57

24020	Senior radiographer	39	PET-CT	IDC	15	PgDip in medical imaging and nuclear medicine		0:13:41
24021	Graduate radiographer	37	PET-CT	IDC	6 months	BSc in radiography	Face-to-face	0:17:41
24022	Radiographer	46	PET-CT	Mobile	24	PgDip in nuclear medicine	Face-to-face	0:23:24
24023	Radiographer	43	CT, MRI and PET-CT	Mobile	23	Bachelor of technology	Face-to-face	0:14:04
24024	Assistant practitioner	31	CT	CDC	3 months (12 years as clinical assistant)	Level 5 in radiography (assistant practitioner)	Face-to-face	0:14:04
24025	Radiographer	26	CT	CDC	3	BSc in radiography	Face-to-face	0:17:11
24026	Senior radiographer	40	CT and MRI	CDC	16	Diploma in radiography	Face-to-face	0:17:33
24027	Radiographer	38	MRI	Mobile	16	BSc in radiography	Face-to-face	0:35:13
24028	Senior radiographer	50	PET-CT	Mobile	25	BSc in radiography	Face-to-face	0:25:58
24029	Clinical assistant	40	PET-CT	Mobile	10	PgCert in teaching	Face-to-face	0:11:37
24030	Technologist	59	PET-CT	Mobile	30	PgDip	Face-to-face	0:17:38

4.1 Evidence-based Practice and Continuing Professional Development in radiography

This section covers the following categories: i) understanding of EBP and CPD; ii) barriers to EBP and CPD; iii) engaging in EBP and CPD; iv) promoting EBP and CPD; and v) learning and knowledge sharing in practice.

4.1.1 Understanding of Evidence-based Practice and Continuing Professional Development

Most participants showed awareness of the concept of EBP. This was specifically noticed among those with higher positions, higher qualification level or those interested in improving radiography services. Although there seems to be a general awareness of EBP and various reasons for its importance are highlighted, most participants could not describe what EBP entails.

''… I'd say Evidence-based Practice is information that we gather altogether to improve the quality of services and effectiveness of services, and how we can correct that, finding out risks and making sure that we clear all that''. [Participant 24027, Senior Radiographer MRI, mobiles]

''Evidence-based Practice is… changes to what we do, based on research, our experience of other departments or areas, where certain actions have shown to produce better results. That has been tested and verified, if you like, and then that's something we can adopt in our department, implement into our policies, to make our outcomes better.'' [Participant 24003, Clinical Lead MRI, static]

''Evidence-based Practice, obviously, what we do within the units, whether that's clinical scanning, whether that's reporting is all based on previous work that has been undertaken, peer-reviewed and accepted as the best practice. [Participant 24004, Reporting Radiographer, static]

Participants provided several reasons for partaking in EBP and highlighted the importance of EBP. This includes improving services with regard to patient care, efficiency and effectiveness, to reflect on practice and to ensure practice is research-based. The focus and use of EBP appears different for those working clinically with direct patient contact, compared to clinical leads and reporting radiographers. Participants who are patient facing were mainly concerned with adapting current practice to improve patient care and pathway, whereas clinical leads and the reporting radiographer highlighted efficiency, effectiveness, pathology and case-based situations. Additionally, some participants felt that EBP is considered part of their role and a legal requirement as a registered professional.

''...healthcare is constantly evolving. There are financial reasons why it's really important that we have Evidence-based Practice. Because one of the things it can prove is that something is cost effective.
It's also a very emotive area, healthcare, and you might have companies producing wonder drugs for very, very rare diseases that cost a lot of money. But money is a limited resource in healthcare, so you've got to prove value for money as well.''

''As things evolve- And that's the other thing about medicine, it evolves all the time, as we create knowledge – things like DNA sequencing and things like that, new treatments become available – and we've got to constantly move forward with that, to improve outcomes for patients''. [Participant 24003, Clinical Lead MRI, static]

''I have to go out and find the sources. It may be that most of it is specific case based. Whereas as a technical radiographer, you might learn something that covers a number of clinical applications and will assist in a number of patients almost immediately. From a reporting point of view, if you are working on a specific pathology and its MRI appearances, you're working on it for that case that's in front of you… You may come across a pathology that is quite infrequent. You might only see it once a year.'' [Participant 24004, Reporting Radiographer MRI, static]

''…adapting our practice so that we're not all working to ideas and research and premises that were 20 years old, 15 years old, even 10 years old or even last year. We're working with things that are very up to date and the idea is that it encompasses research evidence and best practice, so from personal experiences your practical personal experiences as well as what research tells us.'' [Participant 24017, Senior Radiographer MRI, static]

''Just because they've already been proved by research. So, if that helps to improve our care for our patients, it's a good idea to implement them.'' [Participant 24009, Apprentice Radiographer PET-CT, static]

''Evidence-based Practice is pretty much learning from situations that have occurred or things that have happened, and reflecting on them. Personal experiences, not just of yourself, of others, or within the department as a whole, or the unit as a whole.'' [Participant 24021, Graduate Radiographer PET-CT, static]

''So it's important, it's a requirement first of all of the HCPC, So as a professional…So it's a legal requirement, really that evidence based practice is used.'' [Participant 24017, Senior Radiographer MRI, static]

Some participants seemed unaware of EBP, which mainly involved those working as a clinical assistant, technologist or those who completed their qualification outside of the UK. Additionally, some seemed to confuse EBP with CPD, or directly link the concepts.

''Oh, I don't really know, Evidence-based Practice. Just what you see in a variety of different settings and how that could be applied to where you work and if it's beneficial to implement it to where we are or suggest it be implemented.'' [Participant 24030, PET-CT Technologist, mobiles]

''Having evidence that you've done your CPD, like having some record of it somewhere to produce if you get audited.'' [Participant 24023, Senior Radiographer multimodality, mobiles]

''We need to prove that we're continuing with our professional development. And… we have to have evidence to show that we are capable of basically doing our jobs.'' [Participant 24010, Senior Radiographer MRI, static]

''It allows us to, especially in your careers, allows us to grow. You know, to acquire more knowledge…'' [Participant 24014, Senior Radiographer CT, IDC]

''Evidence-based Practice, so it's having something physical to show that I do meet the requirements to be able to do my position.'' [Participant 24001, Clinical Assistant MRI, static]

4.1.2 Barriers to Evidence-based Practice and Continuing Professional Development

This section discusses the commonly reported barriers experienced among the participants, relating to a lack of motivation, lack of support, lack of time, lack of resources and modality and site related obstacles.

4.1.2.1 A lack of motivation

During the observations at the CDC site, a conversation took place between a CT radiographer and assistant practitioner, in which the assistant practitioner mentioned finding research ''not interesting''. Moreover, finding appropriate research articles and analysing those to assess its quality is perceived as a difficult task. Unlike the assistant practitioner, the CT radiographer found research interesting, however, experienced difficulties comprehending research articles due to the academic language and terminologies. A lack of motivation seemed apparent among those toward the end of their careers or those who did not feel challenged in their role. Additionally, some participants felt less motivated due a lack of enforcement to engaging in EBP and CPD.

''I'm coming towards the end of my career and I'm less keen than I was to enrol in courses and things. And that's a reflection on me, rather than the company. I know if people want to do training, they can bring it up in their PDR and put their smart objectives in and apply for courses….Because if I'm brutally honest… if I had been audited this year, I would have had to produce three years' worth of CPD. And I'm not the only one, I know for a fact, I have a pile of things at home, a file on my computer, where, if I read something or if I find something interesting, I'll put it in the pile, but I very, very rarely write it up or formalise it.'' [Participant 24003, Clinical Lead MRI static]

''Motivation sometimes because, I speak for myself, the graduate scheme is not the best in terms of we basically stay in the graduate scheme for a few months and it doesn't matter how good you are or how well you've been doing in the few months,

that you're still a graduate, you still need to be considered a graduate. You can do half of the things, so motivation, try to motivate people, it's kind of hard in that thing.'' [Participant 24008, Graduate Radiographer PET-CT, static]

''There's no checking, there's no enforcement making sure people have done CPD. There's not as much encouragement as there should be to make people do- So you will find there are some people who naturally want to learn and will push for these things, will go out to seek CPD and improve themselves, and they'll be other people who will sit back, do their job, and not necessarily work to better themselves.'' [Participant 24002, Senior Radiographer MRI, static]

4.1.2.2 A lack of support

Many participants mentioned a lack of support by their employer, of which nearly half experience a lack of support due to other company priorities such as increased productivity and efficiency. This reflects the observations made at all sites, in which the team's focus was ensuring efficiency and high patient throughput. This was achieved by, for example, staffing models that allowed an increased productivity and maximising appointments and patient lists. For example, clinical assistants were part of the staffing model and took responsibility for preparing the patients for their scan (e.g., safety screening, cannulating, changing etc.), resulting in the patient to be scanned immediately after the previous. Additionally, it allowed staff to rotate for breaks without any pauses in the day where patients are not booked. Participants, however, associated the efficiency and high throughput with a business mindset to improve financial gains. Additionally, staff shortages, daily pressures and increase in patient demand was considered a constraint to engaging with EBP and CPD.

''We can't afford to take time out of the day to say we'll block two hours out of the diary, or an hour out of the diary, and we'll do some training. The demand here is so- The pressure is so great, we can't do that.''

… I think it's a very low priority for the company. There will be people in the company at head office level who think it's a very high priority. But their voices are much quieter than the finance team and other areas of the company that are making more noise about what we should be doing and hitting targets, and things like that.''

''…And I don't think as a unit even it has been a priority, because we've spent the last five years firefighting staff changes and upheavals in the department for various reasons, and new contracts, and the pressures of the numbers on us…'' [Participant 24003, Clinical Lead MRI static]

''…because we're a business at the end of the day, it's a business that needs to be managed. A lot of people don't realise the NHS is a business as well, so it all revolves around money and things. Uhm, to be honest, I don't know how they would be able to do it and be you know, a profitable company. So it's always figures, more patients, more money.'' [Participant 24010, Senior Radiographer MRI, static]

Specifically, participants identified a lack of support from the company and their line managers. A lack of support from line managers was particularly experienced among the mobile team, and those who have managers with a non-clinical background. Participants felt that managers with a clinical background would have an increased appreciation for CPD and EBP, and understanding of any clinical challenges. This resonates with conversations had with the clinical team during the observations, in which participants explained that a manager with a clinical background is preferred as they ‘’connect with you and understand any operational challenges’’. Although a general lack of support was experienced, majority of the participants felt that they received most support from their peers and clinical leads, albeit some lack of support by clinical leads is encountered due to their primary focus on quality of care and pressures from the company to increase effectiveness.

‘’There are a lot of emails that come out about stuff like that. But, again, it’s probably just when you come into work. If I’m off for a couple of days and you come in, obviously the emails that you get, but then when you come in it’s like, this is happening and that’s happening. It’s just word of mouth. There’s nothing evidence-based about that, apart from an email…’’ [Participant 24016, Clinical Assistant Multimodality, IDC]

‘’I think, from the culture we have at the moment, because of pressure, I think it’s a very low priority for the company. There will be people in the company at head office level who think it’s a very high priority. But their voices are much quieter than the finance team and other areas of the company that are making more noise about what we should be doing and hitting targets, and things like that.’’ [Participant 24003, Clinical Lead MRI, Static]

‘’From a CPD point of view to do with covering off basic training to do with fire, health and safety, medicines management, Alliance Medical are very good at providing that information, providing that access to courses and providing a framework where it’s undertaken and audited to make sure that you’ve done it. So, from that point of view, which I consider the bolt on bits as opposed to key CPD, which has got to do with

your technical ability as a radiographer, your clinical knowledge, difficult situations, handling patients, those kind of things, we get very little from our employer.'' [Participant 24004, Reporting Radiographer MRI, Static]

''Well I would have to say I think the managers probably need to go around to at least the static sites to see how they're working. Look at other research or other evidence based and see how that can be put across to what we do.'' [Participant 24030, PET-CT Technologist, Mobiles]

''I'd say if we got more clinical based staff, it would probably be even more effective because sometimes I find when we talk to nonclinical staff, they might not understand what you're trying to converse to them. It takes them a while to understand where you're coming from in terms of trying to improve something. That then takes a while for the information to be conversed and improved…'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''I have done that over the years, and I don't- it's never got anywhere. And I suppose, part of the problem is, that sometimes the managers aren't clinical-based, so they don't understand what I'm saying. So, it just gets dismissed because it's not really on their agenda. I suppose they think, "Well, if it ain't broke, why fix it?" So, therefore no change occurs, and it falls on deaf ears.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''The leads, I don't think they are interested in it. That's what I think. Because if it's about the quality of the job… And I think they are restricted in a place like Alliance because it's a private company.'' [Participant 24012, Senior Radiographer CT, IDC]

''Usually my clinical lead and my teammates help me with that. Some help me with research some things and things like that. But in terms of time and anything else, Alliance doesn't help much because we don't have that much time and most of it, we need to do it in the workplace, so in terms of time, yeah, that could be better.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''I think really from the team… it's from the team as I say, discussing stuff that we've found out and asking questions of each other, not just of new stuff, but of things that you may have learned three or four years ago that you've forgotten…'' [Participant 24017, Senior Radiographer MRI, Static]

During the observations and engaging in conversations with the clinical team, participants mentioned that they have experienced a shift in the company's priority, observing a decline in ''morale, patient centred care and communication the past five years''. Particularly, the clinical teams feel that manager's roles have changed, where managers ''care less about the shop floor'', ignoring patient needs such as accounting for mobility issues or time with patients. This was felt unfavourable, as the clinical team find communication and time with the patient highly important. Although CPD courses have been made available, some participants felt that courses are not promoted sufficiently, which was associated with managers' lack of awareness and understanding of the importance of EBP and CPD.

''… once upon a time, you used to be able to go to a meeting. There used to be nuclear medicine meetings, and they were worth so many credits. I've not really seen those. I don't even think those meetings still exist now. They were really accessible, and a lot of people attended as well. But I feel, now, that there's so much focus on getting maximum capacity out of scanning days and things that I think a lot of staff are, quite frankly, a bit tired, and haven't always got time.'' [Participant 24022, Senior Radiographer PET-CT, mobiles]

''…Because it's all for the patient, at the end of the day. And, like I was saying to you earlier on, you don't get long with the patients and that's sad. I mean, the amount of people that have said to me, "Thank you for your help, you've been really patient, you've been lovely." It's just lovely. That's all I want.'' [Participant 24016, Clinical Assistant Multimodality, IDC]

''I know that there was a nuclear medicine and PET conference that happened last month. I knew about it because of my previous workplace, but no-one promoted it here. Maybe that's because I only started in December. Maybe they put it out to people to go to before that. But I felt like it wasn't promoted, where in my previous work, we were very much encouraged to go.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

''But I don't feel like we get a lot of active encouragement for CPD in the department at the moment, either from the company or at the department level.'' [Participant 24003, Clinical Lead MRI, Static]

''… And I suppose, part of the problem is, that sometimes the managers aren't clinical-based, so they don't understand what I'm saying. So, it just gets dismissed because it's not really on their agenda. I suppose they think, "Well, if it ain't broke, why fix it?" So, therefore no change occurs, and it falls on deaf ears.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''… It was a type of manager course but it wasn't based just for managers it was for everybody, but there are people that we are above, even though I'm not a manager, and it looked like it would be very helpful for that. So, I applied if I could go on it and it got turned down to say, "It wasn't appropriate for my job part." [Participant 24030, Technologist PET-CT, Mobiles]

Lack of support from peers was identified by some of the participants. The knowledge that is shared between staff is mainly related to current practice and training staff members, rather than discussing EBPs or (new) practices. This aligns with the observations made, in which senior members of the team were teaching junior staff or students to scan or position patients, but not necessarily challenge current practices or discuss any (new) EBPs. Those with higher positions and increased interest in improving practice such as clinical leads and reporting radiographers felt more involved in consulting research for EBPs. However, implementing new practices were often protocol driven, and the full process of EBP is rarely completed. For example, implementing EBPs and assessing the outcomes was considered challenging.

''To be honest, I don't know. I know it was brought up to management, but I think a lot of the clinical assistants were against it happening because they didn't feel it was necessary.'' [Participant 24019, Clinical Assistant Multimodality, IDC]

''Rarely, you will be taken aside for somebody to go through something and explain something to you. It's more on the job training, you know, you advance through your skills matrix or they come across something and pass on some knowledge.'' [Participant 24002, Senior Radiographer MRI, Static]

''… we are quite happy to introduce something that we feel is Evidence-based Practice, but we very rarely complete the full circle and assess what kind of impact it has had. Most of the things we've implemented on Evidence-based Practice tends to be technical protocol driven things. For example, changing a specific protocol or how we acquire images, again, based on best practice within the papers. We tend to do that regularly, but it's not something that we specifically either audit or say, "No. We must do this." It's a case of, "What do we think is the most appropriate way to image a particular body part?" So, we're quite good at finding what other people do and what is considered best practice. We are reasonably good at implementing that. I would probably say, on a scale of 1 to 10, four. We are exceptionally poor at actually saying whether that has an impact on clinical management and patient outcomes. That would be a zero.'' [Participant 24004, Reporting Radiographer MRI, Static]

''…As I work in the mobile unit, it was a difficult situation for them to get to us. Then you think about all the other environmental issues that will affect that patient care such as the weather, such as the facilities that we have in the unit, the shortages of

equipment. Because it's a very small, compact space, so you're not going to have as much equipment such as wheelchairs and all that to help the patient. So, we found that delayed the patient care. The waiting times were affected and delayed the…I found it really difficult because we had to keep conveying that same information over and over and over and over to try and get it all improved… So, it took a bit of time for management to pick it up and do something about it.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''…Staff often speculate about, "I wish we could do it like this," or whatever, but sometimes, things don't actually progress from just the gossip in the control room…'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

Some participants highlighted a lack of support from clinicians or radiologists. For example, changes to protocols were considered mainly radiologist-led, with little input from radiographers or technologists. Correspondingly, many participants felt that radiography is a ''narrow profession'' as it is highly protocol-driven, allowing little flexibility or opportunity to introduce new EBPs. Some participants related this to a restriction due to employment with an independent imaging provider. This was particularly commonly experienced among the PET-CT radiographers and technologists, and the mobile team.

''… The prostate scans. Before we were doing it with contrast. Then recently, the radiologists in the Trust, they don't want it anymore. So, we're just giving contrast if it's needed. And for the MS patients right now, we're incorporating a 3D FLAIR, because I think they're trying to compare it with a 2D FLAIR sequence. So, they will

send some emails to our lead, yeah? Then the lead will coordinate with us, change the protocols and the sequences.'' [Participant 24015, Radiographer Multimodality, IDC]

''I think we as technologists originally were very, you know, we had to fight tooth and nail to be recognised and to actually have a degree.'' [Participant 24030, PET-CT Technologists, Mobiles]

''To get, specifically, the Evidence-based Practice ones, it's a bit more difficult to get hold of those resources and to know what would be relevant to us to actually put into practice because our roles are sometimes quite narrow, quite fixed, what we're doing. So to continue to… If we're doing scanning along the spine, scanning the head, scanning liver, how much more can that Evidence-based Practice keep changing enough to continuously be learning about it? [Participant 24002, Senior Radiographer MRI, Static]

''…It's all to do with autonomy really, for me. We don't have the autonomy to do anything differently to how- if we step outside of the strict protocols we have in our job, then we would be reprimanded for that because we wouldn't be doing things… Because everything's so protocol-led within Alliance you don't have the freedom to make decisions in a way that you might do otherwise, to get from A to B. Does that make sense? You go from A to B in a certain set way, and if you deviate from that set way, then it's often frowned upon…'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''…We kind of just follow whatever trusts tell us to do. We don't really get involved in the actual setting up of any protocols with them.'' [Participant 24023, Senior Radiographer Multimodality, Mobiles]

4.1.2.3 A lack of time

All participants considered a lack of time an obstacle to engaging with CPD and EBP. Most participants experienced a lack of time due to work pressures including high workload and challenges related to staff shortage. Additionally, some participants felt that engaging with CPD and EBP outside of contracted working hours may interfere with an acceptable work-life balance. This aligns with the observations made in the departments, where the environment was often fast paced leaving little flexibility for other, non-related clinical tasks. A lack of time may become magnified due to unexpected clinical challenges. For example, during the observations at the CDC, the clinical team was behind schedule due to difficulties cannulating a patient leading to working throughout their breaks.

''I would say, obviously, just time. We're just very busy. Our days at work are back-to-back patients every day. So, I'd say, yeah, just time.'' [Participant 24024, Assistant Practitioner CT, CDC]

''Time, I would say. Because it's such a busy department, my role starts at 7:30 in the morning until 5:30 at night. I don't always get out on time, and in between that time, there's not enough time to do any sort of research or studying, and if I do, it does impact on when I finish.'' [Participant 24001, Healthcare Assistant MRI, Static]

''A lot of people's reasons that I hear are because of time, always saying that they don't have the time to do CPD. Why should they have to do that in their own time outside of working hours? The company should provide time.'' [Participant 24002, Senior Radiographer MRI, Static]

''I would say the constraints of time, especially currently because a mobile radiographer, it's a lot of travelling. There's also your personal life… So, that's the only thing that I would say then you have to do then fit in all that new information. You need to find the time to do it. If you're at work, because of the number of patient times, you've got to try and keep up to date with making sure that the patients are all taken care of. And at the same time, when you're actually working because of the busy system that's happening around us, it's difficult to then do your training while you're also then focusing on all these other duties that you have…'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''…I've got a lot of things that are just on the backburner, because I can't do, which will build up and might have an impact later on, but there's very little time here to do anything like that.'' [Participant 24007, PET-CT Technologist, Static]

''…I don't really have the opportunity to do that much anymore. When I first started doing nuclear medicine, I quite often went to the BNMS conference, but I think as things get busier, there's a bit more pressure to be working, clinically, to get through the scans, rather than releasing people to go on conferences and things.'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

Staff shortages increased pressure on the team, creating an environment in which engaging with any non-clinical tasks becomes more challenging. This was also noticed during the observations where a clinical assistant became unwell and went home, resulting in radiographers encountering difficulties to keep up with the patient flow and demand.

''… Being short-staffed doesn't help. Whether it's through illness, through annual leave or not being able to fill positions, it means that there's more demand put on the current workforce. So not everybody has the time to do what they want to do.'' [Participant 24001, Clinical Assistant MRI, Static]

''I've asked to do a few things that have come up, for example, say, on Christie's, and it has been turned down due to staffing issues…'' [Participant 24030, PET-CT Technologist, Mobiles

''…If we didn't have enough staff here, then we can't really send other people to go, I would say.'' [Participant 24007, PET-CT Technic, Static]

''…We're just a small department; it might be a bit hard to go and do a few courses. Because there are only technically three of us at the moment… So maybe just have a larger variety of staff, because then you don't have to worry about the waiting times or lists...'' [Participant 24021, Graduate Radiographer PET-CT, IDC]

4.1.2.4 A lack of resources

Nearly half of the participants identified a lack of resources as an obstacle to engaging with EBP and CPD. The participants experienced difficulty in accessing up to date and pertinent literature, particularly if not enrolled in a university course. Personally funding access to literature such as journal articles was unfavourable among most participants. Additionally, some participants did not have the facilities such as access to an uninterrupted area or computers to engage with EBP and CPD or had a lack of confidence in technical skills.

''If you are not currently studying, how can you even have access to any resources? As soon as I've finished with the university, it will be really difficult for me to do any research. If I want to access any research papers, or any books or things, unless I buy them, I really can't have access.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''…I'm a society member, I get access to the society journals, I can get limited access to American Journal of Radiology and the British Journal of Radiology. But if I want to read full articles, you've got to pay for those. And I think, at that point, I'll read the abstract and then move on and look for something else… Unless there was something I was particularly interested in or something that was particularly pertinent to a project I'm involved in at the moment, then I probably would pay.'' [Participant 24003, Clinical Lead MRI, Static]

‘’I think here there's not space. Sometimes we are forced to do it in the control room and people need the computers. There's not enough computers…’’ [Participant 24006, Clinical Lead PET-CT, Static]

‘’So maybe there should be some protected time and facilities made available so that they can have a quiet and uninterrupted environment, have access to resources.’’ [Participant 24002, Senior Radiographer MRI, Static]

‘’I think IT is a massive one for me. I really struggle with IT. I am not of the generation where you learned it in school, I learned binary, who nobody knows what that is. I have asked probably for 12 years, starting this job, if I could have some sort of IT training, basic stuff, that my kids would have learned in school… We're more and more reliant on everything being done digitally, and I feel really lost… I had the Christie dementia and cancer care course that was remote. I had to borrow a laptop off one of my children, who then had to set it up for me to get Teams onto it. And the whole process was so stressful…’’ [Participant 24028, Senior Radiographer PET-CT, Mobiles]

4.1.2.5 Barriers related to modality and site

A lack of time to engage with EBP and CPD was experienced among all participants, independent of the modality and type of site. Similarly, a lack of motivation and resources was considered an obstacle across the modalities and types of sites. However, as previously reported, a lack of autonomy to implement EBPs was more commonly experienced among those in PET-CT and mobile sites. In PET-CT, protocols were considered more rigid and prescriptive due to the nature of the modality involving injection of radiopharmaceuticals into patients’ bloodstream, followed by obtaining anatomical detail provided by CT to create a comprehensive image. Similarly, the mobile team felt that they cannot deviate from the protocols provided by the host site, as they are often temporary support to reduce the hospital's waiting times. Additionally, a lack of support by management and peers was increasingly experienced among participants working at mobile sites, as they do not see their managers frequently and often work with different colleagues due to the frequent travelling associated with their role.

''I do try to keep up to date with the latest practices in PET as well, but we don't always get exposed to the most current ways of imaging when you do mobile work. As far as research goes, a lot of the static sites tend to do more of that…. Well, to be quite honest, I don't feel I, personally, get a lot of support with it… As a mobile worker, you're not really seeing your line manager face to face very often, so those conversations don't really occur now. I'm not incriminating anybody or criticising anybody. With the role, it's quite difficult, I think, because we're moving from site to site. Static sites, you've always got the same group of people. You've got cases that you could discuss, as a group, and bring up at staff meetings and things. It's not quite as easy, I don't think, when you're a mobile worker. Everyone's so distant from one another as well, so I think it makes it more challenging.'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

''…it really is just there's the protocol, push the button, run the protocol, don't deviate, and that's that.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

4.1.3 Engaging in Evidence-based Practice and Continuing Professional Development

Most participants used the terms EBP and CPD interchangeably, and considered mandatory e-learning part of CPD. Many participants reported irregular engagement with EBP and CPD, or did not document their engagement with CPD for HCPC audit purposes. Participants reporting frequent engagement with EBP and CPD were in the process of completing the company's graduate scheme or a formal qualification. Additionally, some felt a sense of obligation and considered engaging in EBP and CPD part of their role, particularly advanced practitioners. Irregular engagement was mainly reported among clinical assistants, those with reduced interest in research and EBP, and participants approaching the end of their career.

''…They give us the e-learning, so that's where we get CPD as well.'' [Participant 24013, Senior Radiographer CT, IDC]

''There's the Myrus training, the e-learning. I complete that every year and do the up-to-date ILS training every year. Wherever other training meets the requirements to be able to do my job, if I'm not asked to do it, I sometimes volunteer to do it.'' [Participant 24001, Clinical Assistant MRI, Static]

''Supposedly… (Laughter) I'll be honest. I just do the trainings every year. I'm part of the Society of Radiographers, so I get articles every now and then that I read when I get that sent to my house. It comes as an article, so I read those. I help out with training other radiographers, and sometimes you get students every now and then. My current job role states that we help them as well.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

‘’Reflecting on my own practice, which, to be honest, I don’t do… I do reflect on my own practice constantly, but I don’t document it enough. And that’s my big issue with CPD, is finding the time to actually document what CPD I’m doing. For me, formalising the CPD is a pain… just because I don’t enjoy doing it. I mean, I quite enjoy reading the journal articles and things, but then to go away and put that in a formal… But then that’s a reflection on me…But to me, it’s a barrier, because I don’t enjoy doing it. I enjoy actually getting involved in things and learning about stuff, but I don’t enjoy having to catalogue that, if you like. So whether there would be an easier way to do that, I don't know. Possibly.’’ [Participant 24003, Clinical Lead MRI, Static]

‘’Not as often as I would like. I think every three, four months maybe we have a new course or then every year you have your e-learning that you have to do.’’ [Participant 24006, Clinical Lead PET-CT, Static]

‘’So pretty much, at the moment, with being on the graduate scheme I’m engaged in CPD quite a lot, until I complete my graduate scheme, in two years’ time.’’ [Participant 24021, Graduate Radiographer PET-CT, IDC]

‘’At the moment, I’m studying, so every day.’’ [Participant 24009, Apprentice Radiographer PET-CT, Static]

‘’Daily. Mainly because of the role I’m in as a reporting radiographer. There are always instances where there is something new, different on a scan. Then you have to do a review of the current literature, past papers, other sites and knowledge bases

out there that you can use and utilise to try and formulate what your answer to the clinical question is going to be. Apart from that, there is always the obvious CPD, things that we do around what I would call the basic functions of what we do. I do read a lot, I do listen to a lot of podcasts, online lectures and I do try and undertake some kind of formal learning at least every other year.'' [Participant 24004, Reporting Radiographer MRI, Static]

''Every week, at least. It's a legal requirement to do CPD.'' [Participant 24002, Senior Radiographer MRI, Static]

''…To be honest, I'm probably not as engaged with that type of thing as I used to be a few years ago. I wouldn't like to say that they're not doing that; I'm probably saying that I don't actively seek it out, really. So there probably is a lot of information there that, maybe, I'm not accessing.'' [Participant 24022, Senior Radiographer PET-CT, Static]

Scientific literature was considered a source for EBP, which was mainly reported by those with an increased interest to improve practice, and those with higher qualification levels or positions. Some participants also read the Synergy magazine to explore new practices, which is received as part of their SoR membership. Some reported books or radiography websites to be a useful source of understanding the basics of a modality, such as MRI physics. Additionally, videos or information on the company's intranet platform was considered a source of new information including practices.

''…Journals obviously, peer review journals. New practices quite often come by our Q&R department at head office.'' [Participant 24003, Clinical Lead MRI, Static]

''…Well, sometimes it is sent to us. Other times you just have to look for it in the journal, like, journal nuclear medicine...'' [Participant 24006, Clinical Lead PET-CT, Static]

''I read a lot of books, there are sort of Bible books that we all go by for our... Kind of like, not necessarily about practice, but about physics. So whereas practice changes and adapts obviously with time and input from research projects and personalities and experiences, physics doesn't really change…. if you need to remind yourself of something, there are books that you would go to or certain websites also that you would go to.'' [Participant 24017, Senior Radiographer MRI, Static]

''Tutorial videos where other people have shown their practices as an Evidence-based Practice, but I use that to support the findings from articles.'' [Participant 24002, Senior Radiographer MRI, Static]

''… I watch a lot of videos, so there are there are a lot of YouTube videos, various doctors, various consultants, physiologists now host quite regularly on their either on their own websites or on their institution websites for that's also, also through YouTube as well, those are very good. You get to know the good radiologists to follow and the ones that will continually update.'' [Participant 240017, Senior Radiographer MRI, Static]

''If you are a member of the SOR, they send you these magazines monthly. That's it.'' [Participant 240015, Senior Radiographer CT, IDC]

''…We all are I believe the Society of Radiography members, so anything new, they will update as we all have a membership.'' [Participant 240018, Senior Radiographer PET-CT, IDC]

''That's passed down from our manager… But things like that are also available on our intranet and things like that.'' [Participant 240018, Assistant Practitioner CT, CDC]

Nearly all participants considered other professionals, such as their peers, radiologists or (line) managers a source of EBP and CPD. Advanced practitioners particularly felt that they learnt most from radiologists and their direct peers. Some participants reported that they could not rely on all their peers to discuss new practices, as this is dependent on their relationship with the peer, their peers' experience level and interest in EBP and CPD. Training new starters or students, and learning directly from scanner manufacturers during application sessions were also considered CPD. Some participants learn new practices through clinical trials undertaken at their site. Additionally, some sites screen for EBPs at surrounding hospitals, and duplicate the practice and policy into their own practice.

''I think they've (radiographers and technologists) all learned from each other. I see them all sort of talking and working together. I think they've all had probably different experience with their backgrounds, where they come from and what they've been

doing. So, I've seen them work together, talk and communicate.'' [Participant 24016, Clinical Assistant Multimodality, IDC]

''Probably, let's say, 80% from colleagues, then from the internet, and journals. If you are a member of the SOR, they send you these magazines monthly.'' [Participant 24015, Radiographer CT, IDC]

'' The managers, the radiologists, they're the ones that have used Evidence-based Practice and feed back to us what we should be doing so we're guided by what they've done…I don't think we do enough to support Evidence-based Practice. It's knowledge that's passed down by people who we know, we assume, we trust, have learned what needs to be done through Evidence-based Practice.'' [Participant 24002, Senior Radiographer MRI, Static]

''So, I suppose it mainly comes from either speaking to people who I work with, who have worked in different places to me, and tell me about what they're doing in their places, or possibly from articles that I might read, such as there's quite a lot of work going on around dementia at the moment, and how PET-CT is involved in that. But as I say… there's not the opportunity to put them into practice… Although we do learn off each other each day, there's always new things, but yeah, it depends on who you're working with, and how experienced they are as to whether you're learning from them.'' [Participant 24028, Senior Radiographer PET-CT, Mobile]

''I think we quite often share stories of things that have happened, or interesting cases and things, so yeah. It depends who you're working with. With some people,

it's easier to have those conversations with.'' [Participant 24022, Senior Radiographer PET-CT, Mobile]

''On a day-to-day basis, interacting with other healthcare professionals. There are obvious things like reading journal articles when they come out, when the new stuff gets published. Developing new policies and procedures, that's CPD. Training students. It's a really good thing, I believe, for our staff and for me, that you have people coming into the department and asking you questions. And sometimes you don't know the answer, and that's good. Because then you go away and find out what the answer is, and that doubles up the CPD for both people. Sometimes we get manufacturers in, when we get new equipment, or the likes of the new… where you've got application people coming in and teaching you new techniques and showing you new software, new pieces of kit that they use. So that's classed as CPD as well.'' [Participant 24003, Clinical Lead MRI, Static]

''…I do have conversations, peer conversations with other reporting radiographers and reporting radiologists which tends to be case specific, just asking for their feedback or their interpretation on individual cases. My work is audited and I do receive the audit results on a monthly basis. If there are any discrepancies, they are described there and I can always use those as a starting point to review, whether it's just a simple omission or whether it's a lesion has been misinterpreted. That information, although it is primarily mine because I do most of the reporting, that is always shared between the reporting radiographers, and I see their audits because I undertake all the audits. For example, if another reporting radiographer has missed something, or there is something, an interesting case where there's feedback, then

at least I will have that information as well.'' [Participant 24004, Reporting Radiographer MRI, Static]

''From colleagues? I would say maybe from the doctors, the radiologists. I wouldn't say from colleagues, no.'' [Participant 24006, Clinical Lead PET-CT, Static]

''…We've got a lot of trial patients as well. So, I would say that could be part of Evidence-based Practice because what we do at trial, they may become as a normal practice in the future.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''…We looked at vessel wall imaging, so we looked at some research papers that were out there to see what other places have done and the success and what would be the most relevant sequences to run, what was being run at a hospital nearby in neuro centre, and then putting that into practice. So we've done a few of those scans, we've not done many of those. I don't know the outcome to the patient, whether that was beneficial, but that's how we approached it.'' [Participant 24002, Senior Radiographer MRI, Static]

''New practice was kind of set up by [nearby hospital] and we've more or less adopted a slightly-modified version of their policy.'' [Participant 24003, Clinical Lead MRI, Static]

Half of the participants find formal education, e-learning, attending conferences or courses provided by the company a beneficial, and in most cases favourable sources of EBP and CPD. Particularly, most participants working in PET-CT mentioned attending courses by Christie Academy, which was considered key to engaging with CPD and a valuable source of EBP. Additionally, reflecting on one's practice, patient feedback and audit outcomes were considered approaches that may prompt EBP and CPD in practice.

''I do read a lot, I do listen to a lot of podcasts, online lectures and I do try and undertake some kind of formal learning at least every other year.'' [Participant 24004, Reporting Radiographer MRI, Static]

And the e-learning is from GE or sometimes webinars from other providers, like Siemens… sometimes they have training as well, so they are giving us a link just to register on that and then we'll do it. And PET-CT also have something like the Christie Foundation, so they are giving us the chance to learn about other modalities, as well.'' [Participant 24013, Senior Radiographer CT, IDC]

''I'm doing some online courses. Yearly, I'm attending the UKIO conferences...'' [Participant 24016, Senior Radiographer Multimodality, CDC]

So reading articles, going to conference, going to any talks that are available to me, either on line, through the Siemens' website, or it could be other interactive online venues… I try to do it as regularly as I can. So if there's an option for me to go to a talk, or if I get the opportunity to go to a conference, then I will take that opportunity… I guess with CPD, we're constantly doing online courses. We're also going to Warwick, usually, for courses in-person. Then you saw my portfolio, so *making sure that everyone's up to date with where they should be.* [Participant 24020, Senior Radiographer PET-CT, IDC]

''Well, I want to say, probably, not enough, but actually, I'm quite- not a nosey person, but throughout the day, and if there are interesting scans and things, I will note them down and look up reports and things. So I class that as CPD. I don't always document things, but I do try to keep things up to date, as far as my CPD portfolio and things. Just reflective practice is one of the main things I do, really. So if there's anything significant that happens where I feel, "Oh, God, I wish I'd done something differently," I have got a few things written up for reflective practice.'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

''We do our monthly audits, like hand hygiene and things like that. So, just, obviously, keeping on top of audits and just making sure that we're practising safely.'' [Participant 24024, Assistant Practitioner CT, CDC]

''Within the clinical settings, we tend to ask patients, we give them…Feedback forms. We give it to them, and then they just give it to our reception, or sometimes they also leave it to us. Then we have to scan it in and then it gets audited. [Participant 24027, Senior Radiographer MRI, Mobiles]

4.1.4 Promoting Evidence-based Practice and Continuing Professional Development

As previously mentioned, formal training, attending courses or conferences was considered key to promoting EBP and CPD. Creating forums, journal clubs or a dedicated training department was felt a beneficial approach to promoting EBP and

CPD. For example, this could be to review and discuss images for pathology and technique, particularly with radiologists or advanced practitioners who were considered the decision makers and knowledge holders with regards to clinical practice.

''Well, we could basically do a conference once a month in different sites to try to explain what's happening, try to show the researchers and things like that, to try to basically force people to know and to be a part, updated, and the knowledge about the field and things like that, probably.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''Get a group of people together who have got the experience and knowledge, and then they can teach the others. I think also training is a massive area that we're failing in, at the moment because training is not consistent at all. There doesn't seem to be anybody with PET-CT who is in charge of training, and it depends who people work with, what they learn. Some people, you're going to learn a lot more from than other people. And you'll learn the right way, not the wrong way, or right ways, not wrong ways…'' [Participant 24028, Senior Radiographer, Mobiles]

''I think there should be a training department, a training team, that specialise in delivering training. That would be… Having it as more of a centralised thing would ensure fairness.'' [Participant 24002, Senior Radiographer, Static]

''You don't have a forum either. There's never a forum to discuss things like this. We don't have a meeting. We used to have a meeting once a year which albeit seems a

bit ridiculous once a year, but at least it was a forum where everybody was in a room together, and if people did have ideas, they could discuss them, and you were given face-to-face information from all different kinds of people. But now, we don't have that. So, yeah, it would just be sending an email. I think it would be really useful to have more working groups within Alliance, where people get together and discuss, "Right, we're doing this, this way, is this the best way we're doing it? Is there another way we can come up with to make things better?" We have none of that. And I think it's a real shame because we have a lot of knowledge between us who are on the frontline to be going in and saying, "Right, we think we can do this, and let's trial it and see if it works." [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''Things like journal groups are really good… I've seen other people in other sites work with those really good, so they'll be looking at latest published data about whatever might be the hot topic at the time, or something that would perhaps to learn something new then those things would be really relevant. And like at the moment I'm training to do cardiac. So if we had a cardiac journal group, that would be brilliant. And if we had, you know, the chance, the time to sit down for a few hours or once month with the cardiac lead and would go through, you know, the most recently published cardiac MRI evidence and chat about it. And we could look at our protocols and see whether our protocols or see what everybody else's is.'' [Participant 24017, Senior Radiographer MRI, Static]

''So I'm thinking every centre needs, at minimum monthly, one group chatting, so needs some topic discussion about some topics…'' [Participant 24026, Senior Radiographer Multimodality, CDC]

''Maybe more involvement from kind of the radiologists, you know, not just working from the level of radiographers but people with more knowledge and who are more used to working with Evidence-based Practice because they actually have to constantly improve and change the way they work. As the guidance changes, they have to keep up with it. Sorry. The people who are making the changes, making the decisions for us to follow, they get more involved in our learning.'' [Participant 24002, Senior Radiographer MRI, Static]

''So maybe I would always like so… a review of our images. So someone will sit with you and do random reviews of the images and what we're trying to achieve and, and go through that so you can learn by what you have already produced…we've got go see radiologists, uhm, we could speak to reporting radiographers.'' [Participant 24010, Senior Radiographer MRI, Static]

Some participants suggested that the training programme and promoting education was previously better at AML, which is believed to have changed due to a shift in the company's priority of increasing patient throughput, the increased size of the company and to reduce cost. To promote EBP and CPD, participants suggested increasing awareness and improving communication among staff, and improve collaboration with the host sites, SoR and universities.

''…Historically, they [AML] were very good at promoting education…I feel like they aren't as encouraging as they have been in the past… Because we had a full training department when I joined Alliance, and that has gradually been whittled down. We

used to run our own courses all the time. And we had a clear pathway. When radiographers started with the company, where you would do an introductory MRI course, which everybody did. And once you'd completed that, you'd have the option straightaway to enrol onto the basic MRI and then follow onto the intermediate. And that would lead to a post-grad certificate. And that's something that everybody was encouraged to do…I just don't think the opportunities are pushed as much as they used to be within the company. And that may be financial could also be the fact that, when I joined Alliance, we were a small company of 50, 60 employees, 70 employees, and now we're hundreds, with lots of sites all over the place. So it has become a much bigger company, it's much more difficult to manage.'' [Participant 24003, Clinical Lead MRI, Static]

''But I think if there was a bit of structure to it, if they were running workshops or whatever- Because once upon a time, you used to be able to go to a meeting. There used to be nuclear medicine meetings, and they were worth so many credits. I've not really seen those. I don't even think those meetings still exist now. They were really accessible, and a lot of people attended as well. But I feel, now, that there's so much focus on getting maximum capacity out of scanning days and things that I think a lot of staff are, quite frankly, a bit tired, and haven't always got time…'' [Participant 24022, Senior Radiographer, Mobiles]

''By creating more awareness. You know, getting radiographers involved and teaching them what Evidence-based Practice actually is.'' [Participant 24025, Radiographer CT, CDC]

''Maybe if they were to give us a bit more information on what the Society of Radiographers have. Or maybe if they would engage with them, as well. I know we do it, but sometimes you miss things, when you get that many emails. Where, if it's sent to the company as a whole, then it could maybe give all departments a good chance to go on the courses that they do. Because they sometimes do very different ones and unique ones to what are just provided as a standard, don't they?'' [Participant 24021, Radiographer PET-CT, CDC]

''I think better collaboration with the trust or other doctors sometimes. Because, here in IDC, you cannot meet your full potential, especially when it's taught by the, for example, university school. So, they have a lot of new things there.'' [Participant 24013, Senior Radiographer CT, IDC]

''I think, maybe, advertising any talks that are going on around the area, or even further afield, just so people are more aware of it. So you could have a newsletter that identifies where and when. Maybe in-house, we could do more things. So we could have evenings where people volunteer to do talks about different modalities.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

Fostering a culture of EBP and CPD was felt an important factor to improving EBP and CPD in clinical practice. Strong leadership is believed to be an essential component to promoting and fostering a culture of EBP and CPD. This would include, for example, leading by example and making resources available for staff. Particularly, some participants expected encouragement and guidance from management. Majority of the participants highlighted the importance of protected time to allow engagement with EBP and CPD. Additionally, resources such as access to literature and easily accessible information were considered key to improving EBP and CPD among staff.

''If I go of probably past experience where I used to work as a training provider, that was very evidence-based, I don't know how the company here holds the files of training with staff and development. I don't know if they've got dates that pop up, I don't know if they've got anything like that, but I haven't seen any files. But normally if I had staff that were due training or anything, I would have a file, I would have a diary system and obviously with all the evidence that they've got. I mean, I've got my file, because I've just finished my care certificate, which I'm just about to send off. So, I've got all that with my file and everything else, so I don't know if that's held in the company or not.'' [Participant 24016, Clinical Assistant Multimodality, IDC]

''…It certainly needs buy in from the clinical team. I think anything that's been successful in Alliance Medical and within the NHS has always had a figurehead, a senior person who has driven change. We've got to be able to manage that change process and take people along with us. I think it needs very careful planning. It has to be available. It has to be available to everyone. It has to be available in a format that is easily accessed for staff, especially if they are clinical, whether that's via a mobile phone or a PC within the department. I think we need to be able to demonstrate to staff the benefits of Evidence-based Practice. Without showing them the benefits, I think it would be a struggle to get anything better than spoon feeding people.'' [Participant 24004, Reporting Radiographer MRI, Static]

''Very strong leadership, by people… By seeing people using Evidence-based Practice, where they're getting their resources from, sharing their resources. That does sometimes happen where somebody will pass something on but it should be more of an ethos within the company where people are more encouraged to do that because they're seeing everybody else do that, rather than something unusual or something that somebody does behind the scenes.'' [Participant 24002, Senior Radiographer MRI, Static]

''Promote any conferences that are happening, or talks in the area, or talks out of the area, I think that would help a lot. Or even if we shared it between ourselves. If I read an article that I feel is quite interesting, then send it on to my colleagues. But, honestly, I don't do that. On LinkedIn, I often find that there are some useful things as well.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

''Maybe to encourage them, have suggested topics where they could go and learn.'' [Participant 24002, Senior Radiographer MRI, Static]

''I just think if they… rather than us have to try and research if they could maybe have a list of things that they thought would be beneficial not only to us but to the company. But any kind of moving forwards so in the future if they could maybe have a list of, like, you know, the upcoming things. And if there was a computer, if when you maybe started, you know, having a car, having your own laptop. And even if it was just to access information related to that, you couldn't use it for anything else I think would be really beneficial.'' [Participant 24030, PET-CT Technologist, Mobiles]

‘’… I think just guidance, really, and pointing you towards particular – I don’t know – websites or whatever. Something that you could complete afterwards, like feedback and things. Something that you could actually physically have hold of – do you know what I mean? – and that’s your evidence. I think, sometimes, just recording it is a challenge as well, and finding the right way to document things. So being able to do all that in one place, like, ‘This is where you go. Look at this. What were your thoughts?’ and that would contribute to something, if that makes sense.’’ [Participant 24022, Senior PET-CT Technologist, Mobiles]

‘’But for me, the two things probably would be some protected study time, to say, “Right, you're going to have two hours this week where you're at work, you can sit in the room and do some CPD.” Because then I’d be more inclined to think, “Right, I should really be doing some CPD.”’’ [Participant 24003, Clinical Lead MRI, Static]

‘’… It’s like they don’t really give you any time to do any of that stuff, so maybe getting some time to sit down. We can always show them when we have our PDRs and stuff, this is what you’ve been doing with your time.’’ [Participant 24023, Senior Radiographer Multimodality, Mobiles]

‘’Access to current literature would be really good. It's very difficult to get the latest published papers initially without paying for them. They're all behind the firewall unless you go, you know, illegally under the radar, but those those options are getting fewer and fewer... Why doesn't the company just have a company wide subscription? Just like… my husband is a university lecturer, so I can get some published information through his access. But you know that's fortuitous, but that

shouldn't be how it should be…'' [Participant 24017, Senior Radiographer MRI, Static]

Half of the participants felt there should be increased enforcement to engage with EBP and CPD through policies, the employers or the HCPC. For example, participants suggested compulsory CPD attendance or reviewing and monitoring of EBP and CPD at a department level. Of those participants, some believe that not only the registered professional should be held responsible, but also the employers as they could incentivise, or offer employees dedicated time and resources to engage with EBP and professional development activities. On the contrary, some participants felt that increased enforcement could suppress voluntary adherence and lead to a long-term negative relationship with EBP and CPD and should therefore be kept optional and a personal choice as a professional.

''I think in my opinion, it's better to enforce it. Because if nobody's enforcing it, people will be lazy. To do these things, I think it's better to have a tracker and some goals should be set.'' [Participant 24015, Radiographer CT, IDC]

''Well, you could do, but I think staff need to have that protected time to do it as well. That would be the argument, that, "You expect us to do this in our own time. How can you enforce it?" So that would be quite tricky. I think giving people the time and the material, as well, is important, because sometimes it's hard to think, "I've got-" Or if you have got a bit of spare time, like, say, the scanner breaks down or whatever, you'd be like, "Oh, well, you've got some time to do some CPD," and you're like, "I'm

not quite sure what I can do my CPD on."'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

''I think to be honest, it should be more pressurised on the employers rather than employees. Because I think they are the people who have got the power. Because even with the training that we have to do, they don't even give us time to do it. Like in the NHS, people get time to do their yearly compulsory training, but for us, you have to do it in your own time at home, which I think this is really unfair. Then you don't get paid you have to do that. Because it's part of your job and it's improving your job.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''… Where I worked before in Belgium… each tech had their own- not a passport, but like with credits. So you had to continue outside of work. You had to go to conferences and that…. So you had to keep going on that as an individual…I think that would be a good choice, a good thing if everybody had their own, like, profile or whatever with credits and you should be keeping- imagine, like, 10 credits a year or whatever. If you don't follow- if you don't go to conferences, if you don't show- like, do posters, you lose credit. So, therefore, not that you would lose your registration, but maybe something, an incentive should be done…'' [Participant 24006, Clinical Lead PET-CT, Static]

''I don't know if they can enforce it because it's on your own back to do it yourself really. It's part of your registration, you've got to keep on top of it yourself, haven't you? It's one of the core values and one of the principles of why you get your registration.'' [Participant 24021, Graduate Radiographer PET-CT, IDC]

''As professional people, we have a responsibility with our professional registration to undertake CPD because patients should expect the person who is undertaking their scan, reporting their scan, involved in their clinical management should know what is the best thing to do at any given time… We can't necessarily, I believe, enforce people to do it because if you start enforcing specific people to do it who are hesitant, reluctant, then all of the positive things become negative things… I've always found that if you start and you have the right group of people who start the project and can communicate what the project is about, and then can take people along. Then people who are more peripheral, and who are always going to be peripheral can look in and go, "That's pretty good. I wouldn't mind a bit of that." [Participant 24004, Reporting Radiographer MRI, Static]

''I think if your part of a professional body, it's almost enforced, anyway, so you should be doing it. In-house, I think that's tricky, because people have different preferences in terms of- You shouldn't be enforced to do a presentation, for example, because that might be detrimental to the person. So I think, yes, encourage it, but enforce it, maybe not. I don't know how I feel about that… Because you can't enforce someone to do a presentation, but you could enforce them to engage in a different way. So give them options.'' [Participant 24020, Reporting Radiographer PET-CT, IDC]

4.1.5 Learning and knowledge sharing in practice

During the observations, differences were identified between the clinical roles across the sites and imaging modalities, and a hierarchical structure within the teams was noticeable. Clinical assistants and assistant practitioners were in a supportive role, ensuring patients were prepared, screened for safety and all the necessary documentation prior and after the scan was completed. Radiographers and technologists commonly had additional responsibilities, such as ensuring fire or radiation safety. Although both, radiographers and technologists had additional responsibilities, technologists felt less pressure to engage in CPD as they are not HCPC registered. Clinical staff often relied on their seniors to make decisions or share their knowledge. These observations align with the responses of participants, in which over half of the participants mentioned that knowledge is shared by dedicated individuals only. These individuals do not have an official role or responsibility to share knowledge, but participants had a general expectation due to their role as a manager, clinical lead or their overall wealth of knowledge and interest in learning and development.

''I think within the departments themselves, there are the people that are there to train people. Obviously, it's not their job title, but they're very experienced, and they're the ones that train people. So when people are surplus, they're the people that they're put with, and then other than that, it would just be management.''
[Participant 24019, CA Multimodality, IDC]

''… In the department, I think we have two or three people who are keen to share knowledge and encourage other people to look at the information that's out there… Maybe in one instance, I would say the department kind of expects it of them and possibly it's more appropriate to the current role of that person, because they're in a position to be able to help out with that kind of thing. I mean, I think a couple of the

other people who are quite good at it, it's not expected of them, but they do it because that's just the kind of people they are.'' [Participant 24003, Clinical Lead MRI, Static]

''…One of my colleagues is the radiation protection supervisor (RPS), actually two of them are RPSs, so they basically helped us with the knowledge in regard to the radiation protection safety in case of contaminations, spills and things like that.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''I guess the managers would share their knowledge. I think we just do that on a day-to-day basis.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

Although the company covered the cost of courses or further education such as assistant practitioner or radiography degrees, participants observed mentioned that they had to be ''proactive'' and ''chase'' their own learning. Particularly, those engaging in a course, training or further education on the mobiles often experienced less support in their learning, as staff often rotate resulting in a lack of repetitiveness in learning radiography techniques from their mentor or other senior colleagues. Notwithstanding that the mobile team travels frequently to support other healthcare organisations, participants explained that they do not interact or learn from healthcare professionals including radiographers employed by the host site. Those based at an IDC or CDC have frequent interactions with their colleagues from other imaging modalities and supported each other during situations such as emergencies, but not necessarily shared knowledge unless they were training in the modality. Similarly, albeit those based at a static site interact with professionals employed by the host site more frequently, they rarely share knowledge on their modality or speciality.

''No, from PET-CT and from CT, they are coming into MRI to learn how to do MRI, and we are training them also.'' [Participant 24011, Senior Radiographer MRI, IDC]

''Yeah, we don't have any interaction with the trust or the radiologists. So, we're not led by them at all. I used to be in the NHS. I would say my practice in the NHS was a lot more evidence-based than it is with Alliance. It's more policy-led.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''Not really. Because for me, as a CA, they don't really need to speak- just for reception maybe, but they don't really get involved in what we do. So, I don't really pick up anything from them.'' [Participant 24029, Clinical Assistant PET-CT, Mobiles]

''When we move from one place to another. Yes, we do, because… We do when you move from one modality to another, but we don't, sort of, yes… Unless, I think if you want to personally, if you want to personally know more, then you would go…'' [Participant 24012, Senior Radiographer CT, IDC]

''Because we do cross modality, yes. But if you didn't, then no, because you'd be in the tea room, and people don't want to talk work in the tea room. Do you know what I mean? But if I go to CT, I'm learning from the other CT radiographers, or maybe someone who's come from MR and doing CT.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

''We work as a team if there are any incidents that happen, when it comes to the patient, because they've come from a hospital setting and they're able to offer a lot more… Like, last week, we had a crash. A patient fainted whilst I was scanning them. I pressed the buzzer and the crash team, the nurses, came. I was just observing because I've never been in a situation like that, so I learnt… I understood that I can learn from a nurse, so yeah… When it comes to patients… For example, the patient pathway or if there's… Like that incident that occurred… One of the head nurses will come and she'll do a debrief, she'll make sure everyone is okay and what the next steps are for that patient. So we're all involved in the patient's care, rather than just radiographers.'' [Participant 24025, Radiographer CT, CDC]

''…I do, because I have connections to people who work in CT, so I do learn like, for example, if someone's coming to us and then we're going to CT, it's interesting to know what CT are doing.'' [Participant 24010, Senior Radiographer MRI, Static]

''Only if I go and ask. So, if I have a specific question about CT, I will go in speak to the guys in CT around there. If I have a specific question about MRI safety in a neuro centre, or a new type of programmable shunt and things like that, I will ask the specific question. But there is not…Even in this region where Trusts are pretty close together and the overall group of clinical staff providing the service, there is some movement between them and people tend to know each other, there still isn't that generic or underlying current of sharing of knowledge.'' [Participant 24004, Reporting Radiographer MRI, Static]

4.2 Future of radiography

This section covers the following categories: i) AI and technology; ii) role change and advanced practice in radiography; and iii) learning and knowledge dissemination.

4.2.1 Artificial intelligence and technology

Nearly all participants mentioned the influence and importance of AI and technology in radiography. Participants who have been practicing the radiography profession for an extended period highlighted the significant advancement in technology over the years, automating some core tasks of a radiographer including positioning and planning, manual development of images, manual exposure settings and image quality checks. Participants believed that although AI will become more prominent changing the role of a radiographer further, communication and the patient interaction side of the role is required for a patient-focused care and could therefore not be replaced by AI.

''Probably same thing, different machine, faster, more efficient, more patients and probably, I'd say less mistakes hopefully, and less radiation for the radiographers.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''I'm back from the day when I was a veterinary nurse and we used to dip the films in ink and all the different things. I don't know, I just think it's gone all about numbers and throughput. And I think unfortunately a lot of patient person to person has gone and I just think it's probably going to end up going more that way, yeah.'' [Participant 24030, PET-CT Technologist, Mobiles]

''I think, the way it's going, it's definitely going to change. There's going to be a lot of AI involvement in radiography itself. The job is going to become a lot easier from the scanning side. Patient interaction, patient involvement, I can't see AI, or anything, involvement in that so that'll always be there. The actual scanning perspective, that'll change.'' [Participant 24025, Radiographer CT, CDC]

''I imagine very much it will get taken by AI, and a lot of it will just all be done by AI. But then you've got to think of the patient care side of it and things like that. So, I think we'll still be around, floating around, but I think very much it will all be AI, to be fair.'' [Participant 24024, Assistant Practitioner CT, CDC]

''…Currently, things are moving so quickly. I mean, you look at the difference between our new scanner and the scanner here, and people come and grumble that they have to- Because they do three days in [department] and they do everything for them, the scanner, don't have position heads or- It's putting everything in place, putting in the right protocols and things. Then they come here and they feel they have to do it.'' [Participant 24003, Clinical Lead MRI, Static]

''…For example, on how we position the patient now. Because before, we were the ones who used to position them, but now you have this camera doing the positioning for you.'' [Participant 24014, Senior Radiographer CT, IDC]

4.2.2 Role change and advanced practice in radiography

Some participants considered AI an immediate threat to completely replace radiographers, whilst others believe it is likely to change the nature of the profession significantly, meaning radiographers may need to adapt and develop new skills to work alongside AI technology, potentially impacting their current roles and responsibilities. For example, participants highlighted the increased possibility of remote working, an increase in advanced practice and a shift in knowledge required including pathology recognition and clinical knowledge. Some participants felt that this may result in a great shift in roles within radiology, where care assistants and assistant practitioners act as operators, which was previously mainly associated with a radiographer's role; and radiographers in supervisory roles or undertaking radiologists' tasks. Additionally, some participants viewed AI as a potential tool for enhancement and improved patient outcomes due to its accuracy and speed and considered it an inevitable integration within the highly technological profession.

''I think at some point we'll cease to exist. There'll be AI all over. I think with PET, we still need people to inject. I think withdrawing, that's already mechanical, so that's already a machine. I think scanning can be a machine already. We don't really need to be there… But you still need somebody to inject. So at some point, I think we'll all be replaced by machines, unfortunately.'' [Participant 24006, Clinical Lead PET-CT, Static]

''Because one of the things about radiography is it has always been a bit of a mix between technology and a caring profession. Something like physio, they're never going to be replaced by AI because it requires a hands-on physical interaction, a lot of the time. And I think parts of their role will be taken over by computer-generated things… Whereas with radiography, our imaging part of our job could almost, in five years, be done by remote, somebody sitting in a control centre with 10 screens in front of them, just setting things away.'' [Participant 24003, Clinical Lead MRI, Static]

''I think we have to accept that AI is going to take on a massive role in this. The involvement of the radiographers will become less, so it's even more important that we continue our learning so that we don't become deskilled. So that when we do come across the need, where the AI can't perform for whatever reason, the radiographers still have that knowledge to intervene, check what the AI is coming up with, and deal with the situation.'' [Participant 24002, Senior Radiographer MRI, Static]

''It has changed in the very long time I have been a radiographer. It has changed immeasurably. It is so technology driven and with AI coming on board in certain aspects, the role of AI is only going to increase… When I started MRI, you had to know a lot more technical information. Whereas now, I think my preference would be that the radiography force in the future has more clinical knowledge, disease processes, where MRI sits as far as clinical management is concerned, be able to have more of a consultant type role with patient groups… A lot of the technical things will be taken care of, but advancing into that more clinical role where we can assist in the clinical management of patients and answer those questions… Whether we get into a situation where, in real time, there is a lot more hot reporting, so a report is available for a patient, so a patient does find out, "Have I got a brain tumour today?" "No. You haven't got a brain tumour today." Although then you have to close the loop off with a clinician, at least that patient can skip out of the hospital feeling better about themselves, and happier, and if you've got happy patients, they live longer. '' [Participant 24004, Reporting Radiographer MRI, Static]

''I think the radiography profession is completely changing. Like, many years ago, I think radiographers were quite limited of what they were doing. Probably they were just operators more than anything else. But nowadays, they are reporting, and I have heard – I don't know how true it is, but it must be true because I heard it from university – that in a few years' time, all radiographers must be able to report on their scans as well. Which is, I think, our role is quite changing, so we are now involving in a lot of things that other radiographers weren't involved.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''I would be more worried if I was radiologist than as a radiographer. Because I think the images are still going to need to be produced, and to produce images, you'll still need to get the patient into the imaging department and out of the imaging department. So that requires a person, whether that's just an AP or a clinical assistant to do that, and the computer does the rest. But with AI, certainly a lot of the reporting stuff is just going to get done automatically by computers. So I think, in 10 years' time, our profession will be unrecognisable from what it is now. But I think it's important that something proactive happens now, with the society and the profession, to develop the profession into different areas that will still be required.'' [Participant 24003, Clinical Lead MRI, Static]

''Yeah, but all the lines are being blurred, aren't they? You have, you know, physician assistants or whatever we're calling them this week. They've changed a few times, you know, nurse practitioners, prescribing nurse practitioners, prescribing midwives. You know, all those lines are being blurred. At the end of the day, what's a

doctor? I it just ''have you got a medicine degree or not?'' [Participant 24017, Senior Radiographer MRI, Static]

''I think it's going to have input from AI. I think that there might be more reporting radiographers as well, because of the lack of radiologists. Us being able to upscale is always beneficial, I think…'' [Participant 24020, Senior Radiographer PET-CT, IDC]

''I don't know because equipment is advancing so much. I think we're always going to have a role to play. Sometimes the skill is taken out of the job over the years with the advancement of all the technology, that's the only downside to it. It's better for the patients in the long run.'' [Participant 24023, Senior Radiographer Multimodality, Mobile]

4.2.3 Learning and knowledge dissemination

Participants proposed several solutions to improve learning and knowledge dissemination in the future including an increase in access to resources such as time and information, support, encouragement and empowerment. Participants highlighted the importance of creating (support) networks and interconnectedness within the company and across the discipline through, for example, online platforms allowing for near-instantaneous sharing of information, potentially leading to a more collaborative and knowledge-driven radiography workforce.

''Through consistency, regular reliable resources that you can depend on. It's not haphazard, it's not hit and miss. You know when you're going to get it, if you're going to get it, so it's fairer for everybody to have access. It shouldn't be that some people

can have access and others can't, so accessibility needs to be good.'' [Participant 24002, Senior Radiographer MRI, Static]

''Maybe if there was, like, just one online platform where everything could be done all the same way, because… and at least everything's being kept up to date.'' [Participant 24007, PET-CT Technologist, Static]

''Regular meetings, team working exercises, attending conferences, your employer support, basically, to do all of these. Because at the moment, I don't think that our employer is supporting any of these. Probably these are the most important ones. Allowing time as well, and expenses, of course, and being paid extra because if you have to do all of those using your own time, I don't think many people will be interested as well.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''There has to be a learning culture. There is not a learning culture, I would say, in Alliance Medical. There is a learning culture in a lot of individuals in Alliance Medical, and as a company, we're very keen to say, "Look. We've got a research department, and we're doing research in this, we're doing that." So, it's not that it's something that I think Alliance is against or neglects, for want of a better word. I just think we can be just so much better at communicating it, driving it through, and demonstrating to the individuals who come in at the bottom the benefits.'' [Participant 24004, Reporting Radiographer MRI, Static]

'*'They need, I guess, a few champions to make that happen and then they would be the kind of the people that you would speak to, follow, discuss things with. Yeah,* *maybe a handful of people that are doing that and infiltrating it down. Then listen to what the staff got to say. You know their experiences and communicate back to us.''* [Participant 24017, Senior Radiographer MRI, Static]

''… Maybe just a bit more promotion of it – I don't know – so people actually know about it. But it's difficult, isn't it? Because, sometimes, you can give people so much information, and they still don't respond to it. I think the individual people need to put themselves forward, as well. As well as the organisation putting that information out there, it needs to work both ways, I think. People need to be engaged in it to benefit.'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

''It would be better for the modalities to be able to talk to each other, and it would be better for the sites to be able to talk to each other as well, because I feel like there's going to be people with such a different experience in them, but we don't get any contact with them…. because sometimes we need opinions from other radiographers of what to do and we can't talk to the trust because they have a totally different policy to what we have. So it would be good to talk to another site if there wasn't anyone available…'' [Participant 24019, Clinical Assistant Multimodality, IDC]

''Maybe more open forums. You get things like that on Facebook, but we don't actually have anything in Alliance, not that I'm aware of, where you can log on and we can ask open questions, "Well, how would you do this? I've got a patient with X, Y and Z. What would you do?" and getting this sort of artefact, "What would you do to reduce that?" [Participant 24001, Clinical Assistant Static, MRI]

‘’I think there should be like a community that would send out any updates. It would just be like if you went on the internet, you googled something, it would be great to have right this is for PET-CT and this is all the new stuff that is coming in and all the things they’ve found out and new drugs and what’s happening where in the world. I think it would be great to be able to have some kind of point of contact to do that.’’ [Participant 24030, PET-CT Technologist, Mobiles]

‘’…Meet-ups if possible. Get together, have a community, support group or something.’’ [Participant 24015, Radiographer CT, IDC]

‘’I would say if you’ve got staff meetings every now and then if everybody is together, then you can have staff meetings where you can all meet up for a moment, a cup of tea while you talk about information that you need to converse to train staff, new things that need to be implemented, new changes that are coming, warn people like that.’’ [Participant 24027, Radiographer MRI, Mobiles]

‘’More communication. And I know they do have their meetings with all the staff, which is good, but then I think they need to try and potentially have a clinical assistant meeting and a radiographer meeting. Because there are some things that we don’t understand that we don’t need to know and the same with the radiographers. It’s good that you still have that full team meeting, but I still think that they need to have the separate meetings, because there is a lot going on and there is a lot of confusion in certain places on both ends. So, I would say separate meetings that way.’’ [Participant 24016, Clinical Assistant Multimodality, IDC]

"It's accelerating really quickly, the change. I don't know where we're going to be in five years' time… I think the community thing is going to be really important still. Because I think keeping that knowledge circulating within a team and within a broader community is really important. Maybe networks might be something that is developed in the future. So that you have got access with stuff like Teams, where you can literally do a global training event, at any time of the day or night. And people from Australia and India and America, radiographers can all come together and compare practices and things like that. I think the network thing is probably going to get bigger." [Participant 24003, Clinical Lead MRI, Static]

4.3 Communities of Practice in radiography

This section covers the following categories: i) awareness and prevalence of CoPs; ii) attitude toward cultivating a CoPs; iii) benefits of CoPs; and iv) NoP and LoP.

4.3.1 Awareness and prevalence of Communities of Practice

During the observations, the clinical team was primarily concerned with efficiency, correct patient preparation, image acquisition techniques, streamlined image post-processing, and utilising technology such as PACS and Radiology Information System(s) (RIS) to manage patient and image data effectively, while adhering to safety and imaging protocols and quality standards. The communication among the clinical staff related to upcoming imaging procedures, workflow, addressing any (safety) concerns the patient may have, relaying any relevant patient's medical history and communicating with other medical professionals such as radiologists or referrers regarding specific (complex) patients. Patient positioning, imaging techniques or experiences were often only shared with trainee staff or students, or during an unusual or complex cases to ensure optimal image quality. Those interviewed were unaware of the term and meaning of ‘Communities of Practice’. When described to participants, nearly half believe that a CoP emerges organically as individuals share their knowledge and learn from each other daily in practice. Albeit some participants mentioned attempting to create groups, attending conferences, team meetings or joining online radiography groups, most do not participate in a CoP, and rarely share or discuss any radiography related information outside of their workplace.

‘’I think it depends whether it’s formal or informal, the Community of Practice thing. Because I think it goes on informally all the time, I think we do share knowledge.’’ [Participant 24003, Clinical Lead MRI, Static]

‘’I think it just happens naturally… Yeah, I think it does. I think it’s like I ask loads of questions, just so I can find out these things. But again, I’ll ask a radiographer why they’re doing that or why they’re doing this and then they’ll explain it to me. And the same with the CT, it just happens naturally. Like today, when I hadn’t put the tape on that lady for the lump, I hadn’t done it, so I asked [colleagues name] if she would come in and do that and then I watched, so now I know.’’ [Participant 24016, Clinical Assistant Multimodality, IDC]

‘’…We tried to set up a regional safety group, which was MRI leads from all other departments – Newcastle, Middlesbrough – but we only had two meetings, and then that seems to have just drifted off… Because a lot of the suggestions that we tried to put in place were shot down by the chair of the group. He was a physics guy, who

said, "Unfortunately we can't do that because of this." So it was a very frustrating thing.'' [Participant 24003, Clinical Lead MRI, Static]

''Yeah, before, or from my past experiences… we'll go for the conferences, and learn some new- Means mainly for some cardiac imaging, how we'll get a good image...'' [Participant 24011, Senior Radiographer MRI, IDC]

''It was quite a few years ago now. There was a Northwest Nuclear Medicine Group, or something like that. I'm not sure whether Christie's were involved, or it was more- I honestly can't remember now, because it was when I was quite junior, but I knew I used to attend. They had quite a lot of speakers. But nuclear medicine is, well, not dying off, should I say, but it is quite a small community. It's still got its place, but I think it's not quite as big as it was.'' [Participant 24022, Senior Radiographer PET-CT, Mobiles]

''I've always wanted to attend MDTs. As far as I'm aware, there's nothing available locally within the Trust for the areas that I have a specific interest in. So, neuroimaging. I do meet stroke physicians on corridors and have chats on corridors. I do send them emails about certain specific cases to get feedback from them. But yeah…'' [Participant 24004, Reporting Radiographer MRI, Static]

''…She's actually having meetings with the clinical assistants. Because we don't often see each other because of the way our shifts are. Normally, only one CA. So, she's actually started having meetings with us so that we can meet as a CA group,

and discuss things that are going on, and how we can improve things, or any issues.'' [Participant 24029, Clinical Assistant PET-CT, Mobiles]

''Pretty much just a monthly meeting, but I've never been on the rota to actually be in one as of yet. I had one in January, but… And then the days off that they have been, I've had other things planned, so I've not been able to come. So I just catch up on the email.'' [Participant 24021, Graduate Radiographer PET-CT, IDC]

''I don't attend any groups… Only if I go on a particular course. We don't have any relationship where I'm in contact with anybody from anywhere else and sharing ideas. My level, I'm working in isolation, almost, from them. Whether those conversations are happening at a higher level and then that's passed onto us is a different issue but, as a radiographer on the frontline, we just work alone.'' [Participant 24002, Senior Radiographer MRI, Static]

''No, because the only people I know that do radiography work here for this company.'' [Participant 24025, Radiographer CT, CDC]

4.3.2 Attitude toward cultivating Communities of Practice

Most participants had a positive attitude towards fostering a CoP, with the view to share knowledge, ideas and EBPs with other radiographers either virtually (i.e., video conferencing technology, an online monitored platform) or in-person attending meetings, gatherings or conferences. Some participants felt that a CoP needs to be made attractive as it may become sessions in which individuals express their dissatisfaction about their workplace. Additionally, participants felt that the CoP should be sustainable, manageable and practicable to ensure it is easily combined with individuals' home life and working patterns.

''Probably to me, it will give me the impression of probably a gathering of people who are doing the same jobs, and then they are sharing their ideas. Say, for example, I might have some experience of doing cardiac scans, somebody might have as well, and then we share our ideas together.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''I'm thinking, instead of working in isolation, you're seeing what goes on in other places. So for me, personally, I've recently taken an interest in cardiac. I've been to a conference in Glasgow where you get to meet people from all over the country working in research, working in hospitals, working in the private sector, all doing different things. When we work together, just in our hospital, we only see what each other are doing, which is more or less the same. It's quite an eye-opener to see what else is actually going on out there in the world. You know, research.'' [Participant 24002, Senior Radiographer MRI, Static]

''I encourage diversity. I think you need to have… I understand there are people that are still learning, there are people that are teaching, and there are people that are improving it. But I feel like if we needed to get those Communities of Practice in order, if we have maybe two people… So, one person maybe attending two different Communities of Practice. One maybe with the group of the people that maybe are in the same, sort of, level of learning or education as them, and then join the one that are more experienced. Then that information can be exchanged and improved

through them, through that situation.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''I think sometimes, when you engage in conversation with other radiographers, you've got a common ground. And it can highlight things they've gone through and you've gone through, that could maybe help you in the future. So I don't think it's a bad thing.'' [Participant 24021, Graduate Radiographer PET-CT, IDC]

''Well I just think it would be not currently going into a whinging situation. I think if it was promoted very positively, kind of, like, a no blame thing or just learning from your human errors or what people find. Because a lot of us sometimes feel this isn't the right way to do a scan, it could be done far easier this way. If we could talk about things and not get shut down just because management want it because a lot of the management haven't actually worked, that's not their background. Just informally but time where if you couldn't attend, obviously not everybody can, and they could change the regions, if you could kind of rotate and then disseminate the information, cascade it down.'' [Participant 24030, PET-CT Technologist, Mobiles]

''It would have to be made quite attractive, I think. To be honest, I'm really not sure, because it's not something that I've ever experienced, really. I'd be intrigued how it would work. I'm just not sure how it would fit in with working as well.'' [Participant 24022, Senior Radiographer, Mobiles]

''Honestly? I think it would probably become a moaning session… I think a lot of people do tend to sort of moan in the background, but then don't say anything in the

front end, you know, if that makes sense.'' [Participant 24016, Clinical Assistant Multimodality, IDC]

''So, this big bit, which would probably be of most benefit to the company – and when I say the company, I mean the staff within the company – this is the bit that's got to be accessible. This is the bit that's got to be easy for people. So, they've got to have time, they've got to have some kind of structure to it, and easily accessible, and the ability to contribute in an open way. I feel it would need to be… Policing is probably a strong word, but it would need to be policed as far as content, interaction, those aspects are concerned.'' [Participant 24004, Reporting Radiographer MRI, Static]

Participants recognised the benefit of both, virtual and in-person CoPs. According to the participants, virtual CoPs would provide greater accessibility and flexibility by eliminating travel needs and allowing for a wider range of participants from different locations, while in-person CoPs would offer better opportunities for deeper relationship building, improved non-verbal communication through body language, and stronger engagement due to fewer distractions. Most participants suggested either three- or six-monthly CoPs, depending on the needs of the group and whether it is virtual or in-person.

''It depends, it could be both. I know that some… they tend to do the online part, but stream the conference while some people are there and some people are at home, so that could help with people that are from really far away.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''A bit of both, I think at least so many times a year it should be face to face. But also to get familiar with other people as well because you never see, you know, I've not met some people. I met somebody for the first time yesterday and I've been here a year and a half, but yeah I think a mixture, a mixture.'' [Participant 24030, PET-CT Technologist, Mobiles

''Pretty much it could be both, it could be face-to-face and Teams, for people who can't make it at the time. Because it's not hard to put a camera up, is it? For them to log on, even if there were people sat here. How often? Every three months?'' [Participant 24021, Graduate Radiographer, IDC]

''I think sometimes it is good to come together in a room rather than over the computer, because I think a lot of people are computer shy. And I think people are shy in any way when they come into a room, but I think once you get talking and open up, I think it would probably be best if it was face-to-face. But obviously if not then Teams is just as good.'' [Participant 24016, Clinical Assistant Multimodality, IDC]

''I feel like sometimes humanising things actually makes it much better, talking face-to-face, body gestures and you can tell that people understand your situation, your information, or not…'' [Participant 24027, Senior Radiographer, Mobiles]

''Again, the practicalities of it, I think maybe six-monthly would be sensible depending on the topic of interest. Maybe it wouldn't be six months for everything, it would be six months for a particular area that people are interested in. So you could

have multiple ones going on around similar times.'' [Participant 24002, Senior Radiographer MRI, Static]

''It's probably worth doing one every quarter. You wouldn't really want more than one every three months because that would be a bit overkill. And you'd have to allow the time to do this, and the people to have the time to do it, which is often very difficult in this job because we don't have set rotas and set days. But yeah, I would think either once every quarter, or at least two a year. But I don't think you'd need more than that.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''I think is the be all and end all. I think it has to be technology driven. It has to be. Face-to-face meetings are absolutely fine, and I think if you've worked in a very large centre with multimodalities, 50, 60 staff you can have face-to-face meetings and have people coming in, doing talks and things like that. For the vast majority of people employed by Alliance Medical, that is not necessarily an option. So, it has to be delivered from a technology point of view, but it has to be delivered in a way that the staff can access and are comfortable with, and it actually does what we want it to do.'' [Participant 24004, Reporting Radiographer MRI, Static]

''It would probably have to be online just because of our whole mobile set-up, we're not all in the same place at the same time. Although every now and then having something in-person would be really nice…'' [Participant 24023, Senior Radiographer Multimodality, Mobiles]

''Not too frequent because then it gets too much. We're already bombarded with so much information. You can maybe do something on a smaller scale, maybe once a month. Would be really good. But on a larger scale. Once a quarter would be really good? You could have, you know. A big zoom presentation. Perhaps you know senior radiographers, consultant radiographers in the you know in the company could present. That would be really good, we will all log in, you know, for a couple of hours. So down time that's getting everybody… But then you could record it and send out to people. It is really good at the time because then you can ask questions and engage in any discussion. Maybe we should take it in turns, so we can start rota, so this will be the third of the staff. And then another third of the staff. And so everyone gets to go and the scanner still runs.'' [Participant 24017, Senior Radiographer MRI, Static]

''Oh, yeah, we could do it online. I just feel like online sometimes it's not as engaging and people just often are on mute and then no cameras and then nobody's really paying attention.'' [Participant 24006, Clinical Lead PET-CT, Static]

''Personally, I hate Teams. Much prefer, I'm old school, much prefer face to face. Uhm, I think you learn better face to face. I think Teams is, I think quite tiring and a bit boring and I have done training on Teams like when we've done stuff and everything but much, much prefer face to face.'' [Participant 24010, Senior Radiographer MRI, Static]

4.3.3 Benefits of Communities of Practice

Participants believe that CoPs would benefit the organisation, patients and the radiography discipline in general, initiating a culture of continuous learning and improvement by facilitating knowledge sharing and dissemination, promoting best practices, fostering collaboration, improving (clinical) skills, driving innovation; ultimately leading to improved patient care and outcomes. Additionally, some participants highlighted that CoPs may result in more efficient operations and improved problem-solving capabilities across teams, improved understanding of each other's roles within the organisation, and likely place the organisation in an advantageous position to partners and customers.

''I guess it just gives everyone a place to share their knowledge.'' [Participant 24005, Senior Radiographer MRI, Static]

''You get better, more skilled, radiographers that are learning from different radiographers that have come from different walks of life, have worked in different areas, worked in different countries, worked at different trusts.'' [Participant 24025, Radiographer CT, CDC]

''Sharing best practice will be of benefit to everybody, so that not we're not all we're not doing things that we've been just been doing forever in the same way. It would be an opportunity to present new ways of working new findings, opinion, different opinions from different radiologists. We're all led by the radiologists whatever unit we're in, and we work to what they want. But that doesn't mean that we shouldn't be, you know, listening to radiologists at other sites and then maybe taking that back to

our radiologists and say: ''hey, these guys in Liverpool are doing this, so this might be better". We're then almost sort of in charge, leading the conversation then.'' [Participant 24017, Senior Radiographer MRI, Static]

''I think we would have a better relationship with the radiologists if we are improving and moving with the times and… If they're moving forward with their expectations and what they need, we need to be able to move dynamically with them. In order for them to have these conversations with us, we need to be knowledgeable. Instead of it being one-sided where they tell us what they've found out and what they want, we can negotiate with them or have a more educated discussion with them to work out what the best way forward is. They may even appreciate our input.'' [Participant 24002, Senior Radiographer MRI, Static]

''It will underline any situations that have been overlooked, maybe. You could find that there might be information that you might improve to just improve the whole system in general. Be it whether it's just staff morale, be it whether it's got to do with the business itself, be it whether it's got to do with the patient care, be it whether it's got to do with experiences that people have, and whether it's the way that staff work around the department, the environment. It will improve a lot of things, I believe.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''If you provide the opportunity for individually technical and clinically minded radiographers to improve and hit their goals, then it, kind of, feeds up. If then, as a company, we have a lot of actively engaged staff trying to deliver services based on best practice that hits all of the goals of the company along the lines of excellence,

learning, we have an engaged workforce, they're more likely to be more productive, however we want to define the word productive. They're going to be more productive. The relationships between clinical staff of different disciplines are always going to improve. So, if you start at the bottom, drive everything through, the company wins, yeah? Because of improved relationships, improved productivity, improved patient outcomes.'' [Participant 24004, Reporting Radiographer MRI, Static]

''I think it will be beneficial for the company, because you're producing, like, highly trained and skilled professionals.'' [Participant 24015, Radiographer CT, IDC]

''Yeah, I think it is beneficial for Alliance, because we are not just scanning patients, but we will know what we are doing with that patient as well. So, we can better organise or make a new technique about a certain procedure.'' [Participant 24013, Senior Radiographer CT, IDC]

''I think there's that many modalities in Alliance and me coming into MRI, I've only ever known MRI. I've become a little bit more familiar with PET CT, of course, working with them. No idea what happens in CT or x-ray, but I think for those that work behind desks as well in head office who make these policies and procedures, it's worth them actually seeing what does actually happen, what the difference is between working on a mobile, what the difference is working in a static hospital. Where we are acute side, we don't just get to do a list and stick by that list. We could have everything dropped on us at any minute. They need to see what limitations

we've got and to expect the unexpected.'' [Participant 24001, Clinical Assistant MRI, Static]

''Oh, very important. I mean we will not be doing unnecessary scans, we will not be giving unnecessary radiation, obviously, and we won't always need to send some patients home. If we had an easier way of solving some of these knowledge problems, you know… We can be on the phone for hours calling for a radiologist just to advise, when we could have saved their time. We send them home, they've lost time. Oh, it will benefit the patients a lot.'' [Participant 24012, Senior Radiographer CT, IDC]

''Always benefits patients because you're improving your practice, improving your protocols, getting the best out of your imaging. Just from example, if your protocol can be reduced so your patient spends less time in the scanner that would be great because patients don't want to be in an MRI scanner. Nobody wants to be an MRI scanner. The less time possible, the better. So that's just, you know, for example, but obviously in terms of diagnosis as well, if there are better ways to reach a diagnosis with better protocols or different protocols, newer protocols, different ones that different sites can have different stuff available to them. You know, and perhaps you want to be sharing that and then maybe doing the same thing. And comfort and, you know, counselling and tips and tricks and, yeah, we talk about that quite a lot. It's beneficial to the patient experience, but not in forms of diagnosis or treatment, but in terms of their experience in a scanner.'' [Participant 24017, Senior Radiographer MRI, Static]

''It will improve a lot because the more the information is spread, the new radiographers that come in will learn more. The new radiographers will come in with a fresh initiative and new ideas to improve. It just becomes a norm which you just adjust to, and then you, you know… I believe, yeah, it will definitely improve quite a lot in terms of that side. The quicker the information spreads, the easier it is to train new staff.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''…I think the only way we can say we perform good practice is by keeping up to date with what's changing within our profession, and what we should be doing. So, in my opinion, it can only be a positive thing, especially when you're looking at contracts being renewed. You need to be able to say to these customers, our staff, they're working- I want to say in the most modern way, that's not right, in the most relevant, I suppose, up-to-date way. And they are working to good practice. It's very easy in this job just to mundanely go day in, day out doing the same thing for years and years, and then you get stuck in a rut, and people don't want to change…'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

4.3.4 Networks of Practice and Landscapes of Practice

Most participants mentioned involvement of other companies, departments/sites, professionals or disciplines as part of the CoP. Particularly, nearly all participants had a positive reaction to involvement from staff based at NHS organisations and host sites, improving collaboration and overall understanding of the host sites' expectations, policies and procedures. Additionally, participants believe that NHS organisations hold and generate majority of the knowledge and skilled staff due to the volume of complex cases undertaken at a regular basis.

''I think it's always good because Alliance probably have got their own protocols and everything, and it's nice to know that what we practice here is acceptable by other companies, whether they are private or NHS as well, and share ideas. Because maybe they are doing something that is better than us, or we are doing something that is better than them.'' [Participant 24009, Apprentice Radiographer PET-CT, Static]

''Well, they can provide more quality images. Because… I used to work in the hospital, so I did a lot of cases, which were pretty hard, I'd say. It's hard, with difficult scans. So, when I came here, I felt like as my knowledge- not my knowledge, the things I'm doing, I, kind of, downgraded from that. Yeah, and I found that I feel like the rads inside the hospital, they, kind of, look down on us. Because sometimes they're saying that, "Oh, they don't know how to do this type of procedure.'' [Participant 24014, Senior Radiographer CT, IDC]

''I think it's very insular if you stay within Alliance with this sort of thing. You're only going to get a certain set of opinions because you've only got a certain set of people.'' [Participant 24028, Senior Radiographer PET-CT, Mobiles]

''Yeah, I think it would because we do often have a lot of trouble with the trust. Things don't align and we don't have the same policies that they do. So we never know really where we stand with some stuff.'' [Participant 24019, Clinical Assistant Multimodality, IDC]

‘’It would be. It would be, especially for the Trust that we work with. It would be really helpful if they came in once in a while to tell us what they did. Because they tell us that what they do, we should be doing, you know? But we’ve got rules that we are supposed to follow, and then you think, “What should we be doing?” [Participant 24012, Clinical Assistant CT, IDC]

Majority of the participants felt that it would be beneficial to involve professionals from other disciplines to understand the different knowledge bases and identities within the healthcare system and discuss the best course of actions based on patient factors and current research, leading to improved patient care by facilitating cross-disciplinary learning and communication across professional boundaries. Participants believe that they are likely to learn most from radiologists as they could provide feedback and insights on image quality, complex anatomy, pathology interpretation and clinical context of imaging requests. Some participants suggested creating not only profession or modality related CoPs and NoPs, but also role specific communities. For example, CoPs and NoPs for reporting radiographers or clinical assistants. Additionally, many participants felt that involvement of educational institutions such as universities would be valuable as such organisations generate evidence-based knowledge, and vice versa could obtain insight into clinical practice and implicit information, with the view to identifying any areas for research.

‘’It would be good, especially with nurses and doctors because our experience here is that usually the wards don’t know what to do when they see PET scan preparations. It would help us update what they need to do, and the fact that we have contact with nurses would help us with some medications that we don’t know

that could affect the quality of the exams.'' [Participant 24008, Graduate Radiographer PET-CT, Static]

''It will be good because we're part of the MDT team. So, the information you get from doctors comes to us and the information we get from even GPs, from other nurses, or physiotherapists, they can learn from the trainings that we get as well. I'll give an example. Sometimes you get referrals that have come to us, but then the patient is probably not safe to go in an MRI scanner. So, situations like that, if we all learnt together, and we have the doctors understand that the clinical history for that patient is very important before they then send the patient into the department, that's one thing that can improve. It's the same thing as physiotherapists. They can also tell us how they decide to refer patients, what they could improve. We could suggest things, fresh initiatives from different points of view would probably improve.'' [Participant 24027, Senior Radiographer MRI, Mobiles]

''I feel like, especially for things like pathways, it helps you with a greater understanding of what's going to happen after they've been for their scan and they find a certain thing. If someone has a question, and you're able to share your knowledge with them that you've gained from someone else, then surely, that's valuable.'' [Participant 24020, Senior Radiographer PET-CT, IDC]

''We're an enigma to a lot of the hospital. They don't know what we do and why we do it. Doctors who've been here for a long time still don't understand why we have restrictions on MRI scans, why they have to have like the capacity forms… That would be good. It would streamline the referrals. The process would be quicker. The

doctors would know what's expected before they've even got the referral. They would create the referral. They would have the lack of capacity form, for instance, already sorted, not waiting a few days for it because they could be proactive and, "This patient has this stimulator, this patient has this". They could do all of that before even handing us the referral and then that patient would be seen so much quicker.'' [Participant 24001, Clinical Assistant MRI, Static]

''I think radiologists are a good one, especially in PET. I think across the board. Physiotherapists? I don't really see how that would relate to PET, because ours is pretty much… I get it for MRI and CT, but I don't think that would be a bad thing for them either.'' [Participant 24021, Graduate Radiographer PET-CT, IDC]

''It's mobile clinical assistants because on mobiles we don't often see each other. So, it could be that maybe I'm struggling with something and I don't see another CA for a long time, or we just don't see each other. Then, at this meeting, it's quite good just to voice anything.'' [Participant 24029, Clinical Assistant PET-CT, Mobiles]

''My answer is in an informally formal setting. So, it really just depends on what aspect of Evidence-based Practice. So, role related. If I try and extrapolate it so it would be suitable for all members because for me, personally, I would be very selfish. There would be a specific area, part of Community of Practice that would be for reporting radiographers, and there aren't very many of us. That's much easier because at the end of the day, a meningioma looks like a meningioma. Whereas from a technical point of view, if we just talk about MRI, for example, there are many ways to skin a cat. So, how you acquire the images and what protocol you use and what individual sequences you use, and whether that's manufacturer dependent is

slightly more complex, and a big wider, broader church compared to the image interpretation aspect that sits there.'' [Participant 24004, Reporting Radiographer MRI, Static]

''…Absolutely, because they [universities] are the ones doing the research, aren't they? Just about anyway- or they know where the research is and they're normally up to date on most things.'' [Participant 24007, PET-CT Technologist, Static]

''Start from the bottom, isn't it? (Laughter) Yes. Absolutely. Students. Most lecturers, they've been into clinical environments. So, if they know about this information and they convey it while the students are actually learning, that's probably the best, where it all starts. Then when they come in, and once they have the information and they see the fruition into the practical side of things, they then can put the theory side and the practical side together to understand exactly how the situation is, if there's any improvement, what roles they have to play, what they can do to improve. If they know they know they need to communicate, with how they communicate the information and everything… That would be good because the lecturer can pick information as well from radiographers, the current situation, what's happening at present, and how they can improve it. There are always changes every now and then in terms of policies and procedures and how we run information, for example, we had COVID.'' [Participant 24027, Senior Radiographer, Mobiles]

Chapter 5: Discussion

The aim of this study was to explore promotion of knowledge dissemination and/or sharing, EBP and learning in radiography through the theory of CoPs. Specifically, the primary focus of this investigation was to explore and analyse the theory of CoPs and formulate strategies to cultivate CoPs in the context of radiography. To achieve the overall aim, it was important to understand the barriers and facilitators of learning, EBP and knowledge dissemination and/or sharing in practice, as this would generate understanding of the possible impact of CoPs and support the development of the conceptual framework and recommendations. Chapter 4 identifies three core categories namely, i) EBP and CPD in radiography, ii) future of radiography and iii) Communities of Practice in radiography. These core categories are viewed and discussed independent from each other, as they are separate phenomena and equally significant. However, it is arguable that these core categories are highly interlinked and interdependent, which is examined and discussed further in this chapter. The chapter interprets and contextualises the findings related to the categories, and situates them within existing literature. Rather than presenting a separate theoretical framework chapter, the discussion itself serves as a platform for theory development. Through critical engagement with existing research and theoretical perspectives, the chapter establishes the conceptual foundations for the theory proposed in the subsequent chapter.

5.1 Engagement with Evidence-based Practice and Continuing Professional Development in radiography

This section explores the extent to which EBP and CPD are adopted within the radiography profession. It examines the influence of factors such as motivation, level of qualification, and resource availability on engagement with EBP and CPD.

Furthermore, it highlights the importance of cultivating a research-oriented culture, the role of support and empowerment, and considers the mechanisms through which learning and knowledge dissemination occur in radiography practice.

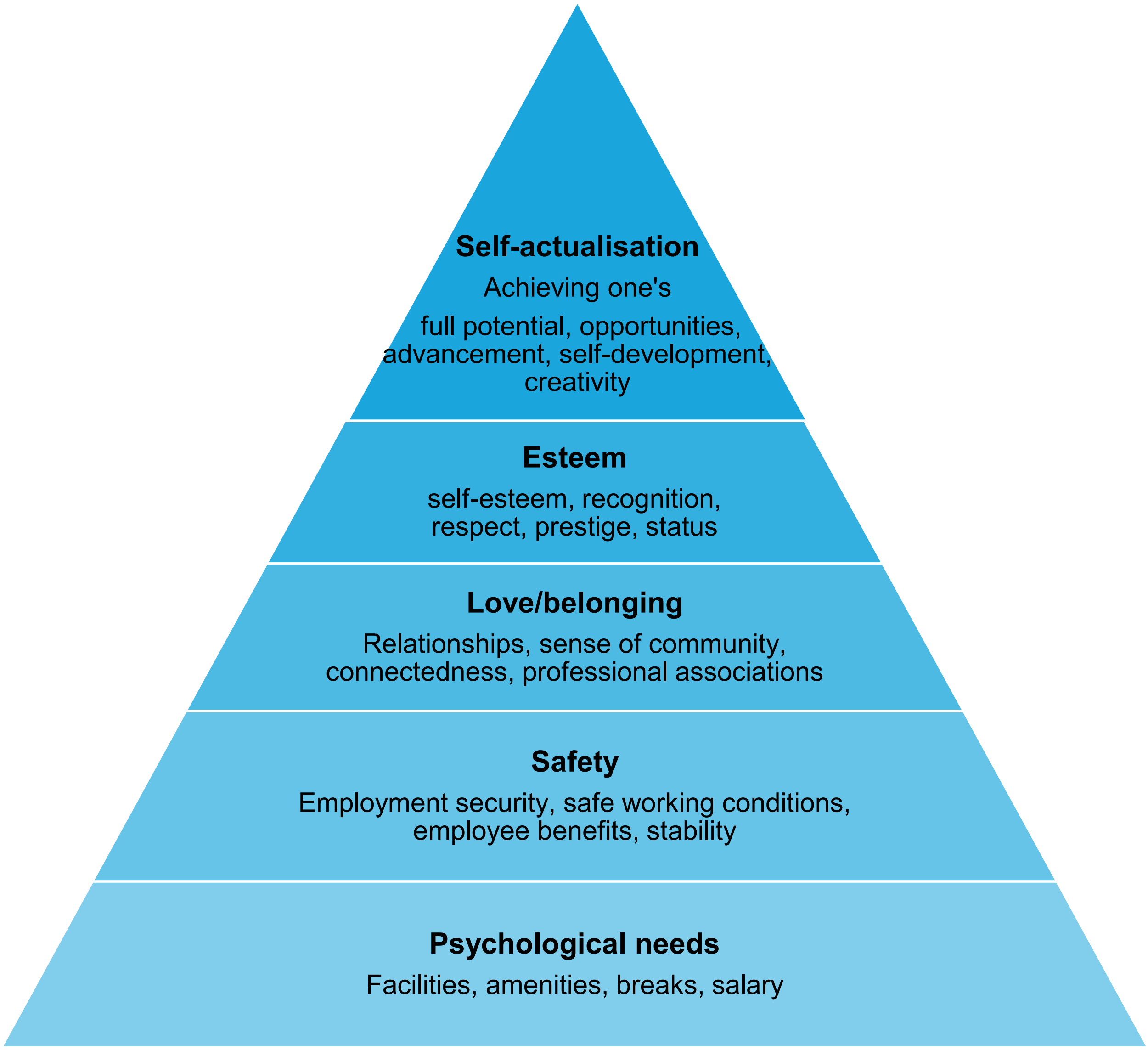
5.1.1 Motivation, knowledge and qualification level

Derived from EBM, EBP has emerged in relatively recent years and is adopted across various disciplines and professions as a means of providing high quality and cost effective care (Brettle, 2020). Although highly encouraged by numerous notable organisations and individuals such as NICE, Agency for Healthcare Research and Quality, Archie Cochrane, and educational institutions and professional societies and organisations, the uptake of EBP differs across the range of (allied) health professions (Rawle *et al.*, 2023). EBP in radiography, or ''evidence-based radiography'', defined as "radiography informed and based on the combination of clinical expertise and the best available research-based evidence, patient preferences and available resources'', is irregularly applied in practice (Hafslund *et al.*, 2008).

While the concept is recognised and generally viewed positively, its full implementation is still emerging, and is encountering challenges with radiographers facing barriers such as a lack of confidence and knowledge in research skills (Al Balushi, Watts and Akudjedu, 2024). This resonates with the findings of this study, in which participants show general awareness of the concept of EBP, believe it benefits the service and patient outcomes, and consider EBP part of their role as a registered professional. However, most participants could not describe what EBP entails, and the steps required for successful implementation. Notably, understanding of EBP was primarily noticed among those in higher positions, holding a higher qualification level or those interested in improving radiography services. Additionally, patient facing participants were mainly concerned with use of EBP to improve patient care and pathway, whereas clinical leads and reporting radiographers highlighted efficiency, effectiveness, pathology and case-based situations. A possible explanation for this might be that reporting radiographers and clinical leads often complete a post graduate qualification and are expected to operate at an expert clinical level, make complex decisions, provide leadership, and contribute to service development, education, and research, abiding by the pillars of advanced practice (NHS, 2017). A university level qualification is likely to have a positive impact on the understanding of EBP and research, as the results show that unawareness was mainly noticed among clinical assistants, technologists or those who completed their qualification outside of the UK, where EBP and research may not necessarily be part of their curriculum or professional responsibility. Another possible explanation for this is that advanced practitioners, due to their higher position and expanded roles, may experience a heightened sense of responsibility and motivation, leading to increased engagement in EBP. This links to studies suggesting that there is a positive relationship between feelings of personal growth, autonomy and leadership, and intrinsic motivation and responsibility (Karaferis *et al.*, 2022; Taylor *et al.*, 2022).

A lack of motivation to engage in EBP and CPD was reported among some participants, particularly those toward the end of their careers or those who did not feel challenged in their role. Moreover, some participants felt less motivated due a lack of interest in research, enforcement and/or incentive. These factors have been reported previously, with studies showing a lack of motivation and interest across (allied) healthcare professions including radiographers (Halkett *et al.*, 2017; Dennett *et al.*, 2021; Paci *et al.*, 2021; Ongori and Kabo, 2024). Employee motivation is generally considered an essential factor for the success of an organisation, with researchers arguing that motivated employees can engage with the organisation and demonstrate commitment, efficiency and job satisfaction (Sekhar, Patwardhan and Singh, 2013; Lee and Raschke, 2016; Vo, Tuliao and Chen, 2022). In the context of healthcare, it is assumed that an increase in a professional's motivation likely affects the quality of patient care positively (Veenstra *et al.*, 2022).

Work motivation is defined as "a set of energetic forces originating within and beyond an individual's being, which determines the form, direction, intensity and duration of work-related behaviour" (Gagné, 2014, p.38). Additionally, it is arguable that motivation can be viewed as the process of stimulating individuals by energising, directing and sustaining behaviour and performance to achieve a desired outcome or expectation (i.e., workplace motivation requires stimulating and nurturing to foster a productive environment). This links to Maslow's hierarchy of needs, suggesting that individuals are motivated by a set of needs, with the lowest levels (physiological and safety) representing extrinsic motivators and higher levels (belonging, esteem, and self-actualisation) reflecting intrinsic motivation (Maslow, 1943). The hierarchy is depicted as a pyramid, representing the requirement to fulfil the lower levels first, as without fulfilment of the previous level an individual may lack the motivation to progress (see Figure 5.1).



Based on literature of Maslow, 1943

Figure 5.1 Hierarchy of needs at a workplace

Applied to the workplace, this means that to drive motivation, employees require i) basic psychological needs such as access to a restroom, breaks, a comfortable working environment and a steady income to support oneself; ii) safety including a safe working environment, and feeling emotionally safe and supported; iii) love and belonging, such as a sense of belonging to the organisation and relationship-building with peers; iv) esteem including the need for self-worth, respect, recognition and achievement in the workplace, and finally v) self-actualisation, signifying an employee's drive to reach their full potential and contribute meaningfully, fostering a sense of purpose and accomplishment. Therefore, based on this theory, it is important for employers to understand the needs to establish strong workplace standards and connect those to employees' safety, sense of belonging and self-esteem, impacting their intrinsic and extrinsic motivation.

Another commonly used theory of motivation is that of Herzberg, arguing that job satisfaction and dissatisfaction are influenced by two distinct sets of factors, namely i) hygiene factors (which prevent dissatisfaction) and ii) motivators (which drive satisfaction and motivation) (Herzberg, 1966). According to Herzberg, hygiene factors cannot motivate employees but can minimise dissatisfaction. In other words, one can only dissatisfy if they are absent or mishandled. Hygiene factors (extrinsic factors) include company policies, salary, working conditions and interpersonal relations, which relate to an individual's environment. Conversely, motivators (intrinsic factors) create satisfaction by fulfilling individuals' needs for meaning and personal development. Motivators include achievement, recognition, responsibility and advancement. The theory suggests that there is a direct relationship between the hygiene factors and the motivators. That is, once the hygiene factors are addressed, the motivators promote satisfaction and encourage production. For example, a premise inherent in Herzberg's theory is that individuals strive to succeed in a role. To support their success, individuals should be placed in positions aligned with their interests, in combination with clearly set out goals, standards and a feedback process. Another example is the providing recognition (e.g., public appreciation, monetary reward) and ownership (e.g., freedom, opportunities for added responsibility) for the work carried out, as such factors promote motivation.

Among other prominent figures in the field of motivation, Maslow and Herzberg offer slightly different perspectives on workplace motivation. Although not contradictory but complimentary to one another, Maslow’s theory is mainly based on satisfaction based on fulfilling human needs, while Herzberg's theory relies on reward and recognition. Both, Maslow’s hierarchy of needs and Herzberg’s two-factor theory of motivation acknowledge that individuals are motivated by a set of factors which can be grouped into categories, with lower-level needs or hygiene factors needing to be addressed before higher-level needs or motivators can be effective. In the context of the current study, Maslow and Herzberg’s theories can be used in practice to examine, understand and ultimately remove the barriers to EBP and CPD such as a lack of motivation and resources.

5.1.2 Impact of resource limitations

Healthcare may be considered one of the most complex public systems due to various interacting components, its dynamic nature and unpredictable outcomes. Particularly, healthcare is under constant pressure from changes in biomedicine and society, with those challenges exacerbating when faced with unpredictable large-scale outbreaks of (infectious) diseases such as the COVID-19, highlighting the importance of comprehensive and sustainable management of resources in healthcare (Anesi and Kerlin, 2021). However, decision-making and long-term planning continues to be dominated by the problem of financial constraints and its immediate consequences including workforce shortages, limited resources and infrastructure limitations, resulting in workforce burnout and a decline in quality of care (Maynard, 2017).

Most healthcare systems, including the UK healthcare system is facing significant financial constraints leading to budget cuts, potentially impacting patient care (Khan, 2023). The aging population and increasingly complex healthcare needs are one of the key drivers to the rising demand. The primary reason for the aging population is increased life expectancy due to advancements in healthcare and improved living conditions, and declining fertility rates (Cristea *et al.*, 2020). The demographic shift poses a dual challenge: i) how to respond to the increasing demand and complex healthcare needs, and ii) how to ensure that the healthcare system is equipped and prepared to provide quality and equitable care.

The implications of the demographic shift are far-reaching. The healthcare system, as currently structured, is unprepared for the significant population changes and health challenges. The system is also fragmented, (financially) inefficient, with disparity in coordination, access and quality (Shepherd, 2016). Additionally, the system inadequately addresses the social determinants of health such as housing, education, transportation, social care and income, which may influence the health outcomes and behaviours of the aging segment of the population (Jones and Dolsten, 2024). Similarly, older adults and their caregivers are insufficiently engaged in the planning and delivery of care, or leverage the potential of home- and community-based care models, which may improve access, quality and affordability of care (Spiers *et al.*, 2019; Zimpel-Leal, 2020). The challenges currently experienced in healthcare continues with pressures related to the growing shortage of healthcare providers, meaning that the supply and availability of qualified and skilled healthcare professionals such as physicians, pharmacists, nurses and allied healthcare professionals are insufficient and inadequate to meet the increasing demand and need of the population (Looi, 2024). The workforce crisis is driven by insufficient investment in training new staff, inadequate workforce planning, and limited government accountability (British Medical Association, 2025). Both, staff recruitment and retention are significant challenges, with a high degree of work-related stress, moral injury, and burnout reported within the NHS workforce (Shemtob *et al.*, 2023). The continuous challenge in retention and recruitment creates a vicious cycle: staff shortages produce environments of declining staff wellbeing, which increases pressure on existing workforce, and in turn encourages higher turnover and absence.

Insufficient funding and budget cuts are other key challenges faced by healthcare systems (Khan, 2023). Although the financial challenges are a result of external factors such as inflation, the COVID-19 pandemic and industrial actions, the poor financial position is also caused by inadequate leadership and ineffective planning and management of resources (Public Accounts Committee, 2025). Additionally, although expected to improve healthcare outcomes, rapid medical and technological advancements have also contributed to the increasing healthcare costs (Anderson *et al.*, 2022). Moreover, healthcare organisations are continuously pressured with regulatory compliance, demanding maintenance and record of patient safety, quality of care, privacy, and financial integrity (Dunbar, Keyes and Browne, 2023). However, complying with these regulations can impose significant barriers and costs on healthcare systems. On one side there is an aging population with increasing healthcare needs and requirements, and paradoxically there is a strained healthcare system with workforce shortages, fragmentation and financial and capacity challenges. Addressing the paradox requires innovative solutions, policy reforms, institutional support, and a concerted effort to restructure the healthcare system that involves a culture of EBP and CPD (Pitsillidou *et al.*, 2021; Ramazan and Graham, 2025). However, due to the pressures outlined, investment in innovative solutions, infrastructure and support for EBP and CPD may not take priority. Instead, government officials and healthcare organisations appear to focus on ‘‘firefighting’’ and managing the immediate challenges at hand.

The combination of the (inter)national financial, workforce and capacity challenges in healthcare may explain the barriers to EBP and CPD observed in the current study. All participants considered a lack of time an obstacle to engaging with EBP and CPD. The lack of time was initiated by work pressures including high workload and challenges related to staff shortage. The observations supported the interview outcomes, in which there was little flexibility and time factored in for non-clinical tasks observed in practice. Time was particularly an obstacle when encountered with low staffing levels or unexpected events on the day. These findings are consistent with other studies, which identify a lack of time as a key barrier to engaging with EBP (Al Balushi, Watts and Akudjedu, 2024). A lack of time to engage in EBP or any off the job training, curriculum or tasks are not unique to the radiography profession, this trend has been observed among other healthcare professionals including nurses, physiotherapists and physicians (Hong *et al.*, 2019; Pitsillidou *et al.*, 2021; Gleadhill *et al.*, 2022).

Nearly half of the participants considered a lack of resources as a barrier to engaging with EBP and CPD. Specifically, participants experienced difficulty in accessing current and relevant literature, especially if they were not enrolled in a university course where access to literature is often provided. Furthermore, some participants lacked the necessary facilities, such as a quiet area or computers to engage with EBP and CPD, and some also lacked confidence in their technical expertise. A lack of access to facilities such as a quiet space or computers might be particularly challenging for those permanently working as part of the mobile team, as mobile units are typically compact and designed to accommodate only the essential equipment for the scanning service. A lack of resources is a commonly reported factor limiting the extent of EBP in radiography and other health professions (McArthur *et al.*, 2021; Pitsillidou *et al.*, 2021; Al Balushi, Watts and Akudjedu, 2024). Limited access to the resources such as recent and pertinent literature, computers or uninterrupted areas is concerning, as it may compel professionals to base their decisions on their initial training or rely on knowledge and experiences of their peers, rather than recent research evidence.

Overall, resource limitations could impact the implementation and impact of EBP and CPD in radiography, as those limitations may hinder the professionals' ability to access, evaluate and apply the best available research, and engage in activities that promote professional development and competency. For example, EBP relies heavily on recent, high-quality research. Limited access to journals, databases and academic resources which are usually accessible online, professionals may be unable to integrate the latest evidence into their practice. Therefore, without access to current literature or computers, decisions may be based on outdated practices, potentially leading to suboptimal patient outcomes.

5.1.3 Support and empowerment in radiography practice

Participants indicated a lack of support by employers, emphasising that productivity and efficiency is prioritised in the workplace. This was also noticed during the observations, in which productivity and patient throughput were optimised through staffing models designed to maximise efficiency and patient lists. Participants associated the pressures related to productivity and patient throughput to a business-oriented approach. A possible explanation for this could be that the study was conducted in an independent organisation, where profit is essential for the financial sustainability of the organisation. However, productivity and efficiency may not be exclusive to independent organisations, as other studies have indicated that clinical duties take precedence, leaving radiographers to dedicate personal time for research, which is generally viewed unfavourably (Ramazan, Aarts and Widdowfield, 2022; Al Balushi, Watts and Akudjedu, 2024).

The results reveal a lack of support from line managers, which was particularly experienced among the mobile team and those managed by individuals without a clinical background. Participants preferred managers with a clinical background, suggesting that managers with the clinical knowledge and skills have an enhanced appreciation for CPD, EBP and understanding of any operational challenges. Although a general lack of support was experienced, most participants felt that support was mainly provided by peers and clinical leads, albeit some lack of support by clinical leads is encountered due to their primary focus on quality of care and pressures from the company to increase effectiveness. A lack of support from management and peers is a frequently cited barrier to engaging with EBP and CPD activities among healthcare professionals including radiographers (Upton *et al.*, 2014; Grose, 2016; Berthelsen and Hølge-Hazelton, 2021; Pitsillidou *et al.*, 2021; Abuzaid *et al.*, 2023).

This raises discussions on the knowledge and understanding of healthcare organisations, and their leaders and managers on EBP and CPD. In healthcare, EBP and CPD are often associated with (registered) healthcare professionals, considering it their responsibility to develop and maintain the essential knowledge, skills and attributes to practise safely and effectively (HCPC, 2018d; Connor *et al.*, 2023). However, it is arguable that support from management is instrumental in creating an environment conducive to EBP and research and fostering a positive attitude towards its utilisation within the organisation. For example, the organisation and managers can play a crucial role in facilitating and supporting EBP and CPD by adopting several strategies including allocating resources (e.g., provide education, training, time and access to literature), creating a culture of EBP, promoting staff engagement and supporting implementation of EBPs. This aligns with studies suggesting that increased engagement correlates with support from managers and colleagues (ACORRN Research Radiographer Working Party, 2007; Elliott *et al.*, 2009; Ahonen and Liikanen, 2010; Ooi, Lee and Soh, 2012; Kyei, Antwi and Suapim, 2015; Grose, 2016; Halkett *et al.*, 2017; Moran and Davis, 2020; Piro *et al.*, 2020; Elshami *et al.*, 2021; Bolejko *et al.*, 2022; Chau *et al.*, 2022).

During the interviews and observations with the clinical team, participants highlighted experiencing a shift in the company’s priorities, particularly a decline in morale, patient-centred care, and communication over the past five years. The clinical teams specifically feel that the roles of operational managers have changed, with many believing that managers show less concern for the day-to-day operations, affecting the quality of care. This shift is perceived negatively, as the clinical team values communication and time with patients, considering these essential aspects of their role and patient care. While CPD courses are available, some participants expressed that these courses are not adequately promoted, which they attribute to managers' lack of awareness and understanding of the significance of EBP and CPD. Similar to efficiency and productivity, it is arguable that independent organisations are profit driven and, therefore, place less emphasis on activities such as EBP, training and development. However, a more plausible explanation for the observation is that, given the rapid pace of healthcare, increasing demand, regulatory requirements and pressures related to a lack of resources (e.g., international lack of healthcare professionals), managers view EBP and CPD as low priority when weighted against direct provision of healthcare services. This aligns with studies indicating that the reasons for limited participation in EBP are more complex than simply "a lack of time". In reality, EBP is not highly prioritised by managers and professionals, with activities that are seen to directly impact on patient flow inevitably considered higher priority (Harding *et al.*, 2014; Duff *et al.*, 2020).

Some participants experienced a lack of support from peers. Although knowledge is shared among staff, the results show that those were related to current practice and training new members of staff, rather than challenging current practice. Participants also highlighted a lack of support from radiologists or clinicians. For instance, protocol changes were primarily considered radiologist-driven, with limited contributions from radiographers and technologists. A lack of support by peers, radiologists or clinicians has previously been reported as a barrier to EBP (Ahonen and Liikanen, 2010; Ramazan, Aarts and Widdowfield, 2022; Alakhras *et al.*, 2023). Correspondingly, many participants viewed radiography as a ‘’narrow profession’’, heavily constrained by protocols that offer little flexibility or opportunity for introducing new EBPs. Some participants attributed this limitation to their employment with an independent imaging provider, a perspective especially highlighted among PET-CT radiographers, technologists, and the mobile team. Interestingly, those with higher positions and increased interest in improving practice such as clinical leads and reporting radiographers felt more involved in decision-making and EBP activities. Among this group, participants explained that new practices are often protocol-driven, and the full process of EBP is seldom completed. For example, implementing EBPs and assessing the outcomes were considered challenging processes. There are several possible explanations for these results. Firstly, it is arguable that healthcare is generally a highly regulated industry with various bodies overseeing different aspects, from professional registration to the safety and quality of products and services (Braithwaite, 2024). Particularly a field such as radiography, in which there are potential risks associated with ionising radiation, requiring strict standards to ensure patient safety and effective practice (Care Quality Commission, 2024). This may explain why those specialised in PET-CT face greater resistance and have less flexibility to change their practices or implement EBPs. Similarly, the mobile often serves as supplementary support to an existing service, meaning staff are expected to conduct radiographic examinations in alignment with the host site's policies and protocols. Secondly, as mentioned earlier, individuals in higher positions, or those with a stronger interest in research have often completed postgraduate qualifications, which may provide them with a broader scope of practice and enable them to participate in decision-making including changes to local policies, procedures and protocols.

Overall, fostering a collaborative, informed and supportive environment for EBP and CPD appears to be essential to engaging with EBP and CPD. Support from peers is required to encourage shared learning, motivation, and confidence to implement new practices. Physicians' and radiologists' support is required to provide clinical context and help align imaging decisions with patient care goals, and offer expert guidance on imaging quality and interpretation, ensuring evidence-based methods lead to accurate diagnoses. Most importantly, all parties should be open to welcoming and encouraging EBPs, while also being receptive to radiographers' suggestions for improving current methods in practice. Organisations and management play a key role, not only by offering resources and support, but also by actively empowering staff, fostering a culture of research and innovation and setting the tone through strong leadership and example.

5.1.4 Research culture and engagement in Evidence-based Practice and Continuing Professional Development

Engagement in EBP and CPD appears to be irregular among participants, with most failing to document any CPD activities for HCPC audit purposes. Irregular engagement was mainly reported by clinical assistants, individuals with limited interest in research and EBP, and those nearing the end of their careers. Those who reported frequent engagement were either undergoing internal training or pursuing a formal qualification, or they felt a strong sense of professional responsibility viewing participation in EBP and CPD as an integral part of their role, especially among advanced practitioners and clinical leads. Similarly, there seems to be a low understanding of EBP and CPD as most participants used the terms EBP and CPD interchangeably, and considered mandatory e-learning part of CPD.

Participants mentioned various sources of EBP and (new) information including the SoR's Synergy magazine, videos, books, radiography websites and the company's Intranet platform. Additionally, some participants benefitted from manufacturer-led application sessions, students and new starters, practices in nearby hospitals and any engaging in clinical trials conducted in their unit. Scientific articles were considered a source of EBP; however, this was primarily reported by those with an increased interest to improve practice, and those with higher qualification levels or positions. Half of the participants identified formal education, e-learning, and company-provided conferences or courses as beneficial and often preferred sources of EBP and CPD. Notably, many participants working in PET-CT highlighted courses offered by the company, such as the Christie Academy, a key driver for engaging in CPD and a valuable source of evidence-based knowledge. In addition, reflective practice, patient feedback, and audit outcomes were seen as important factors that could prompt the integration of EBP and CPD into daily practice. Nearly all participants viewed other professionals such as peers, radiologists, and (line) managers as valuable and primary sources of EBP and CPD. Advanced practitioners felt that they gained most insight from radiologists and immediate colleagues. Nevertheless, some participants noted that they could not rely on all their peers to discuss new practices, as this is dependent on their relationship with the peer, their peers' experience level and interest in EBP and CPD. These results suggest there is presence of reliance on peers and other professionals, aligning with previous studies that have reported similar results (Hayre *et al.*, 2018; Ramazan, Aarts and Widdowfield, 2022; Rawle *et al.*, 2023). For example, Hayre *et al.*, (2018) show that radiographers may rely on ‘’word of mouth’’ of peers and construct personal ideologies towards application of EBP rather than seeking existing evidence-base. Additionally, it suggests that practitioners infrequently engage with up-to-date, scientific literature, despite it being a core component and an essential requirement of EBP.

Irregular engagement in EBP and CPD has previously been observed among healthcare professionals, including radiographers (Harding *et al.*, 2014; Campos-Zamora *et al.*, 2022; Gleadhill *et al.*, 2022; Hakvoort *et al.*, 2022; Al Balushi, Watts and Akudjedu, 2024; Mun, Lee and Shim, 2024). Additionally, studies have demonstrated that a research-oriented culture is not yet universally established in radiography practice (Ooi, Lee and Soh, 2012; Turner, D’Alimonte and Fitch, 2013; Harris and Paterson, 2016; Garlock-Heuer and Clark, 2020; Moran and Davis, 2020; Bolejko *et al.*, 2022; Iweka and Hyde, 2023; Vils Pedersen, 2023; Watts and Snaith, 2023). For instance, inconsistent acceptance of research activities and irregular participation in initiatives such as journal clubs is observed among radiographers (Watts and Snaith, 2023). Additionally, the absence of a clearly defined pathway is identified as a common barrier (Chau *et al.*, 2022). Research has also shown that radiographers do not perceive research as their responsibility, or believe it should be conducted in collaboration with other healthcare professionals such as peers, physicians or physicists (Hafslund *et al.*, 2008). Notably, several studies have revealed that the research component is not considered a mandatory aspect of radiographers’ roles and responsibilities, and that radiographers may not perceive a need to engage in conducting or applying research projects. For example, Metcalf *et al.*, (2010) found that the majority of respondents (83%) reported an absence of pressure from their employer to conduct research, while 53% stated that research was neither a requirement nor a priority in their clinical roles. Correspondingly, Garlock-Heuer and Clark, (2020) found that 63% of radiotherapists who had not previously participated in research projects, believe that research is not a requirement of their role, which is the primary reason for their non-participation.

While these beliefs may be influenced by factors such as a lack of resources and time, they could also stem from a lack of confidence or low professional self-esteem. Ultimately, radiography has not long been fully recognised as a profession, and the development of the role is still ongoing (Field and Snaith, 2013; Knapp and Courtier, 2021; SoR, 2021). Nevertheless, increased confidence is observed among advanced practitioners, which may be linked to their higher degree of autonomy and ownership, involvement in clinical decision-making and their heightened awareness of research implementation. This suggests a potential shift in ownership toward the radiography profession, as radiographers are increasingly involved in developing the tools (e.g., protocols, policies and procedures) that shape and guide their clinical practice (Ramazan, Aarts and Widdowfield, 2022). This highlights the importance of empowerment and a culture shift, promoting research and EBP as radiographers' responsibility. It might therefore be beneficial for radiology departments to offer regular research-related training and education. However, this may need to be delivered in such a manner that reduces perceived hierarchies and encourages individual radiographers to take ownership and feel empowered to implement EBPs.

Ramazan and Graham (2025) propose several strategies for fostering an evidence-based culture, emphasising that leaders and managers play a key role through intentional leadership, supportive policies, and creating an environment in which EBP is valued, encouraged and sustained. According to the authors, leaders and managers may promote such a culture by: i) expanding their own knowledge and understanding of EBP, and leading by example by incorporating research, data, and evidence into both strategic and operational decision-making; ii) embedding EBP and CPD as fundamental organisational values; iii) deliver education and training to enhance the workforce's knowledge and understanding of the principles and benefits of EBP and CPD; iv) facilitate access to resources; v) promote (interdisciplinary) collaboration and communication, and support the development of interprofessional councils dedicated to sharing, evaluating, and implementing best practices; vi) develop a robust infrastructure for EBP and CPD that ensures organisational policies and protocols are based on the most current research and are regularly reviewed and updated; vii) creating a supportive environment where new ideas and change are openly welcomed, valued, and thoughtfully considered; and viii) incentivise and acknowledge efforts in EBP and CPD by celebrating achievements and providing opportunities for professional growth and development. These strategies offer practical approaches that can be considered and implemented in organisations contributing to the cultural shift required to enhance engagement, and further embed EBP and CPD in radiography practice.

5.1.5 Learning, knowledge sharing and promoting Evidence-based Practice in radiography

In the UK, radiography students typically spend approximately 50% of their time in clinical learning environments, where they develop professional knowledge and work to bridge the gap between theory and practice (Hyde, 2015; McNulty, England and Shanahan, 2021). This hands-on learning is supported by clinical radiographers, who share the practical expertise and knowledge essential for professional practice. Considering both the findings of this study and the preceding discussion, radiographers and technologists appear to often rely on their clinical expertise and department protocols, rather than research evidence. Additionally, they are also more inclined to act on guidance from their peers than acting on information found in journal articles, which may also affect students and new graduates. Although educators equip students and with the necessary skills to become evidence-based practitioners, strong social influences may lead them to quickly adopt the dogma of departments that often self-replicate and reinforce their practices as a result (Di Michele *et al.*, 2020).

As previously discussed, there also appears to be a prevailing perception within the profession that individual radiographers, particularly those who have not undertaken postgraduate education or do not practise in advanced roles, have limited ability to influence or change current practice. Previous research has demonstrated that despite the presence of evidence-based departmental protocols, radiographers may still revert to practices learned during their initial training, which may be outdated, rather than adhering strictly to updated departmental guidelines (McEntee and Kinsella, 2010). This poses challenges when best practices evolve over time, rendering the training radiographers and technologists initially received outdated. For example, latest guidance states that gonadal and foetal shielding for diagnostic imaging is no longer recommended (British Institute of Radiology, 2020). However, research suggests that practice has not yet fully shifted, with radiographers continuing to shield patients despite their department implementing a no-shielding policy (Ahern, McEntee and Moore, 2023; Girling, 2024). Therefore, although evidence suggests that shielding patients may be more harmful than beneficial, some radiographers opt not to adopt the evidence-based recommendation and persist with their traditional practices.

A complex professional culture may exist within radiography, characterised by the dominance of medical authority and an inclination toward protectionism. This includes deferring decision-making to radiologists and a tendency to adhere to referral patterns, even when radiographers believe a particular imaging test may not be appropriate (Di Michele *et al.*, 2020). Bairstow *et al.*, (2010) found that 56% of patients had evidence of inappropriate diagnostic practice prior to intervention, while a study by Sobiecka *et al.*, (2016) revealed that 6.54% of CT and MRI scans were either unjustified or had questionable justification. An example of this is unjustified abdominal x-rays on patients with acute abdominal pain (Di Michele *et al.*, 2020). While radiographers may attribute this to medical dominance, it is radiographers' professional obligation to justify examinations. Despite this requirement, the application of examination justification in practice remains inconsistent, resulting in up to 56% of examinations being deemed inappropriate and potentially harmful to patients (Vom and Williams, 2017).

These findings are consistent with the results of this study, which revealed a clearly defined hierarchical structure within clinical settings. Clinical assistants and assistant practitioners were observed to hold supportive roles, often relying on the direction of senior staff. In contrast, radiographers and technologists typically held additional responsibilities, such as overseeing fire safety or radiation protection. These practitioners, in turn, were frequently guided by clinical leads, managers, or radiologists in decision-making processes and in the dissemination of professional knowledge. Although not formally designated, participants described that certain staff members were nonetheless expected by their peers to share knowledge, an expectation often based on their advanced roles or a demonstrated interest in learning and professional development. While hierarchy can provide clear lines of responsibility and oversight, it may also hinder or delay the uptake of EBP approaches. This is evident in the study by Ramazan, Aarts and Widdowfield (2022), which identified the hierarchical structure within radiology departments as a potential barrier to the implementation of evidence-based optimisation strategies. There are several factors that may affect knowledge dissemination and implementation of EBP as a result of hierarchical structures within radiology departments. Firstly, hierarchies may discourage and disempower junior radiographers and technologists to question established practices or introduce new EBPs. Secondly, when decision-making is concentrated among senior staff, there may be an over-reliance on tradition or authority, rather than a critical appraisal of current evidence. Thirdly, the requirement for top-down approval for practice changes may delay the implementation of new evidence-based guidelines, especially if those in leadership roles are resistant or unaware of emerging evidence. Finally, dependency is inevitably created when only a limited number of individuals are considered ''knowledge gatekeepers'', or when the responsibility for knowledge sharing informally falls on those with advanced roles or a strong interest in research and development, as observed in this study. Such dynamics may lead to inconsistency in the dissemination and application of evidence across departments and hinder broader engagement with research and EBPs.

A clear distinction emerged between static, IDC, CDC, and mobile teams in terms of knowledge sharing and dissemination. Participants based at static sites, IDCs, and CDCs reported that they could often rely on their peers for learning and knowledge exchange. In contrast, this was less commonly experienced among members of the mobile team. While all participants enrolled in a course acknowledged the need to be proactive in managing their own learning, those part of the mobile fleet reported receiving less support. This may be attributed to the nature of mobile work, where frequent staff rotation may limit continuity and reduces opportunities to consistently learn radiography techniques from mentors or senior colleagues. Furthermore, mobile team participants explained that despite regularly travelling to support various healthcare organisations nationwide, they had minimal interaction with, or learning opportunities from, healthcare professionals at the host sites. In comparison, those based at IDCs or CDCs engaged more regularly with colleagues across different imaging modalities and supported one another in situations such as emergencies. However, knowledge sharing in these settings was generally limited to instances where colleagues were training within the same modality. Similarly, although staff based at static sites frequently interacted with professionals employed at the host location, these interactions rarely involved sharing knowledge specific to their modality or area of specialisation. These findings indicate missed opportunities for interprofessional learning and knowledge dissemination (Brown and Duguid, 2000). In particular, the mobile team, despite their exposure to a diverse range of clinical settings, represents a significant missed opportunity for informal learning and the exchange of professional knowledge with individuals beyond their immediate teams and organisation. Similarly, while practitioners at static and diagnostic centres engaged in routine interactions with colleagues across imaging modalities, these seem to be rarely leveraged for the purpose of sharing specialised knowledge unless formal training was involved. Such gaps suggest an underutilisation of the broader network of practice that exists across organisational boundaries, potentially hindering widespread of EBPs and innovation.

The restricted dissemination of knowledge and underutilisation of available evidence has far-reaching implications for a variety of stakeholders. Patients, healthcare organisations, policymakers, clinicians, educators, and researchers would benefit from a robust shift towards EBP. For example, in the case of the previously discussed evidence on unjustified abdominal imaging or CT and MRI scans, the consequences of not adhering to established best practices extend beyond patient dose, and other risks associated with those scans. Financially, the savings from reducing unnecessary procedures have implications both at the organisational level and, more broadly, within the healthcare budget (Morris-Stiff, Stiff and Morris-Stiff, 2006; Di Michele *et al.*, 2020).

Participants in this study have proposed several suggestions to promote knowledge dissemination, EBP and CPD. As previously mentioned, formal training such as attending courses or conferences was regarded as essential for promoting EBP and CPD. Some participants advocated for the reintroduction of in-house training programmes or a dedicated training department, which was previously offered within the organisation to support education, knowledge dissemination, and CPD. Additionally, the participants highlighted the potential of forums and journal clubs, which could be implemented at a departmental and/or organisational level. The design of such programmes could involve collaboration with host sites, the SoR, and academic institutions to enhance communication, interprofessional collaboration and foster the dissemination of knowledge, innovation, and EBPs across a broad range of stakeholders. An internal training department can be highly beneficial, as it fosters a culture of continuous learning while delivering tailored programmes that address the specific needs of the organisation. Investing in training and development yields numerous benefits, including enhanced employee retention, elevated staff morale, increased job competency, greater operational efficiency, and consequently, improved patient satisfaction (Gesme, Towle and Wiseman, 2010).

This brings attention to a key observation made: the critical role of strong leadership. Participants emphasised that effective leadership is fundamental to promoting and sustaining a culture of EBP and CPD. Strong leadership involves not only ensuring access to necessary resources including time and information but also demonstrating commitment through personal example. Leading by example requires leaders to possess a solid understanding of EBP and to actively integrate it into their own professional practice. Derived from EBM, the concept of evidence-based management (EBMgt) has been introduced into the scientific literature to support informed leadership practices. Comparable to EBP, EBMgt is an approach to decision-making that emphasises the use of the best available evidence to guide management practices. It involves integrating data from scientific research, internal organisational metrics, professional experience, and stakeholder input to make well-informed decisions that enhance performance and outcomes (Walshe and Rundall, 2001). When applied to healthcare organisations, EBMgt may offer several advantages, including a top-down approach to informed, high-quality decision-making, and contribute to the enhancement of organisational resilience and adaptability (Ledger, 2010). Furthermore, the adoption of EBMgt may encourage critical reflection on current processes through which clinical evidence is translated into practice. It may provide a framework for identifying opportunities to make these processes more accessible and applicable to healthcare professionals, thereby facilitating the integration and sustained implementation of EBPs.

Half of the participants expressed the view that greater enforcement is required to promote engagement with EBP and CPD, whether through institutional policies, employer initiatives, or regulatory bodies such as the HCPC. Suggestions included making CPD participation compulsory or implementing departmental-level monitoring and review processes for EBP and CPD activities. Among these participants, some emphasised that responsibility should not rest solely with the individual practitioner; rather, employers should also be held accountable by providing incentives or allocating dedicated time and resources to support professional development. Conversely, other participants cautioned that increased enforcement could undermine intrinsic motivation and potentially foster a negative, long-term relationship with EBP and CPD. They argued that engagement in CPD should remain a voluntary and self-directed component of professional practice. Currently, allied health professionals, including radiographers registered with the HCPC are mandated to undertake CPD as a condition of ongoing registration (HCPC, 2018b). This requirement is intended to ensure that practitioners maintain competence and continue to develop professionally. To monitor compliance, the HCPC conducts periodic audits by randomly selecting a proportion of registrants at the point of registration renewal. Selected individuals are required to submit a CPD profile that evidences their learning activities and demonstrates how they meet the HCPC's

CPD standards (HCPC, 2018d). However, this study raises concerns regarding the effectiveness of this periodic, random audit approach employed. Participants reported inconsistent or absent documentation of CPD activities, despite this being a key requirement of the regulatory framework. These findings are suggestive of potential limitations within the existing HCPC audit structure, particularly its reliance on retrospective documentation as a principal indicator of compliance. This retrospective approach may compromise professional accountability as it fails to adequately support the continuous monitoring of developmental progress, and increases the risk of deficiencies in the skills and knowledge necessary for the provision of safe, high-quality patient care. This links to studies suggesting that radiographers can have a limited perspective on what constitutes CPD, and face several constraints to engaging with CPD including negative attitudes, limited time and staffing pressures despite CPD being a well-established requirement set by regulatory bodies (Henwood and Flinton, 2012; Grehan *et al.*, 2018; Grehan, Rainford and Ryan, 2023).

The above argument and findings of this study raise important questions regarding the suitability of the current CPD audit model, suggesting a potential need for restructuring. Specifically, consideration of a more formalised and continuous approach to monitoring CPD and EBP activities, alongside the existing random audit process. Such an approach could be implemented at the organisational or departmental level, or modelled after the system used by the General Medical Council, where a defined number of CPD hours must be completed over a specified period, with activities informed by objective practice data and subject to annual evaluation by an appraiser (Karas *et al.*, 2020). Integrating CPD within formal appraisals at a local level may not only involve employers, encouraging them to support staff in meeting CPD requirements to ensure their continued employment, but also enhance professional learning and accountability through sustained oversight of CPD and EBP engagement.

5.2 Adapting to change: artificial intelligence, role evolution and the future of radiography practice

This section explores the future of the radiography profession, with a particular focus on the impact of AI on the discipline, as well as the evolving roles and expanding scope of practice for radiographers. Furthermore, this section presents a series of recommendations aimed at preparing the radiography profession for the anticipated technological advancements that may shape future practice.

5.2.1 The role of artificial intelligence and technology

AI is defined as ‘'the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages'’ (Malamateniou *et al.*, 2021). In the recent years, AI has evolved into an umbrella term encompassing a wide range of technologies involving machine based decision-making at their core. As previously discussed, radiography is a dynamic and evolving profession, representing a synergy between patient safety, patient care, and the integration of technology as a fundamental component of practice. Considering the fields of medical imaging and therapy, early forms of AI-supported technologies were often described using terminology such as computer-aided diagnosis or computer-aided detection (Boone *et al.*, 2015). Today, AI is increasingly integrated into both diagnostic and therapeutic radiography, supporting various aspects of radiology including workflow management, therapy planning, data reconstruction and post-processing, image quality as well as contributing to improving diagnosis and treatment (Malamateniou *et al.*, 2021).

Taking CT as an example, inaccurate patient positioning associated with incorrect vertical centring due to variations in patient body morphology remains a major contributor to poor image quality, increased radiation exposure, and the need for repeat examinations. Booij *et al.*, (2019) investigated the use of a 3D camera system to acquire patient positioning data, enabling AI to generate a 3D mesh of the patient's body, identify the iso-centre automatically, and automate the vertical alignment of the CT couch. Although not without limitations, the automated AI system demonstrated greater accuracy than manual positioning by radiographers, with the potential to enhance image quality and reduce radiation dose. Continued computational advancements may enable the reconstruction of more precise 3D body models from 2D images, supporting broader implementation of such technologies across cross-sectional imaging modalities. Similarly in MRI, AI algorithms and deep learning techniques are increasingly applied to accelerate image acquisition and enhance image quality contributing to improved accuracy, efficiency and workflow optimisation in MRI departments (Kiryu *et al.*, 2023; Najjar, 2023). Similar applications of AI are demonstrated across various modalities including ultrasound, radiotherapy, mammography, nuclear medicine and even the generation and interpretation of radiology reports (Liu *et al.*, 2019; Sheng, 2020; Bai *et al.*, 2021; Najjar, 2023). A unifying feature of these implementations is the contribution of AI to the standardisation of clinical practice, promoting greater efficiency and streamlined workflows within diagnostic and radiotherapy services (Malamateniou *et al.*, 2021).

In this study, the majority of participants acknowledged the growing influence and significance of AI and technological advancements within the field of radiography. Those with extensive experience reflected on the considerable technological progress witnessed over the years, noting that several core responsibilities of a radiographer, such as positioning and image planning, manual film development, exposure setting adjustments, and image quality checks, have become increasingly automated. While participants generally anticipated a continued expansion of AI integration, they also emphasised the importance of patient interaction and the patient-facing dimensions of the role for the delivery of patient-centred care. The integration of AI is expected to further evolve and redefine the role of the radiographer. As previously mentioned, the profession has already undergone significant change with the adoption of PACS and digital radiography, which have eliminated the need for film processing and computed radiography cassette handling, therefore reshaping core responsibilities and streamlining workflow of radiographers (Bansal, 2006). Integration of AI may change the manner in which care is provided to patients, and influence the expectations of service users regarding healthcare professionals and the service delivery. One of the anticipated benefits of AI integration may be the possibility of enabling healthcare staff the ''time to care'', a development that may be particularly significant in addressing the previously discussed evolving demands and challenges projected for future healthcare delivery (Malamateniou *et al.*, 2021). However, this is based on the assumption that the aspects of patient communication and interaction require human involvement, and that only appropriately trained staff can deliver such engagement. An American study by Chai *et al.*, (2021) explored patient perceptions of remote and robot-enabled communication in emergency care settings. The study (n=1154) found that overall acceptability was high, particularly for non-invasive aspects of care such as robot-assisted triage and history taking (65% acceptance), and contactless vital signs assessments (76% acceptance). In contrast, acceptability among participants decreased for more invasive procedures. Notably, the participants in the survey sample were predominantly white (71%) and degree-level educated (67%), with a mean age of 48 years. Additionally, it is arguable whether the results are generalisable to the broader population or to individuals referred for medical imaging, as acceptability may vary depending on the type of examination, particularly in procedures involving patient positioning for projectional radiography.

Whilst communication is considered key to a high-quality care experience, interactions may not always be with a human, and the impact of COVID-19 has accelerated and enabled this shift (Hyde and Hardy, 2021). The need for social distancing and the increased reliance on remote consultations during the pandemic have already changed how patients and healthcare staff interact. In the context of medical imaging, a study by Shi *et al.*, (2021) proposed a fully non-contact, AI-driven CT imaging pathway for patients with COVID-19. This model could potentially be applied to other imaging modalities, with AI technologies supporting the optimisation of patient throughput and workflow efficiency while guiding, and communicating with patients via smartphone applications or similar digital tools. Notably, studies have already demonstrated the potential of online interventions to effectively address the psychosocial needs of cancer survivors (Skrabal Ross *et al.*, 2020).

At a broad level, it can be argued that elements of AI have been present in medical imaging for decades, making the continued integration of AI into the profession likely unsurprising to many radiographers. After all, radiography as a profession is inherently dependent on imaging technology; and without the means to acquire and view medical images, neither radiography nor radiology would exist. This aligns with the findings of this study, in which some participants expected the integration of AI, viewing it as an inevitable development within the technologically driven field of radiography and a potential tool for enhancing practice and improving patient outcomes. Radiographers may anticipate the integration of AI in their practice, given that automation in radiography can be traced back to the 1980s with the introduction of automatic exposure control devices in projectional imaging (Sterling, 1988). The automatic exposure devices allowed radiographers to select the kilovoltage for an x-ray, while the device determined the optimal quanta, terminating the exposure once a sufficient number of x-ray photons had reached the film to produce a diagnostic image. Although it did not interpret or diagnose images, it effectively transferred part of the decision-making process from the radiographer to the machine, as the machine could make this decision more accurately, reducing repeat exposures due to incorrect settings and optimising radiation dose for patient safety. Radiographers widely accepted and adopted this technology, recognising the benefits in improving image quality and patient care (Hardy and Harvey, 2020).

Given the core tasks performed by radiographers in cross-sectional imaging, including patient checks (such as request vetting), image planning, image acquisition and post-processing, and mapping this against areas identified for potential AI automation, it becomes evident that AI is well-positioned to significantly enhance and support the radiographer's role (Hardy and Harvey, 2020). However, if full automation is achieved, it could substantially diminish existing radiographer responsibilities. The expansion in both the scope and complexity of imaging examinations and interventions, along with the rising demand for medical imaging, is arguably a consequence of the advancements in imaging technology and computerisation (European Society of radiology, 2010; Care Quality Commission, 2018). While it is understandable that healthcare organisations are eager to explore the effects of AI in maximising efficiency and throughput and use this as an opportunity to respond to the imaging demands, it is equally critical to acknowledge and appropriately manage the associated risks and potential liabilities. Current regulatory frameworks mandate rigorous human oversight and auditing of clinically deployed AI systems, meaning vendors are currently limited to developing tools that require a defined level of human supervision (Hardy and Harvey, 2020). This presents a new challenge for the radiography profession: radiographers must now develop the skills necessary to engage with and oversee AI-driven, semi-automated processes.

5.2.2 The future role of the radiographer

The next generation of AI-driven systems in diagnostic imaging is likely to significantly influence radiography practice across imaging modalities, reshaping the roles and responsibilities of radiographers (Al-Naser, 2023). However, as previously discussed, the radiography profession has a long history of adapting to technological advancements, particularly when such changes have been beneficial to patient outcomes and align with the profession's commitment to delivering high quality care. While large-scale qualitative evidence of AI's clinical impact remains limited, the rapid pace of development in this field indicates that widespread adoption is likely

(Hardy and Harvey, 2020; Mello-Thoms and Mello, 2023; Buijs *et al.*, 2024). Radiographers must therefore be prepared to embrace the opportunities AI presents, while continuing to uphold the core professional value of patient-centred care.

In addition to improving efficiency and increasing patient throughput, the integration of AI, when aligned with principles of patient-centred care and precision medicine may have the potential to deliver faster, more seamless, and user-friendly clinical service that keeps the patient at the centre of care (Chaddad, Katib and Hassan, 2021; Schuur, Rezazade Mehrizi and Ranschaert, 2021; Van Leeuwen *et al.*, 2022). However, the application of AI has to be delivered with care, and in such a manner that it benefits the service, patients and healthcare professionals. Malamateniou *et al.*, (2021) outline several key priorities that should be addressed before implementing AI within radiology departments including robust validation of AI tools on real-world data; more interdisciplinary, prospective research; more comprehensive regulatory frameworks to ensure the safe and effective use of AI products; active involvement of practitioners, patients, and carers in AI design and its implementation; development of explainable AI solutions; clear medicolegal frameworks and accountability; targeted AI evidence-based education for healthcare professionals including radiographers and radiologists; transparent processes to build patient trust and acceptability; and defined career pathways and role expansion for practitioners in an AI-driven future.

This study shows that some participants viewed AI as an immediate threat that could replace radiographers, while others believed that it may significantly transform the profession, requiring radiographers to adapt, acquire new skills, and adjust to evolving roles and responsibilities as they work alongside AI technologies. Some participants felt that this could lead to a significant shift in roles within radiology departments, with care assistants and assistant practitioners taking on operational tasks traditionally performed by radiographers, while radiographers move into supervisory positions or begin to take on responsibilities typically associated with radiologists. For example, some participants emphasised the growing potential for remote work, and the expansion in advanced practice roles, along with a shift in the requisite knowledge, including pathology recognition and enhanced clinical expertise. Remote working, or teleradiology, is already common in radiology, allowing (outsourced) radiologists to interpret medical images from a distance, offering benefits such as increased accessibility, efficiency and flexibility to both radiologists and patients (Callaway *et al.*, 2021; Obayi *et al.*, 2024). Similarly, remote reporting is also becoming increasingly common among reporting radiographers (Pedersen *et al.*, 2024; SoR, 2024). Notably, remote scanning support has also been introduced and is currently a topic of discussion in the literature, particularly in MRI (Quinsten, Apel and Oliveira, 2023). This system involves radiographers conducting examinations from locations outside the traditional control room, such as from home, an office, or dedicated scanning hub. Using specialised software, radiographers can connect to any MRI scanner virtually from any location, allowing them to either support onsite colleagues or perform the examinations themselves (Hudson and Sahibbil, 2022). This suggests that a shift is already in progress, with the potential for widespread adoption driven by the increasing demand for medical imaging services linked to a growing and aging population.

Based on the above discussion and the predictions outlined by participants suggest that radiographers are likely to undergo significant transformation due to the influence of AI. While AI may not fully replace radiographers, it is expected to serve as a valuable supplementary diagnostic tool that enhances practice (Hardy and Harvey, 2020; Stogiannos *et al.*, 2025). While some traditional tasks, including labour intensive and repetitive activities may become redundant, the developments may also present opportunities for new or expanded roles within the profession. Situated at the intersection of patient care and technological innovation, radiographers are uniquely positioned to serve as intermediaries between complex technological systems and patients, improving communication, and enabling personalised care (Malamateniou *et al.*, 2021). The integration of AI also presents the opportunity to rethink and redesign existing career pathways in radiography. Currently, career progression is often associated with competency in specific imaging modalities (e.g., higher banding when competent in cross-sectional imaging) (Friel *et al.*, 2025). However, as user-interfaces develop and AI increasingly support image acquisition and interpretation, traditional distinctions between modalities (e.g., projectional radiography and cross-sectional imaging) may diminish. Instead, a new divide may emerge between radiographers who possess expertise in AI technologies and their clinical applications, and those who do not (Malamateniou *et al.*, 2021). This shift could redefine advancement within the new profession, with AI literacy becoming a key factor in career development (Doherty *et al.*, 2024).

As previously discussed, the integration of AI may not only reshape routine clinical tasks, but also create new opportunities for advanced practice roles, shifting the profession towards more complex, analytical, and leadership-based responsibilities.

For example, radiographers may increasingly participate in image interpretation and support clinical decision. In the UK, the reporting of diagnostic images by appropriately qualified radiographers has been an area of role development for more than two decades (The College of Radiographers, 2010).

Over time, distinct levels of professional development in radiography have been recognised, including enhanced practice, advanced practice, and more recently, the increasingly prominent consultant-level practice (see Table 5.1). While this activity mainly relates to projectional radiography, mammography and sonography, evidence suggests that, with appropriate training and support, radiographers can effectively contribute to radiology reporting across a broad range of imaging modalities, and as such activity has been increasingly discussed in the recent years (i.e., cross-sectional imaging interpretation, broader scope of practice, increased reporting workload) (Snaith, Hardy and Lewis, 2015; Woznitza *et al.*, 2021; Wood, 2022; Brage *et al.*, 2025).

Table 5.1 Advanced levels of practice in radiography

Based on information of Society of Radiographers, 2020

Level of practice	Description	Education required
Enhanced practice	Performs additional skills or tasks beyond initial radiography training, often within a defined protocol and under supervision.	PgCert or PgDip
Advanced practice	High level of practice requiring expert clinical knowledge and decision-making with leadership, education, and research responsibilities.	PgCert, PgDip or MSc
Consultant practice	Clinical expert with leadership, education, and research responsibilities. Operates independently, often alongside consultant radiologists. The consultant radiographer role requires the ability to drive innovation, inspire, and influence both local and national healthcare agendas.	MSc or Doctorate

Despite the acknowledged value of reporting radiographers and plans to further expand the reporting radiographers' workforce to respond to healthcare demands, concerns persist within radiology circles (Hardy and Harvey, 2020; Murphy, Nightingale and Calder, 2022). Creating systems that (re-)assess diagnostic images could help address some of the concerns and potentially offer a more cost effective alternative to sole image interpretation by a radiologist or radiographer, particularly for high volume modalities such as chest radiography, CT lung screening and screening mammography (Ritchie *et al.*, 2016; Seah *et al.*, 2021; Khalifa and Albadawy, 2024). Accordingly, AI offers an opportunity to respond to the reporting backlogs or workforce challenges, and research can be conducted to explore AI supported reporting services, and create implementation plans ensuring seamless and consistent implementation of AI supported radiography services (Hardy and Harvey, 2020; Rainey *et al.*, 2022). Integrating AI could potentially also support radiographer-led services, including immediate reporting services improving healthcare outcomes, efficiency and cost (Hardy, Hutton and Snaith, 2013; Shepherd, Lourida and Meertens, 2022).

5.2.3 How can we prepare for the future?

The continued development and integration of AI in the radiography profession is inevitable, and to ensure appropriate and transparent use, AI systems should be designed in such a manner that the decision-making process is transparent and explainable (Malamateniou *et al.*, 2021). The widespread implementation of AI presents significant opportunities for increased autonomy and self-definition (Hardy and Harvey, 2020). However, radiographers will need to embrace changes to the profession and work with AI in supervisory roles to fully harness its potential as a supportive tool. Achieving this requires not only an understanding of AI techniques and applications, but also maintain a strong foundation in fundamental imaging principles, enabling radiographers to serve as validators of AI technologies (Aldhafeeri, 2024). This knowledge is also essential for contributing to quality assurance and control of AI-powered software and hardware. Equipping the profession with the necessary skills to engage with such technologies and the related processes could enable the role of the radiographer to expand into a profession that drives improvements in the delivery of imaging services, including greater cross-modality expertise and extended scopes of practice that contribute to improved patient outcomes.

Understanding of AI and its workings requires knowledge which must be acquired through education and involvement in AI research and innovation. If AI becomes an integral part of the radiography profession, it may be essential for pre-registration radiography curricula to include the fundamentals of AI, including its subsets of machine- and deep learning (Hardy and Harvey, 2020; Najjar, 2023). This is a critical measure, ensuring that radiography graduates are equipped with a solid understanding of AI, enabling them to interact with the technology confidently and safely, while maximising its potential in clinical practice. Additionally, with the increasing demand for medical imaging, radiographers may need to develop a broad range of modality and technology-interfacing competencies. Therefore, it may be reasonable to expect radiography graduates to possess the foundational skills necessary to operate and supervise image acquisition across multiple imaging modalities, thereby increasing workforce flexibility (Hardy and Harvey, 2020).

In addition to incorporating AI modules into the radiography curricula, the ongoing evolution of AI technologies will necessitate CPD for radiographers (Van De Venter *et al.*, 2023; Doherty *et al.*, 2024). This will be essential for keeping pace with advancements in imaging techniques, algorithms, and AI tools. Such training may encompass both the technical aspects of AI systems and their clinical applications, as well as an understanding of their limitations and the risks of potential bias. To enhance CPD, learning and knowledge dissemination in the future, participants identified several strategies including increased access to essential resources such as time, information, support, and professional empowerment. These resources have previously been identified as barriers to EBP and CPD, and studies have made several recommendations to removing the obstacles (Brettle, 2020; Bolejko *et al.*, 2022; Di Michele *et al.*, 2024). Additionally, participants deemed the establishment of support networks and strengthened interconnectivity, both within the organisation and across the wider radiography profession critical. In particular, the utilisation of online platforms facilitating rapid information exchange was highlighted as a means of fostering collaboration and contributing to the development of a more cohesive and knowledge-oriented radiography workforce. As the profession advances toward an increasingly technology-driven future, promoting knowledge dissemination through online platforms may offer a valuable way of maintaining connectivity, not only within the radiography discipline, but also across regions and within individual organisations. This approach may be particularly valuable for organisations with a geographically dispersed workforce, such as AML. When appropriately monitored and managed, such online platforms may not only enable rapid knowledge exchange and problem-solving, but also support EBP, CPD, and the development of an online CoP.

5.3 Application and implications of Communities of Practice: insights across sectors and relevance to radiography

As previously discussed, a CoP may emerge organically through individuals with a shared interest in a particular domain, or it can be intentionally arranged to facilitate the exchange of knowledge and expertise within a specific field (Wenger-Trayner, 2015). A CoP must possess three defining characteristics to be recognised as such: i) a domain comprises individuals whose identities are shaped by a shared area of interest, expertise, and commitment (i.e., practitioners). It establishes common ground, guides learning, and gives purpose and meaning to participants' engagement within the community; ii) the community component provides the social structure that enables learning through sustained interaction and relationships.

Participants engage with the community by pursuing their interests through collaborative activities, discussions, problem-solving, information exchange, and the development of interpersonal relationships; and iii) the practice encompasses a shared repertoire of resources including ideas, experiences, and information. Fundamentally, it represents the collective knowledge that the community seeks to develop, disseminate, and sustain over time. This section explores the research findings in the context of CoPs, examines how the theory is applied in other sectors, and considers its potential benefits for healthcare, with a focus on radiography.

5.3.1 Integrating theory into business practices

The concept of CoPs, along with its variations, has been successfully applied across a range of sectors, most notably in government, education, and business (Wenger, 2004). Applied to businesses and organisations, the strategy has been implemented with the aim to improving organisational performance. It is promoted as a key enabler of knowledge management, facilitating the sharing of tacit knowledge, fostering innovation, reducing the learning curve for new employees, and contributing to the development of social capital, thereby enhancing organisational value (Ranmuthugala *et al.*, 2011). From this perspective, an organisation's knowledge resides within a constellation of CoPs, each responsible for nurturing a specific area of expertise essential to the organisation's overall competence. However, attributes that make CoPs well-suited to knowledge stewardship such as autonomy, practitioner-orientation, informality and crossing boundaries, are also characteristics that may be challenging for traditional hierarchical structures (Wenger, 2004). Nevertheless, numerous case studies have demonstrated how CoPs effectively supported knowledge sharing, innovation and organisational learning across various fields including aerospace, software development, hospitality, information technology and the automotive industries (Wolf, Späth and Haefliger, 2011; Topousis, Dennehy and Lebsock, 2012; Pandey and Dutta, 2013; Sporsem *et al.*, 2021; Almeida and Campos, 2022).

A notable example of CoPs in a business context is Raytheon, a global supplier of defence and aerospace systems. In the late 1990s, Raytheon faced significant challenges, including the consolidation of four acquired companies and the need to coordinate a dispersed workforce operating across multiple time zones and geographic regions (National Academies of Sciences, Engineering, and Medicine, 2005). These challenges were compounded by a plummet in the company's stock price, coupled with a decline in the broader stock market. This prompted leadership to rethink its traditional hierarchical structure, into a new structure that was more fluid and capable of collaborating and learning across many diverse boundaries. Therefore, Raytheon's pursued an approach focusing on a collaborative culture built around three core strategies: i) the companywide adoption of Six Sigma culture, which established a common language and culture across the merged entities; ii) implementation of low-cost web-based collaboration tools, such as e-Room and QuickPlace to facilitate communication and teamwork; iii) and the introduction of a CoPs model, which promoted the sharing of best practices across organisational boundaries, leading to the establishment of Raytheon Integrated Logistics Community of Practice. It is noteworthy that Raytheon exemplifies a model in which organisational transformation is initiated through social and cultural change, with technology introduced subsequently to support and enhance these developments. Given that technological systems are often viewed as more adaptable and less constrained by existing social structures, this suggests a potential orientation toward designing technological tools around group needs and dynamics, rather than reshaping social systems to align with technological frameworks (Baxter and Sommerville, 2011). Through this integrated approach, Raytheon successfully fostered a culture of collaboration and fast dissemination of best practices, expertise and tacit knowledge, positioning itself to operate more effectively in a complex and dynamic business environment (Su, Wilensky and Redmiles, 2012).

A comparable example to Raytheon is the case of the National Aeronautics and Space Administration (NASA), as discussed in the article by Topousis, Dennehy and Lebsock, (2012). In the mid-2000s, NASA encountered significant challenges related to knowledge sharing, largely due to the geographic dispersion of the field centres, inhibiting its engineers from sharing their expertise, experiences, ideas and lessons learned. The organisation’s strong centre- and project-oriented culture further impeded the diffusion of knowledge, limiting collaboration between centres and contributing to the emergence of distinct identities and cultures within each location. However, due to the increase in complex missions, constrained project resources, and the influx of a new generation of engineers entering the workforce, the need to foster a more integrated and collaborative environment was required. In response, NASA established the NASA Engineering Network (NEN), a CoPs designed to connect engineering staff across all centres. The NEN provides a suite of information retrieval and knowledge-sharing tools, with a strategic focus on the agency’s core competencies. Key features of the network include access to official lessons learned databases, case studies, organisational charts, a cross-repository search function, and CoPs, which facilitate the collective enhancement of collaboration and organisational learning across the agency. Considering NASA’s geographically dispersed workforce, the community was established primarily in an online format. The NEN is designed to be accessible to all personnel within NASA’s secure network, providing a standardised and user-friendly platform for collaboration and knowledge sharing. This was accomplished by maintaining a consistent interface across the platform, thoughtfully curated by the NEN team, with standardised colour schemes, navigation, and layout. To ensure sustained engagement, content on the platform is regularly updated by the community leaders and the team, with notifications sent via email to inform users of new additions. Although sites are overseen by designated leaders, the communities are intended to operate in a non-hierarchical manner. Engineers are encouraged to participate in discussions, ask questions and interact with peers as their schedules permit. A notable advantage of this CoPs model is its ability to foster new relationships among members. The platform supports mutual learning, allowing individuals to connect, exchange knowledge, and guide one another in accessing resources or expert insights within the community. CoPs have proven valuable to NASA, who currently operate multiple CoPs across its many centres and disciplines, and has continued to expand and develop these communities and networks (Topousis, Dennehy and Lebsock, 2012; National Aeronautics and Space Administration, 2025).

Similar to businesses, government organisations encounter increasingly complex and large-scale knowledge management challenges. Hence, CoPs have been adopted for similar purposes across various government settings (Wenger, 2004). Beyond internal communities, typical government challenges such as education, health, and security, require coordination and knowledge sharing across various levels of government. In such settings, CoPs hold considerable promise in facilitating connections and collaborations across formal institutional boundaries (Iaquinto, Ison and Faggian, 2011; Kothari *et al.*, 2015; Carroll and Crawford, 2024). Similarly, educational organisations are increasingly challenged by the complexities of knowledge diffusion. Early applications of CoPs in education focused on teacher training and connecting professionally isolated administrators with their peers (Wenger, 2004). These peer-to-peer professional development initiatives have gained significant interest in the recent years (Acar and Yıldız, 2016; Arslan Dönmez and Şahin, 2022; Talafian *et al.*, 2025). However, unlike in business or government, in which CoPs primarily serve to enhance performance or decision-making, education presents a unique context in which learning is not a means to an end, but the ultimate goal. As such, the foundational principles of CoPs are particularly well-aligned with the core mission of educational institutions.

As previously discussed, key attributes associated with CoPs include autonomy, practitioner-orientation, informality and boundary-crossing. These features may appear to conflict with the norms of traditional, hierarchical organisations such as government agencies, businesses and healthcare institutions where authority and workflow are highly regulated by formal structures. However, it can be argued that such organisations in particular may benefit from the presence of informal, parallel social systems that facilitate experiential learning, trust-based knowledge exchange, and horizontal learning. These informal networks are not only resilient, but also adaptative, which could potentially serve as catalysts for (rapid) organisational learning and innovation that formal mechanisms alone cannot deliver. As previously discussed, the advantages of CoPs have been observed in other large, hierarchical, and geographically dispersed organisations, and may likewise prove beneficial within highly regulated and structured healthcare environments.

5.3.2 Communities of Practice in radiography

The term CoPs has been increasingly recognised by the healthcare industry as a means to share knowledge, question, collaborate and learn (SoR, 2020a; NHS, 2024). While there is general agreement regarding the essence and potential of CoPs in healthcare settings, its application remains underutilised and insufficiently integrated into healthcare settings. Although networks may naturally occur in healthcare, professionals may be connected by referral, rather than relational pathways with objectives that of CoPs. Additionally, the attempted networks created share some characteristics with CoPs, however, their potential remains largely under-researched; consequently, their benefits in knowledge transfer, organisational culture and performance are yet to be fully realised (Ranmuthugala *et al.*, 2011; James-McAlpine, Larkins and Nagle, 2023). Furthermore, little primary research is conducted examining the extent of learning, engagement, personal or professional development in the healthcare sector (James-McAlpine, Larkins and Nagle, 2023).

In radiography, the SoR has established Specialist Interest Groups (SIGs) to connect individuals with the same interests, such as reporting radiographers or those involved in radiotherapy. The activities within the SIGs include in-person or virtual meetings, social media groups, events and study days, which appear to have similar purpose and principles to CoPs (SoR, 2020b). A comparable concept is also employed by The Royal College of Radiologists (The Royal College of Radiologists, 2025). Another related initiative is Rad Chat, a radiographer-led oncology podcast designed for patients, healthcare professionals, academics and researchers, with the aim to bring views, experiences, skills and knowledge to conversation (McNamara and Julka-Anderson, 2023). Additionally, online searches identified evidence of some local and regional CoPs (Applied Research Collaboration and North East and North Cumbria, 2024). Beyond these more formal structures, informal radiography-related communities have also developed across platforms such as Facebook, Reddit and LinkedIn, where individuals connect and share knowledge and advice on topics such as patient safety. While these networks appear to reflect characteristics and purposes of CoPs, there is limited research on how they are operationalised, its prevalence, recorded benefits and level of participant engagement.

This aligns with findings of this study, in which most participants did not have knowledge or understanding of CoPs, which suggests that although universities and professional bodies such as the SoR recognise its potential benefits, awareness and implementation of the theory have yet to reach the radiography workforce. When the theory was described to the participants, nearly half believed that CoPs naturally develop as individuals share their knowledge and learn from each other in daily practice. Interestingly, observational data showed that the clinical team was primarily focused on efficiency, correct patient preparation, image acquisition techniques, streamlined image post-processing, and utilising technology such as PACS and RIS to manage patient and image data effectively, while adhering to safety and imaging protocols and quality standards. This suggests that clinical staff may primarily focus on the immediate task, procedure or challenge in practice, rather than sharing learning or insights that are not directly related to the task at hand. Additionally, sharing of knowledge and teaching primarily occurred with trainee staff or students, or when handling unusual or complex cases to ensure optimal image quality.

Accordingly, participants reported rarely sharing or discussing any radiography-related information outside of their workplace, suggesting that, contrary to the CoPs theory, neither a sustained ‘’community’’ nor a shared ‘’practice’’ currently exists within radiography.

When the concept was explained, most participants responded positively to the idea of developing CoPs, recognising its potential benefit for sharing knowledge, ideas and EBPs with fellow radiographers, whether through virtual means (e.g., video conferencing technology, an online monitored platform), or in-person attending meetings, gatherings or conferences. However, some participants emphasised the importance of making the CoPs appealing, cautioning that without a clear structure, it may become sessions in which individuals discuss workplace dissatisfaction or grievances. This aligns with a study by Yada and Head (2019), who found that motivation and ability positively influence the implementation of virtual CoPs in healthcare. The results showed that individuals who perceived CoPs as relevant to their work were more likely to develop a positive attitude toward the system and showed a stronger intention to participate. Additionally, participants highlighted the need for the CoPs to be sustainable, manageable and practicable to ensure it is easily combined with individuals’ home life and working patterns. This point is vital, as overlooking practical constraints risks replicating the well-documented barriers related to engagement with EBP, CPD, and other implementation or knowledge diffusion frameworks. As previously discussed, these obstacles often stem from time constraints, workload pressures and lack of support, which could potentially also hinder participation and long-term commitment in CoPs. Therefore, such factors must be carefully considered in the design and implementation of CoPs to promote long-term viability and meaningful involvement. Practical considerations include the frequency and format of the meetings. Participants acknowledged the value of both in-person and virtual CoPs, with virtual formats offering greater accessibility and flexibility, while in-person meetings supporting stronger relationship-building and improved engagement. Most participants recommended holding CoPs every three to six months depending on the groups' needs and the chosen format, and emphasised the importance of strong leadership and dedicated facilitators to support ongoing participation.

Participants noted that CoPs may offer benefits beyond individual knowledge and practice, positively impacting the organisation and the radiography field by fostering a culture of continuous learning, enhancing collaboration, enabling rapid problem-solving and driving innovation. Most participants supported involving other departments, host sites, and professionals in CoPs, forming broader networks or Landscapes of Practice. They particularly perceived value in including NHS staff to improve collaboration, align with (host) site expectations, and access to greater expertise from sites that handle more complex radiography cases. While participants valued input from other disciplines to support cross-disciplinary learning, radiologists were viewed as key contributors, offering feedback on image quality, pathology and clinical context. Additionally, participants also highlighted the value of involving universities to share evidence-based knowledge, and vice versa, offer clinical insights that could guide future research. Cross-disciplinary learning and professional networks in healthcare are widely discussed in literature and supported by organisations such as the World Health Organisation, NHS and HCPC, with the aim to improve patient care through holistic, collaborative decision-making (World

Health Organisation, 2010; Cunningham *et al.*, 2012; Dawe, Cronshaw and Frerk, 2024). Reported benefits include improved communication, reduced professional silos, and greater sharing of knowledge and best practices, ultimately fostering stronger interprofessional relationships, greater resilience, and more efficient, standardised care (Stephens, Robinson and McGrath, 2013; Sutherland *et al.*, 2022; Agyekum *et al.*, 2023).

In summary, this section indicates that while there are efforts to establish CoPs and NoPs in healthcare and radiography, many of these initiatives only share some elements of a true CoP. Additionally, there is limited research on how these CoPs function, their prevalence, recorded benefits and levels of participants engagement. In radiography specifically, the attempted CoPs appear to be driven at a higher level, with great awareness and support from universities, professional bodies and regulators. However, findings from the current study suggest that the concept has not yet reached the workforce and is therefore not established as part of radiography practice. Creating a (virtual) NoP within healthcare organisations such as AML can be valuable due to the geographically dispersed nature of services, enabling rapid problem-solving, continuous clinical support, and promote standardised care across the organisation. This approach could also benefit the NHS as Trusts often operate independently, and regional or national networks could lead to similar improvements in collaboration and outcomes. Involving other disciplines and universities in CoPs may be instrumental, with dedicated- or guest sessions promoting cross-disciplinary learning, supporting participant engagement and keeping the CoPs dynamic and attractive. Overall, with the correct support and structure, CoPs may be a valuable strategy for enhancing individual knowledge, support CPD, and promote innovation and EBP. Additionally, they could serve as sessions or platforms for connection, relationship-building, and collaborative planning to address both current and future healthcare challenges and changes, with the overarching goal of improving patient care and outcomes.

5.4 The integrative role of Communities of Practice

As noted at the outset of this chapter, the three core categories, namely, i) EBP and CPD in radiography, ii) future of radiography and iii) CoPs in radiography have been presented and discussed as distinct yet equally significant phenomena. While each category has been explored individually to provide clarity and depth, their interconnection is central to the wider argument. It is the concept of CoPs that serve as the link between these themes, offering a framework through which EBP, CPD and professional adaptation to future challenges can be advanced. In this context, CoPs are positioned not merely as a conceptual lens, but as a practical tool or strategic approach that can support knowledge dissemination, foster professional development, and facilitate the radiography professions' ongoing response to evolving technologies, workforce demands, and general healthcare reform.

As previously discussed, while both EBP and CPD are widely recognised as essential for effective and efficient healthcare, engagement with these practices remain low among healthcare professionals, including radiographers. In line with the thesis's aim of introducing CoPs into radiography as an alternative means of bridging the theory-practice gap, the approach offers a clear opportunity to promote EBP, CPD and ongoing learning across the profession. Specifically, if appropriately structured, CoPs may facilitate rapid dissemination of knowledge including (emerging) best practices through horizonal, peer-to-peer exchanges. As noted previously, this approach is potentially more suitable for healthcare settings than the traditional knowledge dissemination methods, as rigid hierarchies and departmental silos may hinder the timely integration of new evidence into clinical practice. Hence, by fostering collaboration across disciplines, departments and organisational levels, CoPs could help overcome structural barriers, creating a more agile and responsive (learning) environment.

The findings of this study indicate that practitioners are more inclined to engage with and adopt insights shared by peers as such information is perceived as more accessible and relevant, thereby increasing the likelihood of uptake. CoPs support this by intentionally creating a space for discussion, building mutual understanding and developing a shared sense of purpose, all of which are arguably essential to meaningful knowledge exchange and sustained engagement with EBP. Moreover, peer influence within CoPs can be a powerful drive for behaviour change, helping to reduce the previously reported resistance to innovation and the implementation of EBPs. Crucially, CoPs provide a psychologically safe space where practitioners may feel more empowered to share uncertainties, propose new ideas, and question established norms. Such an environment may encourage the cross-pollination of perspectives, enabling diverse experiences and knowledge to inform creative solutions and reframe traditional practices. As such, CoPs act as incubators for innovation, supporting continuous refinement of practice and a greater alignment between research and practice, ultimately improving services and patient outcomes.

In addition to supporting practice change and innovation, CoPs could significantly contribute to ongoing CPD, offering an informal, socially situated learning that complements formal education and training. Through peer-led activities such as case discussions, critical reflection and shared problem-solving, practitioners engage in meaningful, context-specific learning that enhances clinical reasoning and supports responsiveness to emerging evidence and continuous changes and challenges inherent in healthcare practice. Importantly, engagement in CoPs could not only contribute to personal development, but also offer strategic value to healthcare organisations by promoting a learning culture, supporting knowledge mobilisation, and enhancing consistency in practice. Additionally, CoPs may reduce siloed working across both independent and public healthcare organisations, promote (inter)professional collaboration, and assist in workforce retention by fostering a sense of belonging and sustained professional engagement. Moreover, it may strengthen practitioners' loyalty to their organisation, as individuals may feel more supported, involved and invested in both their professional growth and the broader organisational mission.

CoPs could also contribute to workforce retention and engagement by supporting the development of professional identity, an area of particular importance in radiography. As previously mentioned, radiography is a relatively young profession and is continuing to evolve in scope and recognition. The ongoing expansion of roles, such as advanced and consultant practice, along with the increasing integration of AI into imaging workflows prompts significant shifts in boundaries and expectations of the radiographer's role in the future. These changes can create both opportunities and uncertainties regarding professional status, autonomy and identity. From this perspective, CoPs offer a space in which radiographers can collectively navigate these transitions. Through shared dialogue, reflective practice, and peer validation, practitioners are able to articulate their professional values, negotiate new responsibilities, and critically examine their place within the broader healthcare system. This process not only reinforces a sense of professional belonging but also empowers radiographers to take ownership of their evolving roles, fostering confidence and resilience amid systemic change.

In summary, CoPs can be utilised as a valuable approach to advancing not only knowledge dissemination, innovation and the implementation of EBPs, but also for preparing practitioners for the ongoing and future challenges in healthcare. As the radiography profession continues to evolve in response to expanding scopes of practice, shifting clinical responsibilities, resource constraints and the increasing integration of AI, CoPs could offer a collaborative framework through which practitioners can collectively navigate change, share expertise, and co-develop adaptive approaches to emerging challenges. Furthermore, when strategically supported, CoPs may serve as an organisational asset, cultivating a culture of continuous learning, professional growth, and resilience. However, its impact relies on institutional support, sustained participation, and alignment with the practical realities of radiography practice. This includes adopting a flexible and pragmatic model of CoPs that is responsive to the operational constraints of healthcare settings such as time pressures and workforce limitations. Without these considerations, the individual and organisational impact may be limited.

Chapter 6: Adaptive Communities of Practice: theory and application in radiography

This chapter provides a critical synthesis of the theory of CoPs, a framework developed to explain how individuals learn and share knowledge through social participation. The concept emphasises the importance of collective disciplinary, domains of interest, collaborative engagement, and the development of shared practices, which equitably harness critical knowledge construction. Building on this theoretical foundation and the comprehensive synthesis of the findings, the chapter revisits the CoPs model and examines its applicability within the specific dynamics of healthcare settings, offering targeted recommendations to support the development and integration of a structured CoPs in radiography.

6.1 Revisiting the theory of Communities of Practice

Although discussed in detail in chapter two, it is useful to briefly revisit the key principles of the theory of CoPs prior to proposing an adaptive version applicable to the field of radiography and offering subsequent recommendations. Wenger (1998) introduces the theory by emphasising that the social learning theory proposed is not a replacement of other theories of learning. However, it has its own set of priori assumptions and focus. Wenger proposes a conceptual framework, considering a consistent set of general principles and recommendations for understanding and enabling both learning and knowledge construction within particular contexts and settings which are collectively linked in terms of shared experience. Wenger starts with outlining four assumptions related to what matters to learning, the nature of knowledge, knowing and knowers (p.4):

i) Humans are social beings. Far from being trivially true, this is used as a central aspect of learning.

ii) Knowledge is a matter of competence with respect to valued enterprises.

iii) Knowing is a matter of participating in the pursuit of such enterprises, that is, of active engagement in the world.

iv) Meaning – our ability to experience the world and our engagement with it as meaningful – ultimately what learning is to produce.

Based on the above assumptions, the primary focus of the theory is on learning as social participation. Important to the theory is that participation not only refers to local events of engagement in certain activities with certain individuals, but an ‘’encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities’’ (p.4). As such, the theory includes components necessary to characterise social participation as a process of learning and knowing. The components include the following:

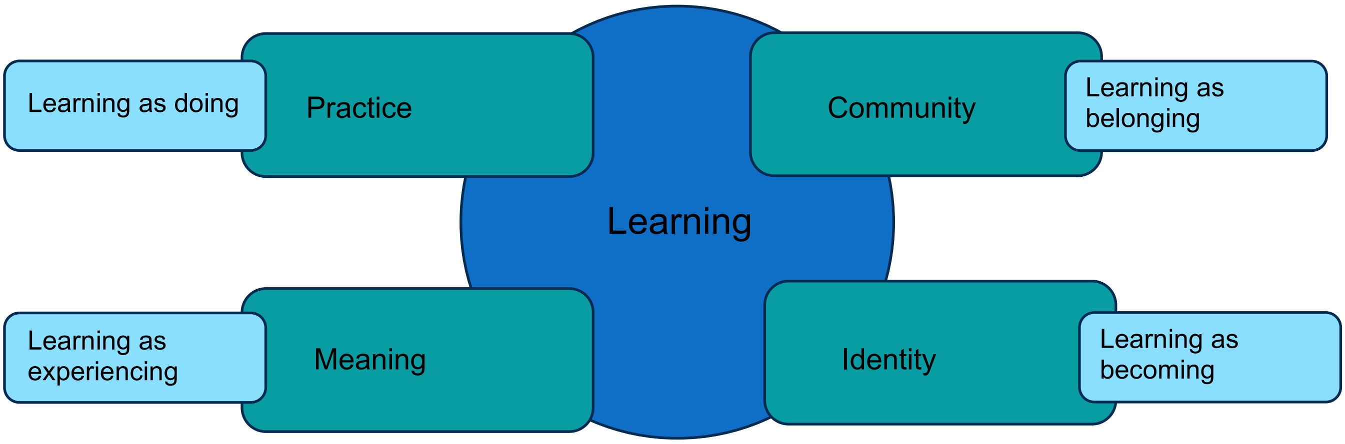
i) *Meaning:* refers to the evolving individual and collective capacity to interpret and experience life and the world as meaningful.

ii) *Practice:* describes the shared social and historical resources, frameworks and perspectives that enable and sustain mutual engagement in collective activities.

iii) *Community:* pertains to the social structures in which shared goals are considered valuable, and where individuals’ participation is recognised as a demonstration of competence.

iv) *Identity:* concerns the way learning transforms our sense of self, shaping personal trajectories and narratives of becoming within the context of the communities.

According to Wenger (1998), the elements are highly interconnected and mutually defining. Therefore, the concept of ‘’Communities of Practice’’ serves as an entry point into a broader conceptual framework, within which it functions as a fundamental element (Figure 6.1).



Based on literature of Wenger, 1998

Figure 6.1 Elements of a social learning theory of learning

Wenger refined the theory by identifying three structural elements that define a CoP, namely domain, community, and practice. These elements are interdependent, and collectively define the scope, functioning, and identity of the community, and serve as the foundational framework of a social structure for developing and sharing knowledge (Wenger, McDermott and Snyder, 2002). The theory describes ‘’participation’’ as the central mode through which individuals engage in a CoP. It refers to more than observable activities; it encompasses the social experience of living and interacting within a community, shaping and being shaped by the practices of that community. As such, participation is not merely a process of partaking, but is also used to construct identities in relation to the communities, involving developing relationships, negotiating meaning, and gradually embodying the shared values and competencies of the group. Through participation, learners do not merely absorb information; they *become* members of the community, aligning their actions, language and perspectives with its evolving norms and practices. In this sense, learning is inseparable from the formation of identity (i.e., individuals are not just learning a practice, they are becoming practitioners).

The theory considers reification as a second form of influencing within a community. Reification complements participation, and refers to the process of giving form to experience by creating tangible representations such as documents, methods, models, tools and policies. Reification not only allows communities to stabilise and communicate shared meanings, serving as a medium for coordination, memory and accountability, but it is also used to build, maintain and reproduce the community (Wenger, 1998). For example, reification might include clinical guidelines or treatment protocols in a professional, healthcare related community. These artifacts do not passively reflect knowledge; they represent and shape how practice unfolds, and how participants interpret and engage with it. Importantly, Wenger (1998) emphasises the interplay between participation and reification. While participation allows for dynamic, emergent engagement, reification introduces structure and consistency. The two are mutually constitutive: without participation, reified artefacts or objects lose their meaning; and without reification, participation becomes ephemeral and unstructured.

As discussed in chapter five, despite the growing interest in CoPs as a framework for collaborative learning, knowledge sharing and problem solving, their implementation in healthcare, particularly in the field of radiography remains limited. Although CoPs have been successfully implemented and recorded in sectors such as education and business, the findings of this study and review of literature suggest that various structural and cultural barriers within radiography settings may hinder its development and long-term sustainability. Healthcare settings including radiography face several resource constraints, notably time pressures and increased workloads, which may limit opportunities for sustained participation in CoPs activities. Moreover, healthcare organisations are typically characterised by hierarchical structures and rigid professional boundaries, and often operate under performance-driven models that emphasise efficiency, standardisation and regulatory compliance, which can conflict with the emergent, informal and adaptive nature of CoPs. Therefore, applying the CoPs model in a healthcare context such as radiography requires intentional organisational support, a willingness to foster cultural change, and a critical re-examination of the CoPs framework to ensure it accounts for the unique demands and constraints of clinical practice.

6.2 Towards a contextualised learning theory for healthcare practice

While Wenger's CoPs model provides a valuable lens for understanding and implementing collaborative learning, it does not fully account for the hierarchical, resource-constrained, and regulatory nature of healthcare practice. Therefore, a contextually adapted theoretical model is proposed. The proposed theory builds upon the foundational elements of Wenger's CoPs namely, domain, community and practice, while integrating empirical insights from this study on the challenges and enablers of learning, knowledge dissemination, EBP and CPD in radiography.

Prior to detailing the proposed theory, it is necessary to ground it in a set of assumptions concerning the nature of learning, knowledge, and the identity of knowers within the healthcare context. These assumptions do not merely frame the theory, they reflect a perspective on how meaning, competence, and professional development emerge in a healthcare context:

i) Healthcare practitioners are inherently social learners

   In healthcare settings, learning is a social process, and knowledge is co-constructed through interaction, observation, and participation in practice. For example, novice professionals do not learn in isolation, but within ''communities'' of practice through clinical placements, shadowing, imitation and engagement with experienced practitioners. From interdisciplinary collaboration to daily reflective debriefings, knowledge is both formed and performed through experiential shared understanding. Practice can be viewed as the medium through which theory is considered meaningful, and community the context in which knowing is refined.

ii) Knowledge is expressed and translated through competence

   In healthcare, knowledge does not exist as static information to be stored and retrieved, it acquires value only when translated into competent action in practice. Competence is the implementation of knowledge: to know is to be able to act effectively, ethically, and responsively in care contexts.

Effective learning therefore requires structures to support translation of knowledge into practice through opportunities for implementation, guided reflection, and ongoing development.

iii) Knowing is shaped by active participation in situated healthcare environments

Learning in healthcare is inseparable from lived experience (i.e., practice). Knowledge is not merely acquired; it is enacted, emerging through engagement with the material, relational, and affective boundaries of care. From routine clinical decisions to complex ethical dilemmas, the practitioner comes to ‘’know’’ through doing, feeling, and responding. This embodied, situated knowledge cannot be distanced from the world in which it comes to matter.

iv) The purpose of learning in healthcare is the creation of meaning

Along with technical competence, the deeper aim of learning is to construct meaning at the level of individual identity, professional purpose, and collective endeavour. Learning must foster a sense of orientation: to the value of care, the responsibilities of the profession, and the needs of patients and communities. When learning resonates with personal and systemic significance, it creates engagement, resilience and a sense of ethical responsibility (i.e., when learning feels relevant and purposeful, individuals are more likely to be engaged and proactive).

v) Learning is driven by motivation, curiosity, and a sense of ownership

While learning is socially and structurally mediated, its motivation is inherent. The desire to develop, question, and improve stems from intrinsic motivation and a sense of ownership over practice, and one’s professional trajectory. A culture of lifelong learning depends on recognising and reinforcing this internal motivation.

vi) Knowledge is situated, dynamic and historically contingent

In the healthcare context, knowledge is not fixed but emerges in specific historical, cultural and institutional contexts, and remains open to revision based on emerging evidence, shifting paradigms, and evolving ethical considerations. As such, learning not only encompasses the acquisition of competence and truths but also the development of the capacity to navigate a world in flux and to question, reinterpret, and adapt knowledge as practice and understanding evolve. This orientation reaffirms learning as a dynamic, cyclical engagement with the complexity and transience of clinical practice.

The above extends Wenger's original four premises in several aspects to reflect the unique demands of healthcare practice. It affirms that learning is social and participatory, but situates it in the high-stakes, relationally complex environments of healthcare, in which knowledge is both co-constructed and enacted in practice. The revised assumptions also place an emphasis on competence, not merely as social recognition within a community, but also the ability to translate the acquired knowledge into competent action in practice. Knowing is not only participatory but also tacit, embodied and affective, shaped by the practitioner's engagement with the material and emotional dimensions of their profession. Similarly, learning is reconceptualised as the creation of meaning at personal, professional and collective levels, rather than merely integration into a community. Moreover, two additional assumptions extend the original premises. Firstly, the role of intrinsic motivation, curiosity, and personal ownership in sustaining lifelong learning, emphasising that learning is not solely a social process, but also a deeply individual endeavour shaped by one's values, agency and commitment to their profession. Secondly, the recognition of knowledge as situated, dynamic, and historically contingent, which requires practitioners to engage reflexively and responsively with emerging evidence, shifting paradigms and ethical complexity. These conditions shift the focus from collective participation alone to include the individual's responsibility for their knowledge, learning, and active engagement with the evolving nature of their practice.

Based on the revised assumptions outlined above, the components of the social learning theory are reconsidered to reflect not only learning and knowing as social processes, but also to account for the temporal, developmental and motivational dimensions of learning within healthcare. While Wenger's original framework focuses on participation in CoPs, the revised model extends this by emphasising individual responsibility, intrinsic motivation, and the role of embodied and context-dependent practice. Knowledge is not understood as static or absolute, but as situated, emerging, and requiring reflexive engagement with uncertainty, change, and ethical nuance. This version attempts to offer a more responsive account of professional learning within the realities of healthcare, taking into consideration not only the implementation of knowledge that is essential to EBP, but also sustained growth and adaptability central to CPD:

i) *Meaning:* in healthcare, meaning is not only a mutual understanding, but also individual meaning practitioners derive from practice. It occurs at the intersection of values, purpose, and care, directing individuals and teams toward action that is responsive and practically meaningful. Learning becomes most impactful when it resonates with both professional identity and the broader organisational and societal commitments.

ii) *Practice:* practice becomes the site where knowledge is enacted, not merely applied. Embodied, situated, and relational, healthcare practice involves acting on conditions in the lived world where competence is demonstrated through ethical, clinical, and contextual decision-making.

iii) *Community:* the community provides the social and institutional structures by which knowledge is co-constructed, shared, and validated. In healthcare, such communities also support mentoring, modelling standards of excellence, and supporting reflective engagement with uncertainty and change.

iv) *Identity:* learning shapes professional identity through an evolving sense of self in relation to roles, values, and expectations. Identity formation involves not just belonging, but a growing sense of responsibility, agency, and ownership of one's practice and contribution.

v) *Trajectory:* learning is temporal and developmental, which occurs through trajectories that trace how individuals evolve over time (e.g., from novice to expert, from peripheral participation to core contribution). These trajectories are shaped by accumulated knowledge, reflective engagement and insights gained through lived experience in practice. This element aligns with the values of lifelong learning, intrinsic motivation and adaptive development to respond to changing healthcare demands.

Similar to Wenger's original four components, the elements of the proposed social learning framework are not discrete; they interact with, shape and reinforce one another. Meaning does not arise in isolation; it is co-constructed through engagement in practice, shaped by communal norms, oriented by personal and professional identity, and sustained over time through developmental trajectories. Practice is where meaning is actualised and identity is enacted, while communities provide the relational and institutional infrastructure in which practice is legitimated, and learning is shared. Identity, in turn, is dynamically formed through these participatory processes, reflecting an evolving sense of agency, responsibility and purpose. Finally, the concept of trajectory introduces a temporal dimension to learning, which highlights how knowledge, competence, and professional direction unfold over time. Together, these elements portray learning in healthcare not as a discrete event, but as a situated, continuous, and reflective process shaped by individual motivation, collective engagement, and the realities of practice. Figure 6.2 illustrates how the five elements influence learning and how they interact with one another.

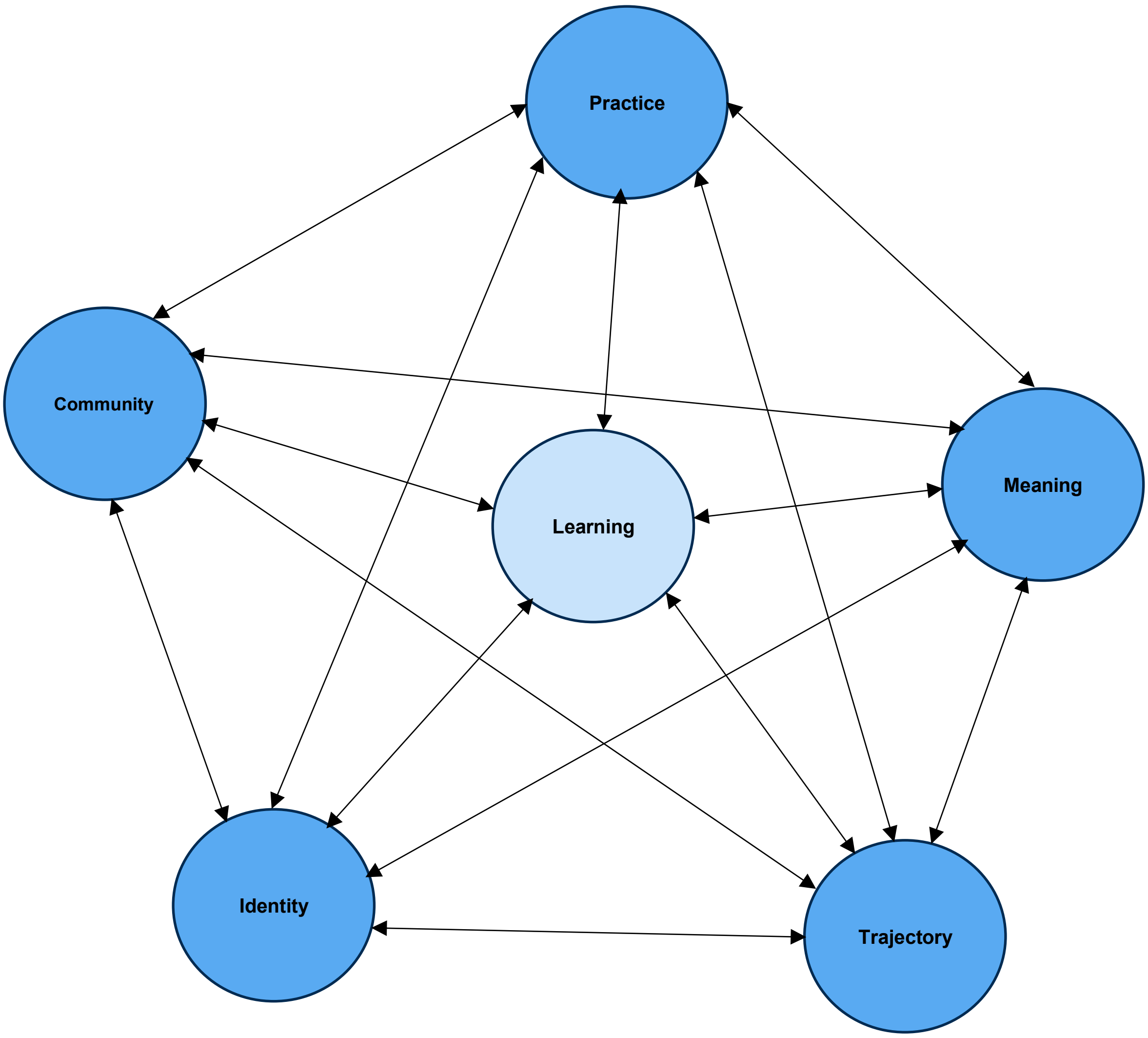


Figure 6.2 A theory of learning in healthcare: a conceptual framework

6.3 Situated Professional Learning Communities in radiography

Building on the assumptions, refinements, and adaptations discussed above, the original CoPs theory is reconceptualised to incorporate the outlined elements of the learning framework, beginning with a definition developed by the researcher:

''A Community of Practice in radiography is a dynamic, socially and professionally bounded space or network in which practitioners individually and collectively engage in the co-construction, implementation, and refinement of knowledge and practice to deliver safe, effective, and patient-centred care''.

In this context, the CoPs is sustained through shared values, professional standards, and a collective commitment to EBP and CPD. While the community provides the structures and relationships that enable knowledge exchange, the revised framework takes into consideration the role of individual learning and active ownership of professional development. Practitioners are therefore expected to not only draw from the community's collective resources but also contribute their knowledge, expertise, and insights. Through such engagement, CoPs in radiography becomes a bridge between theory and practice, aligning (collective) knowledge with individual competence and practice, and ensuring that professional identity, expertise, and purpose evolve alongside the changing demands of healthcare, while facilitating rapid dissemination and potentially the application of knowledge. To capture this, the CoPs framework is revised, building on Wenger's original three elements of domain, practice, and community, while introducing 'individual' as a distinct and equally important component (see Figure 6.3). The framework is articulated as ''Situated Professional Learning Communities'', reflecting two key shifts from the original theory. First, the notion of *situated* emphasises that learning is not abstract or exclusively social, but embedded within the regulatory, organisational, and practice-specific contexts of healthcare. Second, the term *professional learning communities* highlights the dual emphasis on collective learning and knowledge sharing, and individual ownership of professional development, recognising EBP, CPD and reflective practice as integral to enhancing both competence and clinical practice. Unlike the original CoPs model, which highly focuses on social participation, this theory acknowledges that professional practice such as radiography requires both, communal structures and individual agency, ensuring that knowledge is not merely exchanged but also enacted, adapted, and sustained within clinical practice.

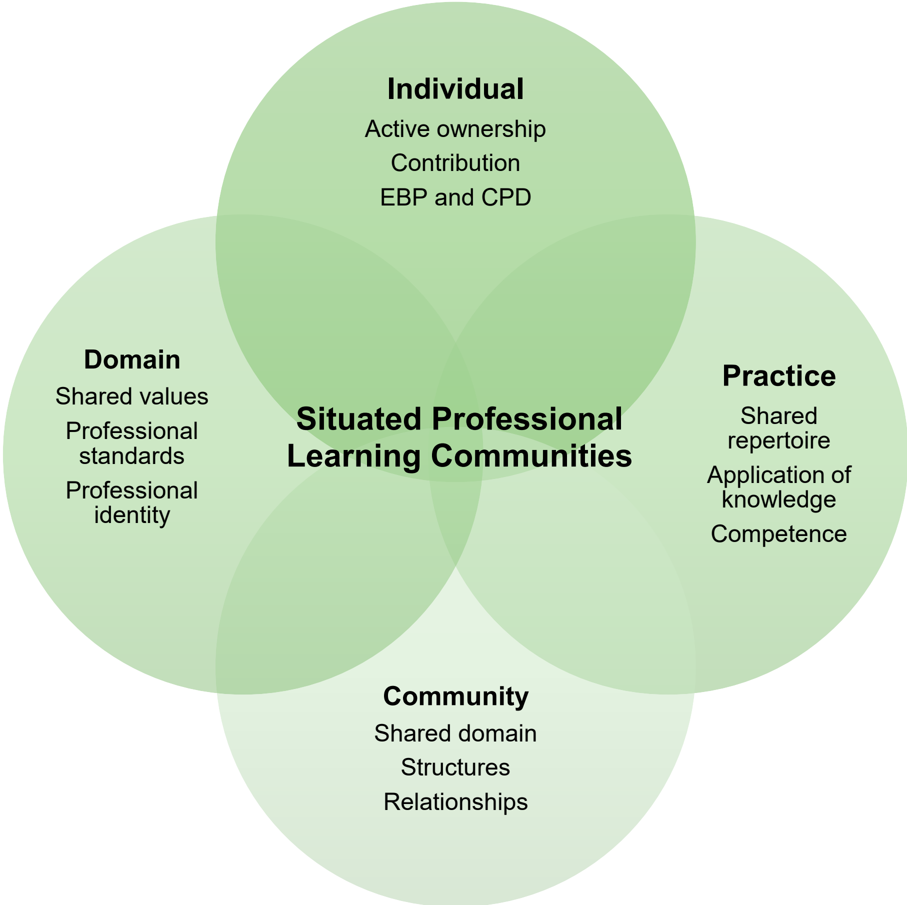


Figure 6.3 Situated Professional Learning Communities: core elements and interactions

To further elaborate on the above figure, the *domain* provides the shared purpose and boundaries that provide coherence to the radiography community. In a healthcare context, the domain is sustained through common values, professional standards, and a commitment to safe, effective and patient-centred practice. Importantly, the domain fosters a sense of belonging and orientation, ensuring that individual and collective learning remains meaningful and relevant, whilst supporting practitioners to collectively develop and refine their professional identity. The *community* provides the social and structural environment in which learning is embedded and sustained, encompassing the relationships, networks, and institutional frameworks that support knowledge and professional development. Communities serve as spaces in which practitioners refine standards, legitimise shared repertoires, and collectively navigate uncertainty and change. Additionally, the community offers the structures for interaction and mutual support, ensuring learning is not isolated, but embedded within a collaborative and socially meaningful environment. This shared infrastructure enhances resilience, accelerates knowledge dissemination, and provides consistency and continuity across both practice and professional trajectories. *Practice* refers to the collective and individual enactment of knowledge reflecting professional competence, involving the integration of evidence, professional judgement, and contextual decision-making. Central to this element is shared repertoire of resources, protocols, and tacit knowledge that practitioners draw upon, and apply, test and refine within their own practice. Finally, the individual represents the foundation of learning within professional learning communities, and act as the bridge between the knowledge created within the community and its application in practice. Ultimately, learning and continuous improvement of practice is not merely a collective responsibility, but also relies on an individual's active engagement, and their professional duty to participate in CPD and apply the principles of EBP. Professional learning, therefore, becomes both a personal and collective endeavour, reinforcing alignment between individual competence, ethical responsibility, and the evolving demands of healthcare practice.

In summary, the theory of SPLC radiography attempts to bridge the theory-practice nexus by embedding knowledge within shared professional values, collective engagement, and individual responsibility. Unlike Wenger's CoPs, it explicitly integrates the dual role of collective knowledge-sharing and individual ownership of learning, recognising CPD and intrinsic motivation as central to professional growth. In contrast to knowledge diffusion and knowledge translation theories which emphasise the movement of information, this framework situates learning within lived practice, where evidence is not only transferred but enacted, refined, and co-created. As a result, it supports the implementation of EBP, sustains CPD, and ensures radiography remains adaptive to innovation and the future demands of radiography.

6.4 Cultivating Communities of Practice: translation to radiography

As detailed in chapter 2.10, Wenger, McDermott and Snyder (2002) provide several tools and strategies to cultivate CoPs. The seven principles, i) design for evolution; ii) dialogue between inside and outside perspectives; iii) invite different levels of participation; iv) public and private spaces; v) focus on value; vi) combine familiarity and excitement; and vii) create a rhythm for the community, offer a flexible and human-centred approach to cultivating CoPs, with a high focus on the ‘organic growth’ of the community. Although the design is theoretically robust and, as discussed in the previous chapter, has yielded positive outcomes across a range of settings including business, the applicability of these principles in healthcare contexts remains tenuous and questionable. In the light of the findings of this study, alongside the critical review of the existent literature on the barriers to learning, knowledge dissemination, EBP and CPD within radiography, it becomes evident that such flexible, organically evolving models may lack efficacy in healthcare environments. As discussed, healthcare settings including radiography are deeply embedded within hierarchical power structures, subject to regulatory oversight, governed by operational protocols, and constraint by resource limitations, which complicate the implementation of such approaches to professional learning.

Wenger, McDermott and Snyder's (2002) first principle, ‘’design for evolution’’, presupposes a context in which communities develop from pre-existing personal networks, and are provided with autonomy and flexibility to grow organically over time. However, as shown in this study and thorough synthesis of the literature, teams and healthcare organisations are often fragmented, and grounded in standardisation, risk mitigation and accountability, leaving minimal space for spontaneous evolution. Additionally, professional hierarchies, governing bodies, national guidelines, and quality assurance mechanisms constrain the adaptive capacities of healthcare teams. While an evolutionary design may foster innovation in less regulated environments, in healthcare it conflicts with the aim to maintain (inter)national consistency in care delivery. Hence, evolution in this context may not be perceived as growth, but as deviation from normative practice, and thus risks institutional resistance. Therefore, professional communities may have to be intentionally created, with clear aims, structure and individuals at several levels within the hierarchy to not only co-create knowledge but also apply and drive changes in practice.

The second principle, ‘’dialogue between inside and outside perspectives’’, could also encounter resistance in a healthcare setting. While external perspectives can stimulate creativity and promote knowledge dissemination, input of outside contributors must be selected carefully as practitioners may view certain contributors as irrelevant, lacking contextual understanding, or limited clinical credibility, which may jeopardise their interest and ongoing engagement in the community. This was evident in this study, in which participants recognised the value of external input, but highlighted the need for relevance. For instance, radiologists’ contributions were considered more useful that physiotherapists, and participants pointed to modality- or role-specific groups, indicating a preference for feedback from immediate peers or those higher in the professional hierarchy. Similarly, the third principle, ‘’invite different levels of participation’’, may be undermined in healthcare due to professional hierarchies. The findings of the study and literature review show presence of a hierarchical structure and a clear chain of command within radiology departments, which may affect contributions of those lower in on the hierarchical chain. Furthermore, as highlighted in this study, the feasibility of voluntary engagement in such communities at any level may be challenging due to the high-pressure nature of clinical work and chronic time and staff shortages. This also links to the fourth principle, which advocates the development of public and private spaces for community interactions, which may be challenging due to the resource constraints encountered.

The application of the fifth principle, ‘’focus on value’’, may also be a barrier in a clinical setting. While CoPs aim to deliver tangible and intangible value to participants and organisations, this study highlighted an increasing focus on measurable outcomes such as patient throughput, cost-efficiency, and adherence to clinical guidelines in radiography. The benefits of CoPs such as improved team communication and professional development are difficult to quantify and may therefore be undervalued or deprioritised by management. Hence, without a clear purpose of the community, and evidence of clinical or financial return, CoPs risk being overlooked in resource allocation decisions. Similarly, the sixth principle, which advocates balancing familiarity with excitement, may have limited applicability in radiography as the profession operates within risk-averse healthcare systems that prioritise standardisation and safety, leaving little scope for practices that deviate from established protocols (Garcia *et al.*, 2015; MacGregor, Breckons and Swainston, 2024). Combined with practitioners' reluctance to change, this means that familiarity may be favoured over innovation within such communities. Finally, the principle of creating a consistent rhythm of activity may be challenging to achieve due to unpredictable schedules, shift work and the lack of resources described previously. As a result, maintaining consistent participation and momentum in a CoP can be particularly challenging in healthcare contexts including radiography.

While the seven principles provide a valuable framework for cultivating CoPs, their implementation in healthcare settings including radiography is constrained by a range of contextual factors. The structural rigidity, professional hierarchies, time pressures, and risk-averse culture of healthcare organisations pose significant barriers to the organic and flexible nature of CoPs. Therefore, the application of these principles in radiography may require adaptation to the realities of clinical practice, including resource constraints. Without such adaptation, the promise of CoPs in radiography settings may remain largely theoretical.

6.5 Establishing Situated Professional Learning Communities in radiography: a top-down strategy

The cultivation of professional learning communities in radiography requires more than grassroot enthusiasm; it requires strategic alignment across all levels of the profession. While Wenger's framework highlights the organic, bottom-up development of CoPs, its translation into radiography demands active engagement and commitment from educational institutions, professional and regulatory bodies, and organisational leadership and structures to ensure such communities are embedded in practice. A top-down strategy ensures that the principles of SPLC are not only supported but also resourced, legitimised and sustained, fostering a culture of lifelong learning and EBP, ultimately contributing to the delivery of safe and quality patient care and services.

Prior to detailing the principles of cultivating SPLC, it is essential to identify the hierarchical levels and associated spheres of influence in radiography, and their potential role in implementing the theory, starting with the regulatory body HCPC and the professional body SoR (see Figure 6.4). The HCPC exerts considerable regulatory influence on the establishment of professional learning communities within radiography through its requirements for professional standards and CPD. As previously noted, although the HCPC operates a CPD audit process, the mechanism could be strengthened by adopting a more formalised and proactive model, similar to that implemented by the General Medical Council. Such an approach might include defined hours of CPD, explicit recognition of collaborative pedagogies, and ongoing monitoring of evidence-based activities, rather than a reliance on a retrospective documentation process. A more structured framework may not only enhance accountability for both practitioners and employers but also create stronger conditions for the development and sustainability of SPLC. Furthermore, through its oversight of pre-registration radiography programmes, the HCPC could adopt a more proactive role ensuring that collaborative learning and the core principles underpinning professional communities are included in curricula. Introducing these approaches at the point of entry into the profession supports the establishment of foundational knowledge and conceptual understanding necessary for meaningful participation in such communities. Therefore, broadly, the HCPC's regulatory authority serves to legitimise professional learning communities, framing them as enablers of CPD and EBP, and thereby reinforcing its role in promoting professional development, knowledge dissemination, and the delivery of high-quality patient care.

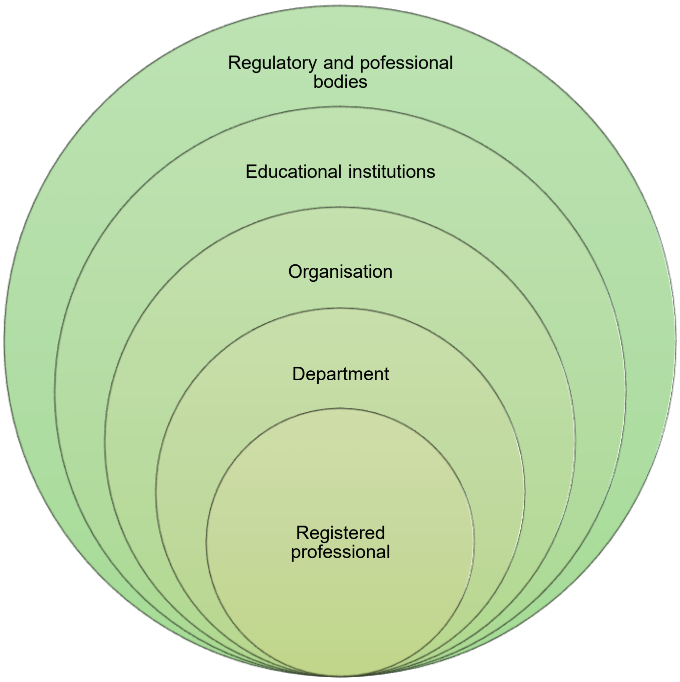


Figure 6.4 The structural hierarchy of radiography: bodies and influences

As a professional body, the SoR is well positioned to support the integration of SPLC in radiography. Through advocacy, the SoR can promote professional communities as integral to the profession’s culture of lifelong learning, reinforcing their role in advancing EBP, CPD and professional autonomy. Additionally, the society could support managers and practitioners by providing practical guidance such as frameworks, toolkits and case studies. As a membership organisation, the SoR could also consider facilitating collaboration and knowledge exchange opportunities through, for example, special interest groups, thereby extending the reach and impact of professional communities beyond departmental and organisational level. Furthermore, the SoR could arrange engagement with employers, educational institutions, and policymakers to ensure such communities are embedded within both national and organisational strategies, thus contributing to its promotion, legitimacy and sustainability in radiography practice.

The role of educational institutions is critical in promoting SPLC as curriculums can be designed to include principles of the communities and collaborative pedagogies such as problem-based learning, case-based discussions, and interprofessional education, which reflect the dynamics of such communities and encourages habits of shared enquiry and reflection. To support the (future) workforce, a stronger partnership between universities and clinical practice could not only support co-creation of communities applicable to the context, but also the extraction of knowledge and understanding of the realities of practice to guide further research. Furthermore, as universities act as hubs of research and knowledge, they could contribute to the dissemination of knowledge by collaborations with organisations and participation in the professional communities. Such collaborations would also enable collective discussion and potential solutions on emerging professional challenges, including the integration of AI and workforce-related matters, while ensuring that perspectives of both academia and practice are represented.

At the organisational and departmental level, establishing SPLC requires both structural support and cultural endorsement. Leadership must provide a clear mandate, supported by resources such as time and collaborative spaces, while also orchestrating engagement and leading by example. This does not imply a directive or policing approach; rather, leadership may help shape direction and create conditions for participation, while discussions within the community remain organic and self-sustaining. In this sense, leadership functions more as facilitation and support than control, with leaders engaging alongside the community rather than imposing upon it. This approach also enables leaders to strengthen and maintain their understanding of EBP and CPD through active participation in community activities, allowing them not only to model good practice but also to gain direct insight into challenges arising in clinical settings. Additionally, implementing SPLCs requires development of an organisational-wide culture of collaborative learning and promotion of critical reflection, including regular case reviews, questioning assumptions, and empowerment to challenge entrenched practices, approaches that closely align with Mezirow's principles of transformative learning (Mezirow, 1991). To integrate this as part of the culture, the practices must be embedded into the organisation's core values and strategy, and reinforced consistently at all levels of the structure. Furthermore, management could arrange and integrate cross-departmental connections and communities to further improve knowledge exchange and prevent insularity, ensuring that communities contribute to wider organisational and/or regional learning.

To encourage engagement with professional learning communities, management may consider integrating CPD, including participation in communities into annual staff performance reviews, thereby strengthening accountability and linking engagement directly to career progression. Collectively, implementing these strategies from a leadership level position professional communities as a sustainable mechanism for advancing CPD, embedding EBP, and improve both professional practice and patient care.

As the establishment of professional learning communities is conceptualised as a top-down strategy, appropriate mechanisms and incentives are in place to enable individuals to engage and contribute with increasing ease, reinforced by the profession's and organisation's commitment to lifelong learning and EBP. Nevertheless, at the individual level, practitioners must also demonstrate accountability by integrating community participation into their CPD and reflective practice, while critically identifying those communities most relevant to their professional development. Active participation requires openness to new perspectives, the sharing of clinical expertise, and engagement with innovations and proposals for practice improvement. Moreover, professionals can enhance their impact by adopting reflective habits that extend beyond personal development to enrich the collective knowledge of the community, including providing feedback and disseminating insights within the group. Based on the findings of this study and the wider literature, practitioners' intrinsic motivation may be fostered by creating meaningful, practice-relevant opportunities in which individuals perceive tangible value in knowledge exchange and collective problem solving, an endeavour that depends on strong leadership at both regulatory and organisational levels. Moreover, recognition of contribution through, for example, peer acknowledgement, career development opportunities or integration into appraisal processes further reinforces practitioners' sense of purpose and belonging. Ultimately, as evidenced in this study, individuals may internalise engagement as a core aspect of their role if the communities are aligned with professional values, personal development, empowerment, and when their outputs yield visible improvements in practice.

In summary, this section outlined the multi-level influences that shape the establishment of SPLC in radiography, considering the regulatory and professional bodies, involvement of educational institutions, organisations, and individual practitioners. Collectively, these stakeholders provide the structural authority, cultural legitimacy, and professional motivation necessary to embed such communities in practice. While a top-down strategy creates the conditions for engagement, sustainability ultimately relies on individuals recognising the personal and professional value of participation, reinforced by strong leadership, recognitions, and alignment with professional values and care outcomes.

6.5 Cultivating Situated Professional Learning Communities in radiography

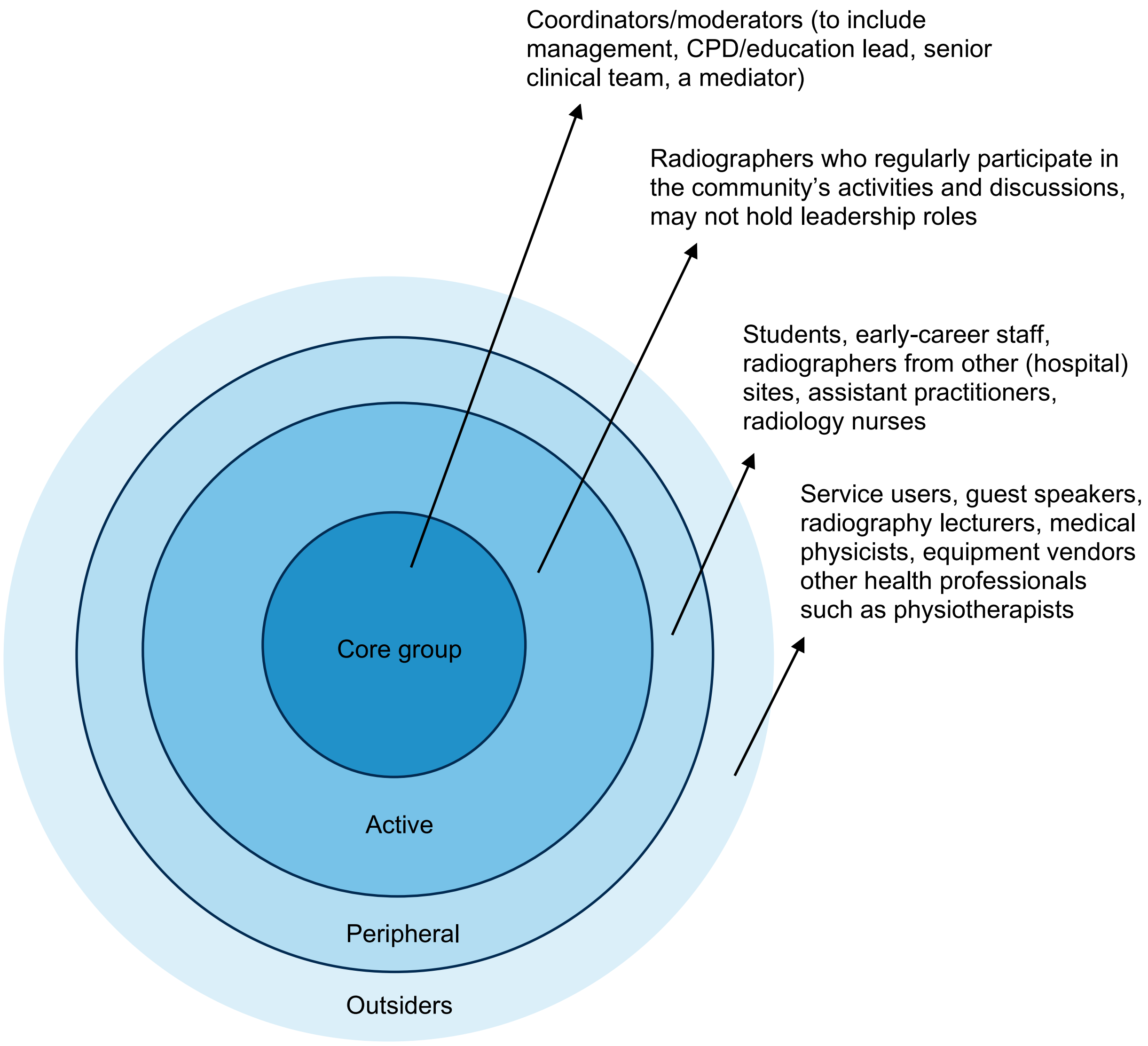
While Wenger, McDermott and Snyder's (2002) original principles emphasise flexibility, adaptability, and the organic growth of communities, their direct application within radiography could be challenging, and therefore requires significant modification to become established practice. As highlighted throughout this chapter, the highly regulated, protocol-driven, and hierarchically structured nature of healthcare, and radiography in particular, limits the scope for spontaneous or unstructured development of professional communities. Instead, its implementation necessitates intentional design, contextual adaptation, and sustained organisational support. Accordingly, this section reinterprets the original principles through the lens of radiography, reshaping its cultivation to align with the realities of a healthcare setting.

As discussed previously, radiography is governed by strict protocols, guidelines, professional standards, and rigorous quality frameworks. This highly regulated environment, along with the hierarchical organisational structures and emphasis on risk mitigation limits the scope of for spontaneous or loosely organised communities and networks in healthcare. Hence, the first principal advocates for professional communities that are purposefully designed and strategically implemented, with clearly defined aims, membership parameters and operational structures. Due the complex, resource-limited, and regulated environment, the intentional creation of professional communities is essential to secure resources, recognition, and ensure a community that aligns with broader service objectives such as patient safety, diagnostic accuracy and operational efficiency. Furthermore, purposeful designs can contribute to fostering a culture of EBP and CPD, thereby reducing the theory-practice gap in radiography. This can be achieved by establishing communities with a structured agenda, scheduled activities and clearly defined objectives, leading to a collective effort of translating research findings into clinical protocols and policies. This deliberate structure also supports CPD requirements, recognising opportunities for reflective practice, peer learning, and documentations of learning outcomes, all of which are essential for professional revalidation. In addition to the above, a carefully structured approach could address the hierarchical dynamics prevalent in radiography settings by involving stakeholders from multiple levels of the professional hierarchy to foster a culture of distributed leadership and mutual respect and understanding. Such a model balances the need for organisational oversight necessary for quality and safety, while creating a psychologically safe environment where professionals can share challenges, propose innovations, and co-develop solutions, strategically utilising this as a mechanism to remove the barriers to EBP and CPD.

The second principle, ‘’facilitating dialogue between internal and external perspectives’’, is central to the enrichment of professional communities, as it enables the exchange of diverse forms of knowledge, and challenges entrenched assumptions. In the context of radiography, engagement with other radiology departments, hospitals and services can introduce innovative practices, emerging research evidence, and alternative viewpoints that stimulate critical reflection, service improvement, and allow rapid problem solving. However, for the dialogue to be meaningful, external contributors must be both relevant and professionally credible. Based on the findings of this study, professionals prefer outside voices to demonstrate an understanding of the clinical environment and its operational realities. Moreover, engagement is enhanced when the input offers direct professional benefit, particularly from contributors that are perceived as credible peers, such as radiologists, academic educators, advanced practitioners, or radiographers from other sites or organisations. Input from other (allied) health professionals such as physiotherapists might be beneficial at local level, promoting interprofessional collaboration. However, such involvement should be carefully managed and purposefully targeted, with the professionals being positioned as invited external contributors or guest speakers, offering periodic insights that stimulate interest and broaden perspectives, rather than serving as permanent or regularly participating members of the community. For example, a departmental professional community focusing on musculoskeletal imaging could invite an advanced practitioner physiotherapist specialising in sports injuries as an external speaker to discuss rehabilitation pathways following imaging findings. The physiotherapist could share insights on how imaging reports inform treatment decisions, highlight clinical implications of specific MRI scans, and discuss how imaging techniques and accuracy impacts patient management. Such a session would not only enhance radiographers' understanding of the care pathway, but also provide the additional knowledge to adapt imaging techniques if necessary. In return, the radiographers could, for example, share insights into the challenges of image acquisition or patient positioning, thereby promoting an overall mutual appreciation of each other's roles within the diagnostic and therapeutic pathway.

Radiography operates within a defined chain of command, shaped by regulatory oversight, clinical governance, and professional accountability. While such structures ensure patient safety and maintenance of service standards, they may inadvertently restrict innovation and implementation of new EBPs, particularly from those lower in the hierarchy such as students and junior radiographers. As observed in this study, power differentials may lead to self-censorship, reluctance to question established practices, and limited participation in discussions, which constrains the diversity of perspectives that professional communities require to flourish. To counter these dynamics, professional communities must be deliberately designed to create psychologically safe spaces where individuals across all professional levels can contribute without fear of reprisal, professional judgement or reputational harm. To achieve this, principle three highlights the need for management of hierarchical participation, which includes strategies such as establishing clear ground rules for respectful dialogue, employing neutral facilitators to moderate discussions, and implementing mechanisms for anonymous input when appropriate. Nevertheless, leadership endorsement remains critical as support from senior clinical team and management not only legitimise the community, but also signals that contributions from employees are valued and considered. However, such endorsement must be carefully balanced to avoid reinforcing existing hierarchies. As such, participating leaders should be fully oriented to the purpose, objectives, and collaborative ethos of the community, ensuring their involvement empowers members to speak openly, share ideas, and challenge practice without fear of reprisal.

The present conceptual framework aligns with the degrees of community participators outlined by Wenger, McDermott and Snyder (2002), considering the core group, active members, peripheral members and outsiders, arguing that the variation in engagement is important to learn, innovate, diffuse knowledge, negotiate and co-create meaning (see Figure 6.5). Particularly, movement between these levels remains a critical feature of professional communities: newcomers may begin at the periphery, observing and gradually contributing, before transitioning toward more central participation as their confidence, expertise, and professional identity develop. Additionally, experienced members may shift between active and peripheral roles over time, depending on workload, career stage, or evolving interests. However, as the present theory proposes a deliberate design of a community, the number of 'active' participants should remain high through purposeful re-invitation of individuals, structured activities, and ongoing engagement strategies. The high numbers of active participants are essential to generate the depth of commitment and critical engagement required to debate practice changes, examine evidence-based approaches, and effectively translate shared knowledge into clinical practice.



Based on literature of Wenger, McDermott and Snyder, 2002

Figure 6.5 Degrees of community participation

Given the workload pressures, shift patterns, and resource constraints reported in this study, the fourth principle of the proposed theoretical framework advocates a hybrid model of engagement that integrates both structured in-person activities and flexible online spaces. Structured in-person opportunities may include professional communities held at three-, six-, or twelve-month intervals, with the frequency determined depending on the size, scope, and complexity of the community. For example, frequent meetings at a local or departmental level may be more feasible, allowing members to address operational challenges on a regular basis, whereas this may be more challenging at regional or national level due to geographical dispersion, scheduling difficulties, and the financial costs associated with travel. These in-person settings provide opportunities for rich interpersonal exchange, immediate clarification of complex clinical queries, and strengthening of professional relationships, which are critical factors for cultivating trust, collaborative problem-solving, and co-creation of knowledge.

In-person meetings can be supplemented with scheduled online meetings and/or asynchronous digital platforms such as discussion boards, shared learning repositories, or secure messaging forums, enabling a flexible approach to engaging with professional communities. These virtual spaces support continuous knowledge exchange, provide rapid updates on emerging evidence or regulatory changes, and allow for timely problem-solving regardless of location or working patterns. For example, an organisation such as AML could implement a dedicated online learning platform to connect clinical staff irrespective of geographic location. Such a platform could host modality-specific groups or thematic communities focused on specialised topics including physics, image optimisation or image interpretation. Within these spaces, members could post clinical queries, share research findings, exchange protocol updates, and collaborate on service-improvement initiatives, therefore enhancing the speed and breadth of knowledge dissemination across the clinical workforce. Overall, the key to this principle lies in balancing in-person interaction with online accessibility to create a flexible and inclusive learning ecosystem that supports EBP and CPD without overburdening clinical schedules and scarce organisational resources.

As highlighted throughout this thesis, radiography operates within a context of ongoing resource constraints, including workforce shortages and significant time pressures. Within such a constrained environment, the allocation of resources to initiatives such as professional communities may be deprioritised or perceived as peripheral to the core service delivery. Consequently, the fifth principle proposes that professional communities must be deliberately designed to demonstrate clear clinical and organisational value if they are to secure sustained leadership support and investment. Beyond fostering collegiality and professional engagement, the community should produce measurable outcomes that directly align with organisational priorities such as improved diagnostic accuracy, streamlined workflows, reduction in image acquisition or reporting errors, enhanced patient safety, and measurable improvements in patient experience. These indicators not only reflect the community's direct contribution to the quality of patient care, but also provide tangible evidence for managers, commissioners, and customers, who increasingly base funding and resource decisions on demonstrable improvements in service quality and operational performance (Lockwood *et al.*, 2025; NHS, 2025). Moreover, visible achievements position an organisation favourably with regulatory bodies and accrediting agencies, such as the CQC or Quality Standards for Imaging, evidencing a proactive commitment to innovation, staff engagement, and continuous quality improvement (Care Quality Commission, 2023b).

To strengthen credibility and secure ongoing support, the communities should be documented through auditable metrics, such as organisational or departmental quality indicators, service improvement data, or compliance with national imaging standards. Framing these results within established performance frameworks allows the communities to be recognised as a strategic investment rather than a discretionary activity, repositioning them not merely as forums for discussion, but as a strategy for innovation, EBP, and continuous quality enhancement. To achieve this, professional communities require rigorous governance, clear aims and specific objectives, supported by measurable success indicators tailored to its scope and subject matter. Meetings should be formally minuted, actions allocated to named individuals, and timelines established for review and follow-up. Combining a strong evidence-based rationale with transparent accountability structures enables professional communities to demonstrate value that resonates with both professionals and organisations' leadership, ensuring sustainability within a resource-constrained healthcare environment including radiography.

Principle six advocates balancing familiarity with safe innovation, addressing the challenges related to reluctance to change among professionals, and the risk-averse culture of healthcare where patient safety, adherence to protocols and regulatory compliance are paramount. While these measurements are essential, professional communities also intend to serve as a strategy to innovation and practice development. Therefore, the communities can act as a structured and safe space where innovation is encouraged but evaluated, allowing members to explore possibilities without compromising established standards. To further reduce anxiety related to change and ensure compliance, proposed changes can be framed within the language of patient safety, EBP and quality improvement, with incremental, data-driven change that is subject to transparent evaluation and collective consensus. Examples of this approach include small-scale, low-risk initiatives such as workflow optimisation to reduce patient waiting times, piloting revised referral or reporting pathways, or trialling emerging imaging techniques with clearly defined audit criteria. These changes remain familiar to professionals as they build on established mechanisms such as quality assurance and clinical governance, while simultaneously fostering creativity and reflective practice. Therefore, the communities operate as ‘‘safe laboratories’’ where new ideas can be tested under controlled conditions, measured against agreed indicators, and if successful, scaled across departments or organisations. This balance between stability and innovation minimises perceived risks of change, while embedding a culture of ongoing improvement, knowledge dissemination, EBP and CPD.

Closely related to principle four, the final principle highlights the importance of creating a sustainable rhythm adapted to clinical realities, as regular and sustained participation is critical for the long-term success of professional communities. However, achieving this is particularly challenging in radiography due to the previously discussed challenges including increased workloads, workforce shortages and a lack of time. Therefore, rather than adhering to inflexible schedules, professional communities can benefit from flexible participation models such as rotating meeting times to accommodate professionals across different shifts, altering between in-person and virtual sessions, or incorporating asynchronous online discussions that allow professionals to contribute at their convenience. Moreover, short and focused sessions, and integrating handovers may further reduce disruption, which could be part of monthly team meetings or daily huddles at department level, embedding learning and knowledge exchange in everyday workflows. These adaptive scheduling efforts serve multiple functions. Firstly, it supports sustaining momentum by ensuring continued discussions, knowledge-sharing, and problem-solving during periods of operational pressure. Secondly, it signals organisational sensitivity to staff workload and well-being, therefore creating a sense of option and voluntary engagement. Finally, by maintaining a predictable yet flexible rhythm, professional communities reinforce their legitimacy as an integral component of CPD, EBP, and service improvement rather than an optional or peripheral activity.

To conclude, the adapted seven principles outlined in this framework retain Wenger, McDermott and Snyder's (2002) core aim to fostering learning through collective engagement, but reconfigure it to meet the specific demands of a regulated, hierarchical, and resource-constrained healthcare environment. Additionally, the principles move beyond the original model’s reliance on spontaneous evolution and fluid participation, emphasising intentional design, organisational alignment, demonstrating clinical value, and flexible yet accountable participation, with a focus on EBP, CPD and knowledge dissemination. Table 6.1 summarises and compares the original and the adapted principles applied to radiography.

Table 6.1 Cultivating Communities of Practice vs. Situated Professional Learning Communities: a comparative overview

Wenger et al's (2002) principles	Original intent	Adapted principles	Adapted application in radiography
(i) Design for evolution	Communities develop organically, evolving from members' needs and relationships.	**(i) Design with structure and intentionality**	Requires intentional design with clear goals, management endorsement, and defined structures.
(ii) Dialogue between inside and outside perspective	Encourage cross-boundary dialogue to bring in new ideas and challenge assumptions.	**(ii) Facilitate dialogue with relevant internal and external contributors**	External input must be clinically relevant and credible to maintain engagement and avoid resistance from practitioners.
(iii) Invite different levels of participation	Enable core, active and peripheral participation to sustain a dynamic community.	**(iii) Acknowledge and manage hierarchical participation**	Hierarchical dynamics require formal mechanisms to empower (junior) practitioners, ensuring safe spaces for contributions and recognition of input across all professional levels.
(iv) Public and private spaces	Provide both open forums and smaller, private interactions for learning.	**(iv) Balance in-person and online interaction**	Interaction spaces must be balanced between in-person and online (videocall, communication platforms) to accommodate shift patterns, workload pressures, and improve access.
(v) Focus on value	Communities thrive when members perceive and create	**(v) Demonstrate value in clinical and**	Value must be linked to measurable outcomes (e.g., diagnostic accuracy, workflow efficiency, patient safety etc.)

		value for themselves and their organisation.		**organisational terms**	to secure organisational support and resource allocation.
(vi)	**Combine familiarity and excitement**	Balance comfort and innovation to sustain interest.	**(vi)**	**Balance familiarity with safe innovation**	Encourage incremental, evidence-based improvements that feel safe within a risk-averse culture, framing change as patient-safety enhancement rather than deviation from protocol.
(vii)	**Create a rhythm for the community**	Establish a consistent pattern of activity to maintain momentum.	**(vii)**	**Create a sustainable rhythm adapted to clinical realities**	Develop flexible, sustainable rhythms to accommodate unpredictable clinical schedules and workforce shortages.

Chapter 7: Recommendations, strengths and limitations

This chapter presents a comprehensive set of recommendations and practical implications for both practice in general, and AML. It also offers recommendations for future research directions to build upon the findings and the generated theoretical framework. Additionally, the chapter critically examines the limitations of the study, and provides context for the scope and transferability of the results. Finally, it underscores the strengths, originality and unique contributions of the thesis, highlighting how it advances existing knowledge in the field, and concludes with a reflection on the PhD journey. Given the level of detail devoted to recommendations, and the critical assessment of strengths and limitations, the chapter is maintained as a distinct chapter rather than merged with the conclusion, ensuring a clear, coherent and well-structured presentation.

7.1 Recommendations for practice

The findings of this study presented three core categories that shaped the discussion: i) Evidence-based Practice and Continuing Professional Development in radiography; ii) future of radiography and iii) Communities of Practice in radiography. From the findings and discussion, a theoretical framework was developed, proposing the SPLC model as a strategic approach to promote knowledge dissemination, enhance EBP and CPD, and foster collaborative professional cultures within radiography.

The thesis highlights that, despite longstanding recognition of their importance, EBP and CPD remain inconsistently applied in radiography practice, carrying significant economic, ethical and legal implications for organisations, practice and patients.

Barriers to implementations are multifaceted including time constraints, levels of individual engagement, and a lack of structured and sustained organisational support. Additionally, both the study findings and broader literature point to potential transformative shifts within the radiography profession in the future, including further integration of AI affecting the role of the radiographer, advancements in imaging technology, and a growing interest in advanced and extended practice roles. To respond to these evolving demands, bridge the theory-practice gap, and enable adaptive, rapid solutions to change, the SPLC framework is proposed as a viable and strategic intervention. Rooted in the principles of CoPs, SPLC offers a structured yet flexible approach to professional learning, supporting the co-construction of knowledge, knowledge dissemination, EBP and CPD. As previously discussed in earlier chapters, the theoretical underpinnings of SPLC provide a strong rationale, contextual foundation, and practical tools for fostering such communities in radiography. However, given that SPLC is a novel concept, their implementation must be approached with caution. A phased and small-scale introduction, for example, within a radiology department, is recommended to explore the dynamics, legitimise the concept, and engage participants meaningfully. This approach allows for buy-in and individual understanding prior to gradual development of communities, including additional, specialised communities, scaling across regions, incorporating external contributors and expanding across interprofessional boundaries.

It is important to note that poor management or superficial understanding of SPLC risks disengagement among professionals, which could in turn, undermine the sustainability of the initiative and jeopardise opportunities for institutional support and funding. Therefore, ongoing management, monitoring and evaluation (e.g., formative or informative feedback mechanisms) of both, digital and in-person SPLCs are critical, serving to assess the effectiveness of the communities, identify potential barriers to engagement or implementation, and enable continuous refinement of the model. It also ensures that the communities remain relevant, generate output, and retain their value for professionals and organisations, ultimately enhancing the quality of care for service users. Furthermore, as detailed in section 6.5, in addition to strong organisational support and leadership, active involvement of key stakeholders such as regulatory and professional bodies, and educational institutions are essential for legitimising and embedding SPLCs within the broader professional landscape. Their engagement is critical in aligning SPLCs with established professional standards, ensuring quality assurance, and reinforcing their relevance within existing structures and governance. This involvement not only strengthens the credibility of SPLCs, but also positions them as a strategic component within wider efforts to advance EBP, support CPD, and facilitate ongoing knowledge dissemination across the radiography profession.

7.2 Recommendations for Alliance Medical Limited

As previously mentioned, AML is an independent diagnostic and molecular imaging provider who deliver services to public and private healthcare organisations. AML operates differently from the NHS in several aspects, including its business model, accessibility, service settings and the range of services offered. The successful implementation of SPLCs within an organisation such as AML will necessitate a significant culture change, including aligning the initiative with the organisation’s core business values and strategic objectives. Furthermore, training and conceptual understanding among both the clinical workforce and management are essential in establishing the foundational groundwork for the development of the mindsets, attitudes, and behaviours associated with the integration and sustainability of SPLCs. Beyond the internal benefits to learning, practice and feeling of belonging in the company, SPLCs potentially also deliver tangible economic value to the organisation. For example, by fostering CPD, EBP, collaboration, and reflective practice, SPLCs may lead to increased workforce efficiency, reduced clinical errors, and improved service outcomes, all of which contribute to reduced operational cost over time. Additionally, an increase in staff engagement and skilled workforce could contribute to lower staff turnover and recruitment costs, further strengthening the organisation's economic position.

From a strategic perspective, a well-embedded SPLC framework enhances AML's credibility and appeal to partners and potential customers, demonstrating a commitment to staff development and quality, positioning the company as a reliable, forward-thinking partner. Crucially, the structured reflection, documentation of practice improvement, and proactive efforts to EBP and CPD with SPLCs plays a pivotal role in supporting regulatory compliance, providing foundation for meeting CQC standards and other accreditation requirements. Particularly, it positions the company more favourably during inspections, evidencing a learning culture, continuous improvement, and staff empowerment, which in turn enhances its public reputation and contributes to a cycle of quality assurance and excellence.

In the context of AML, the diversity of imaging modalities across various operational settings presents complex and varied learning needs, which shape the professional development requirements of the workforce. For example, mobile imaging units may benefit from the implementation of modality-specific SPLCs that are arranged at organisational level, embedding a more consistent and equitable dissemination of knowledge, promote peer supported learning, and reinforce best practices across geographically dispersed teams. Conversely, static sites, CDCs and IDCs may find greater value in establishing SPLCs at the departmental or regional level. These could be complemented by annual, organisation-wide SPLCs centred on specific imaging modalities, providing opportunities for cross-site knowledge exchange, professional development, and standardisation of practice. Depending on organisational priorities and the interest of the workforce, role-specific or subject-specific communities, focusing on roles or areas such as graduate radiographers, assistant practitioners, AI, reporting, radiation safety or patient-centred care could also be introduced, allowing enhancement of professional engagement and support for targeted workforce capability development across the organisation.

Considering AML's dispersed workforce, leveraging technology is essential to not only reduce costs, but also support consistent participation, particularly considering the unpredictable schedules and demands of clinical staff. Platforms such as Microsoft Teams can facilitate the majority SPLC meetings, offering flexibility and accessibility. To complement this, periodic in-person gatherings (e.g., annually) can strengthen relationships, improve non-verbal communication and increase engagement. Additionally, AML could benefit from implementing a company-wide digital platform to connect clinical teams across the organisation, enabling sharing of ideas, rapid knowledge dissemination, and collaborative problem-solving, creating a flexible, dynamic space for professional engagement. Similar to synchronous SPLCs, these digital communities could be tailored by modality, role, or subject, allowing professionals to join groups aligned with their interests and expertise.

However, this approach does present challenges, including the risk of information overload and the need to ensure the accuracy of shared content, highlighting the importance of active moderation and quality assurance.

As detailed in the previous chapter, successful implementation demands a dedicated team, strong leadership and visible management understanding and support. To support the leaders' understanding and knowledge of SPLCs, the scope of such communities could be expanded to include leadership and management, which also further embeds the model into the organisations' strategic operations.

7.3 Recommendations for future research

While the concept of CoPs has been explored in fields such as business and education, the literature review and findings of the thesis reveal a notable gap in research within healthcare, particularly in the field of radiography. This lack of research and its implementation is also reflected in the participants' responses, which indicated limited awareness or understanding of CoPs, but a positive attitude to its integration in radiography settings.

Building on the CoPs framework, the theory of SPLCs offers an adaptive model suited to the specific needs and dynamics of the radiography context. It is recommended that this model is implemented and further investigated through both qualitative and quantitative research methods to capture a comprehensive understanding of its impact and to allow for necessary refinements in response to local or organisational needs. Additionally, although the thesis and framework focus on radiography, the proposed model has the potential to be adapted and applied across other (allied) health professions, given the shared contextual challenges and learning environments in these fields.

7.4 Strengths and limitations

The study is subject to several limitation that must be acknowledged. Firstly, the research was conducted within an independent imaging organisation, which differs structurally and operationally from public healthcare systems such as the NHS. Specifically, the NHS operates under a distinct business model, with different priorities, funding structures, and workforce dynamics. As a result, the specific challenges, enablers and perspectives of EBP, CPD, CoPs and the future of radiography may not fully reflect by those experienced in publicly funded institutions, and the SPLC model may therefore not be applicable in such a setting. Nonetheless, it can be argued that the core issues explored are systemic and (inter)national in nature. These challenges have been widely reported across healthcare sectors and are not confined to any single organisational model, as discussed in detail in the background and discussion sections. Furthermore, irrespective of the sector, all healthcare providers in the UK are bound by the same overarching legislations, regulatory frameworks and professional standards, and increasingly collaborate to respond to the healthcare pressures, which may serve to mitigate some of the contextual differences (Department of Health & Social Care, 2025).

Secondly, a change in the principal investigator's role during the data collection phase represents a potential source of bias. Initially positioned as a clinical radiographer, the researcher transitioned into a managerial role within the same organisation. This shift may have influenced participant behaviour, particularly during observations and interviews due to perceived power dynamics or concerns that their performance was being evaluated rather than studied for research purposes. While every effort was made to minimise this risk, including clear communication of the study’s aims and assurances of confidentiality, social desirability bias cannot be fully ruled out.

A final consideration relates to potential biases inherent in GT research. One of the most notable is interpretivist bias, where the researcher’s perceptions, professional background, or prior knowledge may inadvertently shape data interpretation (Kaptchuk, 2003; Pervin and Mokhtar, 2022). Aligning with the critical realist ontology and post-positivism epistemology, the Straussian variant of GT was employed, which acknowledges the value of both interpretivist insights and objective rigour. The Straussian GT recognises the researcher as an active participant in the analytical process, while aspiring toward systematic, credible, and transparent theory building (Singh and Estefan, 2018). To achieve this, the study integrated structured analytical tools including the paradigm model and the conditional matrix to facilitate a disciplined examination of the data, and supported the mitigation of researcher subjectivity by encouraging the exploration of casual relationships, contextual influences and the broader structural conditions of the phenomenon. This approach enhances the dependability of the study, ensuring that findings are not personal interpretations, but are demonstrably grounded in the systematically collected and analysed data (Ahmed, 2024).

To further strengthen the trustworthiness of the study and reduce interpretive bias, several strategies were employed (Stenfors, Kajamaa and Bennett, 2020; Ahmed, 2024). Firstly, periodic debriefs were conducted with senior management, clinical and academic colleagues, which served to challenge individual interpretations and offer alternative viewpoints. Secondly, a reflexive diary was maintained throughout data collection and analysis phases for documenting of personal reflections, assumptions and emotional responses, enabling the researcher to consciously identify potential bias. This also informed the memo-writing process supported idea generation, and shaped questions for subsequent interviews and observations. Additionally, theoretical sampling was used to guide participant or unit recruitment, allowing the researcher to purposefully seek cases that could elaborate, contrast or deepen emerging conceptual categories (Kyngäs, Kääriäinen and Elo, 2020). This iterative sampling strategy ensured that the data collection was responsive to the developing theory. Data collection continued until theoretical saturation was reached, where no new insights emerged, and existing categories were sufficiently developed in terms of variation and explanatory power (Ahmed, 2024). This process enhanced the credibility and completeness of the findings, ensuring that the final theory was grounded, coherent, and analytically robust. Finally, member checking was completed, in which transcripts were returned to the participants to verify the accuracy of their contributions and offer clarifications or additional insights that may have emerged after their interview. This process ensured that the participants' voices were authentically represented and respected within the analysis, contributing to the confirmability of the data (Kakar *et al.*, 2023; Ahmed, 2024).

In addition to the strengths associated with the systematic and rigorous methodological perspective, the study demonstrates several strengths in both its research design and the theory developed. Firstly, the study was conducted within an independent imaging organisation, an area that remains under-researched despite its growing significance within UK's current healthcare landscape (Kalidindi and Gandhi, 2023; Nightingale *et al.*, 2023). Secondly, the study adopted an inclusive approach to the radiography workforce, involving not only radiographers but also technologists, clinical assistants, assistant practitioners and advanced practitioners across a range of practice settings, including IDCs, CDCs and mobile services, rather than being restricted to the traditional hospital-based context only. Finally, the model proposed is highly detailed and grounded in its own assumptions regarding learning and knowledge. Moreover, it is contextually relevant, accompanied by a practical guide to implementation, and supported by a comprehensive set of recommendations for practice. Two peer-reviewed articles addressing the implications of limited EBP and CPD, and the potential of the theory of CoPs in radiography practice were published to raise professional awareness, establish conceptual relevance, and prepare the field for the introduction of the adaptive SPLCs model.

7.5 Original contribution to knowledge

The thesis explored EBP and CPD, perspectives on the future of radiography, and critically examined CoPs in the context of radiography, a theory that is under-researched in healthcare. Additionally, the thesis makes a distinctive contribution by proposing an adaptive model tailored to the profession. The theory of SPLCs is a nuanced framework, designed to support collaborative learning, knowledge dissemination, EBP and CPD, providing a practical and contextually relevant approach that contributes to ongoing efforts to bridge the theory-practice gap in radiography.

Importantly, the research was conducted within an independent imaging organisation, including settings such as IDCs, CDCs, and mobile units, contexts that are frequently overlooked in UK radiography research. This adds a further layer of originality and extends the applicability of the findings beyond traditional NHS or academic environments. Therefore, the study not only diversifies the research landscape, but also highlights the potential for SPLCs to support learning, knowledge dissemination, EBP and CPD in varied and evolving healthcare settings.

7.6 Reflection on the research journey

The interest in research and academia began long before the opportunity a PhD presented itself. Particularly, my interest in EBP in radiography was sparked during my undergraduate studies while working on my bachelor's dissertation. The initial exposure laid the foundation for a greater appreciation of how research could shape and improve clinical practice, and the interest increased as I progressed through postgraduate training and started my career in radiography. Working in a clinical environment brought a clear understanding of the importance of innovation and continuous improvement, initiating projects within the department and organisation using research and EBP as tools to address challenges, and enhance workflow and patient care. These early initiatives reinforced my motivation to pursue further academic development, and eventually led to discussions with my line manager and senior leadership about the possibility of pursuing a PhD.

When I started the PhD, I was working as a senior radiographer in MRI. Research had to fit around my clinical role, which typically involved three 12-hour shifts per week. Despite the demanding schedule, I found the balance between clinical work and research manageable. However, a year into my studies, I transitioned into a management position, taking on responsibility for overseeing the MRI service and leading a team of radiographers, clinical assistants and administrators. This change significantly impacted the time I could dedicate to the PhD, particularly in the early stages of the new position where the demands of learning to lead and manage a service delayed my research programme. While challenging, this period offered valuable insights and experiences. Balancing responsibilities with academic work required a new level of discipline and adaptability, and reinforced the importance of flexibility, patience, and the long-term perspective. Additionally, the management role supported by studies, providing additional insights into the challenges and possibilities of applying theoretical concepts into the dynamic, unpredictable and resource constrained radiography setting.

As expected, the PhD came with alternating periods of clarity and motivation, where goals felt within reach, the path ahead was well-defined, and I made tangible progress that reinforced my commitment to the project. These moments were fulfilling and served as important reminders of why I started this journey in the first place. However, these high points were naturally balanced by phases of uncertainty, self-doubt, and fatigue, especially as I navigated the demands of completing the PhD part-time. During the inevitable ebbs of progress, I learned the importance of persistence, patience and self-compassion. These phases became valuable opportunities for reflection and recalibration and taught me to appreciate the non-linear nature of research, and incremental progress rather than immediate results.

In retrospect, I would have maintained a general diary documenting my evolving thought processes, assumptions, and emotional landscape throughout the entire PhD. While the reflexive diary during data collection and analysis was incredibly valuable in capturing situational insights and immediate reactions, it did not always capture the full process and experience of the PhD journey, including the shifts in my thinking, the broader academic and personal challenges, or the conceptual breakthroughs that occurred outside of research activities. Therefore, a general thought-process diary could have served as a space to regularly record not only research decisions, but also moments of doubt, intellectual turning points and periods of disengagement. These reflections, had they been captured consistently, would have offered a rich meta-narrative of how I developed as a researcher, and how I became to think the way I do at present.

While the initial focus was on producing a substantial and original contribution to academic knowledge, I have gradually come to realise that the significance of the PhD extends far beyond the academic milestones. Particularly, the PhD has not merely been a project or qualification, it has been a process of intellectual, social and individual maturation. Throughout this journey, I have encountered complex challenges, navigated periods of uncertainty, and cultivated resilience. Most importantly, it has been a philosophical journey that has fundamentally reshaped my understanding of knowledge, the world around me, and of my own place within it, fostering a more critical, empathetic, and expansive way of engaging with the world.

As this phase concludes, the next steps involve implementation, ongoing refinement, and the aspiration that its value will be recognised and integrated into the training and everyday practice of radiographers. Beyond its practical impact, I will carry forward the experience and personal development not only within academic settings, but into any future careers and leadership roles, and everyday engagement with the broader societal and human questions. One of the most important lessons it has taught me is that learning and understanding is not a static achievement, nor does it conclude when a goal is reached. Whether in individuals, professions, organisations or any other setting, growth is a continuous unfolding: an ongoing process of refinement, discovery, and becoming. And so I close this reflection with words that resonate with me and my journey, capturing the cyclical, yet continually evolving process of understanding, maturation, and development:

“We shall not cease from exploration,
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.”
— T.S. Eliot, Little Gidding, Four Quartets, 1942

Chapter 8: Conclusion

The concept of EBP and CPD are fundamental in healthcare, including the field of radiography, aiming to enhance patient outcomes by ensuring that care is current, effective, safe and efficient. EBP involves the integration of best available evidence, professionals' clinical expertise and patient values to guide decision-making in practice, whilst CPD represents the ongoing process of learning and reflection that enables radiographers to maintain their professional knowledge, skills and competence throughout their careers. Despite the widespread recognition of their importance, the implementation of EBP and CPD remains inconsistent, with several barriers contributing to this gap between theory and practice, including negative attitudes and beliefs towards research and EBP, insufficient knowledge and skills to engage with and apply evidence, limited access to resources such as time and literature, and a lack of institutional support or authority to implement EBPs or engage in CPD. The thesis highlighted that inadequate integration of EBP and CPD carry significant economic, legal and ethical complications. Economically, embedding EBP and CPD into practice could alleviate financial pressures by promoting cost effective, evidence-based processes and systems without compromising the quality of the service and patient care. Legally, radiographers and healthcare organisations are required to engage with EBP, research, and audit activities to comply with professional and regulatory standards including those set by the HCPC, clinical governance frameworks, NICE guidelines, and IR(ME)R regulations. Ethically, while some conflicting views with EBP has been identified, it is widely regarded as both best practice and a professional duty when executed with the best interest of patients and service users.

To address the persistent theory-practice gap within radiography, the thesis examined the theoretical underpinnings of Implementation Science, Translational Science and knowledge diffusion theories, and its application within a healthcare context. The theoretical frameworks, while distinct in focus, collectively seek to explain how research can be effectively translated into clinical practice to enhance the quality, safety and efficiency of care. However, despite being well-defined, and conceptually robust, these theories are criticised for their rigidity, complexity and a lack of cohesion. These barriers may be particularly intensified within the highly regulated, multidisciplinary, and rapidly evolving nature of radiography, making the seamless translation of these theoretical models into practice challenging. Consequently, although these frameworks provide valuable insights into mechanisms of change and innovation in healthcare, their practical application and long-term sustainability within a radiography context may present significant constraints. Therefore, the thesis explored the theory of CoPs, a social learning theory, as a potential approach to bridging the theory-practice gap in radiography.

To evaluate the application of the CoPs theory within the context of radiography, the thesis examined the barriers and facilitators of learning in practice, EBP, and knowledge dissemination and sharing, and the extent to which CoP principles are present in radiography settings. These insights subsequently informed the development of a theoretical framework aimed at integrating the CoPs theory into radiography practice. The study was grounded in a critical realist ontology and a post-positivist epistemology, acknowledging objective realities and agreements related to those realities, whilst recognising the influence and value of subjective interpretation. In alignment with this position, and in recognition that the theory-practice gap in radiography arises from multiple, interrelated social and structural factors including practical, individual, and environmental influences, the study drew upon critical theory and symbolic interactionism. These perspectives enabled both a macro-level analysis of power, culture, and structural dynamics, and a micro-level exploration of interpersonal interactions and meaning within radiography practice, thereby facilitating a more comprehensive understanding of the phenomenon under investigation.

As demonstrated in the literature review, there is limited research on the application of CoPs within radiography. Consequently, the study aimed to generate theory grounded in data, rather than merely describe or interpret existing phenomena. Specifically, the Straussian version of GT was employed, as it aligned with the study's philosophical and theoretical underpinnings, attempting to maintain an objectivist orientation by applying systematic inquiry, controlled analysis, and methodological rigour. Additionally, although the research process was conducted in a systematic and rigorous manner, this GT model also values description, enabling a more comprehensive understanding of the barriers and facilitators that shape learning and knowledge dissemination in radiography. Congruent with the GT methodology, the study applied observations and semi structured interviews to allow for exploration of the subject under investigation. A total of seven sites, differing in setting (e.g., mobiles, IDC) and modality (e.g., PET-CT, MRI), and 30 interviews were completed, yielding field notes and transcripts for analysis. In line with the Straussian GT, a simultaneous and iterative process to data collection and data analysis was performed to constantly compare, identify, and pursue emerging phenomena. The analysis process followed the stages of open, axial and selective coding, enabling a systemic development of categories. Additionally, the analysis incorporated both, a paradigm model and conditional matrix. The paradigm model was employed to identify patterns and relationships among causal conditions, contextual and intervening conditions, action/interaction strategies and consequences, while the conditional matrix served as an extension to the paradigm model, providing a holistic representation of how micro (immediate), meso (organisational), and macro (societal) factors interact to influence the phenomenon. These analytical tools facilitated the organisation and structuring of the data and analysis, and supported the identification and integration of relationships among the categories that emerged from the data.

The findings covered three main subjects, reflecting the core categories identified in the analysis process: i) Evidence-based Practice and Continuing Professional Development in radiography; ii) future of radiography and iii) Communities of Practice in radiography. Overall, most participants showed awareness of the concept of EBP, particularly those in higher positions, holding a higher qualification level or those interested in improving radiography services, and recognised benefits in engaging in EBP including enhancing patient care and the radiography service. However, most patients were unable to describe what EBP entails, and used the terms EBP and CPD interchangeably. Accordingly, an irregular engagement with EBP and CPD is reported, with barriers related to a lack of time and resources, a lack of authority to implement changes, a lack of motivation or understanding to engage in EBP and CPD, or a lack of support from management, peers, radiologists or clinicians. Some of these barriers were more commonly experienced in particular settings or modalities. For example, in PET-CT, protocols were considered more rigid and prescriptive due to the nature of the modality involving injection of radiopharmaceuticals. Similarly, the mobile team reported limited flexibility and an inability to deviate from the protocols established by the host site.

Interestingly, although a lack of support by managers, peers and radiologists were reported, nearly all participants considered these parties a source of EBP and CPD, depending on their relationship with the peer, their experience level and interest in EBP and CPD. Nevertheless, formal training opportunities such as attending courses and conferences were regarded key to promoting EBP and CPD. Participants also identified the establishment of forums, journal clubs or dedicated training departments as mechanisms for supporting ongoing learning and engagement with EBP and CPD. More broadly, fostering a culture of learning within organisations was considered fundamental to sustaining these practices. Several participants suggested that increased enforcement, for example through policies, employers or regulatory bodies such as the HCPC may be necessary to ensure consistent engagement. Additionally, some emphasised the need to hold organisations accountable, not solely individual practitioners for supporting and facilitating EBP and CPD in practice.

With regard to the future of radiography, nearly all participants mentioned the pivotal role of AI and technological innovation, noting that advancements have profoundly changed current practice, and will continue to guide its evolution. Many participants anticipated that these developments would alter the role of the radiographer, with some expressing concern that such changes could pose a threat to the profession or transform existing roles, responsibilities, and departmental dynamics. For example, participants predicted an increase in remote working, advanced practice, and supervisory responsibilities, accompanied by a shift in the knowledge and skills required to meet the evolving professional demands. Conversely, several participants viewed AI as an opportunity for enhancement, highlighting its potential to improve efficiency and patient outcomes. From this perspective, AI was considered not only inevitable but also essential to the ongoing evolution of this highly technological discipline. In reflecting on the future, participants identified the need to strengthen learning and knowledge dissemination within the profession. Proposed strategies included improving access to resources such as time, information and support, and fostering a culture of encouragement and empowerment. Participants particularly emphasised the value of building support networks and promoting interconnectedness within organisations and across the wider radiography community by developing online platforms, potentially leading to a more collaborative and knowledge-driven radiography workforce.

Participants were generally unfamiliar with the term CoPs and its conceptual meaning. When the concept was explained, nearly half of the participants believed that CoPs emerge organically, developing as individuals share knowledge and learn from one another in daily practice. However, observational data revealed limited evidence of knowledge dissemination among professionals, except in specific contexts such as training new staff or students, or when addressing complex clinical cases. In routine practice, the clinical team’s focus appeared to be primarily on maintaining efficiency and workflow, particularly concerning image acquisition techniques, patient preparation, data and image management, and adherence to safety and quality standards. Accordingly, most participants reported that they rarely share or discuss any radiography related information outside their immediate workplace. Nevertheless, participants expressed a positive attitude toward the formal establishment of CoPs, recognising their potential to benefit the organisation, patients, and the radiography profession more broadly. CoPs were viewed as a mechanism for fostering a culture of continuous learning and improvement through knowledge sharing, dissemination of best practices and enhanced collaboration. Additionally, participants also associated CoPs with improved efficiency, innovation, and ultimately enhanced patient care and outcomes. Several participants proposed the creation of both, profession- or modality specific CoPs and NoPs, as well as role-specific communities (e.g., CoPs or NoPs for reporting radiographers or clinical assistants). They identified value in virtual and in-person delivery of the concept, with in-person CoPs providing greater accessibility and flexibility, while in-person CoPs offering better opportunities for relationship building and interpersonal engagement. Most participants recommended convening such communities every three or six months, depending on the needs of the group and the mode of delivery. Similarly, interdisciplinary participation (i.e., LoPs) was viewed positively, as involvement of other healthcare professionals were believed to promote cross-disciplinary understanding and communication. However, participants emphasised that their engagement should be strategically targeted to professions offering direct relevance to radiography practice, such as radiologists. Moreover, many participants highlighted the potential benefits of involving educational institutions, arguing that such partnerships could facilitate improved integration of evidence-based knowledge to practice, and vice versa, the academic institutions could obtain insights into clinical practice and implicit information, with the view to identifying any gaps for further research and promoting a more robust connection between theory and practice.

The discussion substantiated the study’s findings by revealing strong alignments with existing literature on EBP and CPD in practice. Particularly, EBP is considered valuable, and was generally perceived positively among healthcare professionals including radiographers, while noting that its full implementation is still emerging and continues to face challenges, including a lack of time, support, resources, and research knowledge and skills. Notably, the individuals in higher positions, those with post graduate qualifications, or those motivated to improve radiography services demonstrate a greater understanding of EBP and research, suggesting that university-level education, additional responsibilities or expanded roles positively influence these competencies. The discussion emphasised the critical role of organisations and management, not only in providing adequate resources and support but also in actively empowering staff, fostering and sustaining a culture of research and innovation, and demonstrating strong leadership that sets the direction for ongoing learning in professional practice. This aligns with Maslow’s hierarchy of needs and Herzberg’s motivation theory, underscoring the importance of recognition, reward, and a supportive workplace standards that foster safety, belonging, and self-esteem, factors that shape both intrinsic and extrinsic motivation. Furthermore, the discussion highlighted a prevailing perception that individual radiographers, particularly those who have not undertaken postgraduate training or do not practise in advanced roles, have limited capacity to influence or change current practice, and often persist with their traditional practices rather than adopting evidence-based recommendations. This may reflect a broader, complex professional culture within radiography, marked by dominance of medical authority and elements of protectionism. Moreover, the discussion also questioned the adequacy of the current CPD audit model, advocating for a more structured and continuous approach to monitoring CPD and EBP activities, supplementing the existing random audit system to increase professional engagement and accountability.

The discussion examined the potential changes awaiting the radiography profession, particularly the continued expansion and integration of AI within this technology-driven field. In response to the growing presence of AI, the skill set required if radiographers must evolve to include a strong foundation in AI literacy, enabling professionals to effectively engage with and oversee AI-assisted, semi-automated processes. Although AI is unlikely to fully replace radiographers, its integration is expected to reshape routine clinical tasks, facilitate remote working opportunities, and potentially increase advanced practice roles. This shift may reposition the profession towards more complex, analytical, and leadership-oriented responsibilities. AI also offers potential solutions to existing challenges, such as reporting backlogs and workforce shortages. Nevertheless, the discussion highlighted that while the integration of AI into radiography is inevitable, it introduces a range of challenges that must be approached with caution. To ensure effective and ethical implementation, AI systems should be developed to promote transparency and explainability in their decision-making processes. Moreover, robust regulatory frameworks and governance structures are essential to support the safe integration of AI into everyday practice, enhancing outcomes for patients, healthcare professionals and services. Crucially, this integration must not come at the expense of the patient-facing aspects of radiography practice, which remains fundamental to the provision of high-quality, patient-centred care. Additionally, the integration of AI necessitates CPD and training for radiographers, enabling them to maintain the competencies required to engage with the advancing imaging technologies, algorithms and AI tools.

Consistent with the findings of the study, the discussion highlighted that although efforts are made to establish both formal and informal CoPs and NoPs within healthcare including radiography, many of these initiatives only share some elements of a true CoP. Moreover, evidence remains limited regarding the operations of these communities, their prevalence and benefits, and the extent of participant engagement. In radiography, CoP initiatives appear to be primarily driven at a higher level, with strong awareness and support from universities, professional bodies and regulators; however, they have yet to extend into the workforce. The implementation of CoPs may offer potential benefits for the radiography profession. Beyond facilitating knowledge sharing, innovation, and the integration of EBPs, CoPs could contribute to preparing practitioners to meet both current and emerging challenges in healthcare. Particularly, as radiography continues to evolve in response to expanding scopes of practice, shifting clinical responsibilities, continuing resource constraints, and the growing integration of AI, CoPs could provide a collaborative framework through which practitioners collectively adapt, share expertise, and co-create responsive solutions. Additionally, when strategically developed and institutionally supported, CoPs may function as valuable organisational assets that foster continuous learning, professional development, and workforce resilience. However, its impact is contingent upon sustained engagement, institutional commitment, and alignment with operational realities of radiography practice. This requires the adoption of a flexible, contextually responsive model of CoPs that considers the constraints of healthcare settings, including a lack of resources, time pressures and workforce barriers. Without such adaptation, the potential benefits for both practitioners and organisations are likely to be limited.

Building on the findings and theoretical foundations outlined in the discussion, an adaptive version of the theory of CoPs is proposed, named ‘’Situated Professional Learning Communities’’. This revised theory is grounded in a set of assumptions concerning the nature of learning, knowledge, and the identity of knowers within the healthcare context. These assumptions do not merely frame the theory; they articulate a distinct perspective on how meaning, competence, and professional growth emerge within a healthcare context. Specifically, the SPLC framework affirms that learning is inherently social and participatory, yet it situates this in the high-stakes, relationally complex environments of healthcare, in which knowledge is both co-constructed and enacted in practice. Based on these revised assumptions, the components of the social learning theory are reinterpreted to capture not only the social dimensions of learning and knowing, but also their temporal, developmental and motivational aspects. Additionally, the revised model extends Wenger’s original framework by emphasising individual responsibility, intrinsic motivation, and the embodied, context-dependent nature of professional practice. Within this model, the core elements – meaning, practice, community, identity and trajectory – are viewed as interdependent rather than discrete, which interact, shape and reinforce one another. For example, meaning does not arise in isolation; it is co-constructed through engagement in practice, shaped by communal norms, oriented by personal and professional identity, and sustained across developmental trajectories.

Informed by these assumptions and alternative perspectives on social learning, the SPLC framework retains Wenger's three foundational elements of domain, practice, and community, while introducing 'individual' as a distinct and equally important component to acknowledge the role of individual learning and active ownership of professional development. Unlike the original CoPs model, the SPLC framework recognises that professional practice such as radiography requires both, communal structures and individual agency, ensuring that knowledge is not merely exchanged but also enacted, adapted, and sustained within clinical practice. Consequently, such communities within radiography become a bridge between theory and practice, aligning (collective) knowledge with individual competence and practice, and ensuring that professional identity, expertise, and purpose evolve alongside the changing demands of healthcare, while facilitating rapid dissemination and potentially the application of knowledge.

The thesis outlined the multi-level influences that could potentially shape the establishment of SPLCs in radiography, considering the regulatory and professional bodies, involvement of educational institutions, organisations, and individual practitioners. Collectively, these stakeholders provide the structural authority, cultural legitimacy, and professional motivation necessary to embed such communities in practice. Accordingly, a top-down strategy for cultivating and implementing SPLCs in practice is advocated, ensuring that communities are not only supported but also resourced, legitimised and sustained. Anchored in strong leadership, the thesis proposed seven reconfigured principles designed to address the specific challenges of a regulated, hierarchical, and resource-constrained healthcare environment. These principles extend beyond the original CoPs model's reliance on spontaneous evolution and fluid participation, instead emphasising intentional design, organisational alignment, demonstrable clinical value, and flexible yet accountable participation, with a sustained focus on EBP, CPD and knowledge dissemination.

Given the novelty of the SPLC concept, a phased, small-scale implementation at department level is recommended to explore its dynamics, legitimise the model and foster meaningful participant engagement. Additionally, it is important to note that poor management or superficial understanding of SPLC may lead to disengagement, risking sustainability and institutional support. Therefore, ongoing management and feedback mechanisms across all modes of SPLCs (i.e., digital or in-person settings) are essential to assess effectiveness, identify barriers and enable continuous refinement of the model. Additionally, active involvement of key stakeholders including professional bodies, regulatory bodies and educational institutions are crucial for legitimising and embedding SPLCs within the broader professional landscape. Their engagement is critical in aligning SPLCs with established professional standards, ensuring quality assurance, and reinforcing their relevance within existing structures and governance. This integration strengthens credibility and positions SPLCs as a strategic mechanism for advancing EBP, supporting CPD, and promoting knowledge dissemination in radiography. Finally, further qualitative and quantitative research is recommended to develop a comprehensive understanding of SPLC's impact in practice and to support the refinement of the model. Similarly, future research should investigate its application across various professional contexts and (allied) health disciplines to assess its wider relevance and potential contribution to professional learning in practice.

In conclusion, this thesis examined EBP, CPD, and emerging perspectives on the future of the radiography profession, while evaluating the applicability of CoPs in practice. Additionally, the thesis makes a distinctive contribution to knowledge through the development of an adaptive model of CoPs, specifically tailored to the radiography profession. The SPLCs model offers a nuanced and contextually grounded approach to fostering and supporting collaborative learning, knowledge dissemination, EBP, and CPD, contributing to the ongoing efforts of bridging the theory-practice gap in radiography.

References

Abrantes, A.F.C.L. *et al.* (2020) 'Evidence-based radiography: A new methodology or the systematisation of an old practice?', *Radiography (London, England: 1995)*, 26(2), pp. 127–132. Available at: https://doi.org/10.1016/j.radi.2019.09.010.

Abu-Odah, H. *et al.* (2022) 'Identifying barriers and facilitators of translating research evidence into clinical practice: A systematic review of reviews', *Health & Social Care in the Community*, 30(6), pp. e3265–e3276. Available at: https://doi.org/10.1111/hsc.13898.

Abuzaid, M.M. *et al.* (2023) 'Exploring Radiographers' Engagement in Research: Motivation and Barriers in Five Arab Countries', *Healthcare*, 11(20), p. 2735. Available at: https://doi.org/10.3390/healthcare11202735.

Acar, I.H. and Yıldız, S. (2016) 'Professional Development of Elementary School Teachers through Online Peer Collaboration: A Case Study', *Turkish Online Journal of Qualitative Inquiry*, 7(4), p. 422. Available at: https://doi.org/10.17569/tojqi.79480.

ACORRN Research Radiographer Working Party (2007) 'Gap analysis of role definition and training needs for therapeutic research radiographers in the UK', *The British Journal of Radiology*, 80(957), pp. 693–701. Available at: https://doi.org/10.1259/bjr/32519670.

Agyekum, E.O. *et al.* (2023) 'Networks of care to strengthen primary healthcare in resource constrained settings', *BMJ*, p. e071833. Available at: https://doi.org/10.1136/bmj-2022-071833.

Ahern, M., McEntee, M.F. and Moore, N. (2023) 'Radiographers' attitudes toward the use of lead contact shielding', *Journal of Medical Imaging and Radiation Sciences*, 54(3), pp. 415–420. Available at: https://doi.org/10.1016/j.jmir.2023.07.006.

Ahmed, S.K. (2024) 'The pillars of trustworthiness in qualitative research', *Journal of Medicine, Surgery, and Public Health*, 2, p. 100051. Available at: https://doi.org/10.1016/j.glmedi.2024.100051.

Ahonen, S.-M. and Liikanen, E. (2010) 'Radiographers' preconditions for evidence-based radiography', *Radiography*, 16(3), pp. 217–222. Available at: https://doi.org/10.1016/j.radi.2010.01.005.

Ahuja, R.B. (2013) 'Ethical practice of evidence-based medicine: A review for plastic surgeons', *Indian Journal of Plastic Surgery : Official Publication of the Association of Plastic Surgeons of India*, 46(1), p. 11. Available at: https://doi.org/10.4103/0970-0358.113701.

Aksan, N. *et al.* (2009) 'Symbolic interaction theory', *Procedia - Social and Behavioral Sciences*, 1(1), pp. 902–904. Available at: https://doi.org/10.1016/j.sbspro.2009.01.160.

Al Balushi, H., Watts, H. and Akudjedu, T.N. (2024) 'Research and evidence-based practice in clinical radiography: A systematic review of barriers and recommendations for a new direction', *Radiography*, 30(2), pp. 538–559. Available at: https://doi.org/10.1016/j.radi.2024.01.012.

Alakhras, M. *et al.* (2023) 'Knowledge, attitude, understanding and implementation of evidence-based practice among Jordanian radiographers', *Radiography*, 29(4), pp. 760–766. Available at: https://doi.org/10.1016/j.radi.2023.05.007.

Alderwick, H., Hutchings, A. and Mays, N. (2024) 'Cross-sector collaboration to reduce health inequalities: a qualitative study of local collaboration between health care, social services, and other sectors under health system reforms in England', *BMC Public Health*, 24(1), p. 2613. Available at: https://doi.org/10.1186/s12889-024-20089-5.

Aldhafeeri, F.M. (2024) 'Navigating the ethical landscape of artificial intelligence in radiography: a cross-sectional study of radiographers' perspectives', *BMC Medical Ethics*, 25(1), p. 52. Available at: https://doi.org/10.1186/s12910-024-01052-w.

Alhabib, A., Almutairi, M. and Alqurashi, H. (2024) 'Patient-Centered Care Model's Effectiveness in Reducing Patient Waiting Time in the Emergency Department: A Systematic Literature Review', *Saudi Journal of Health Systems Research*, 4(3), pp. 103–113. Available at: https://doi.org/10.1159/000540398.

Allmark, P. (ed.) (2015) *Exploring Evidence-based Practice: Debates and Challenges in Nursing*. London: Routledge. Available at: https://doi.org/10.4324/9781315764559.

Almeida, S. and Campos, A.C. (2022) 'New avenues for business competitiveness: the case of a community of practice in the hotel sector', *International Journal of Culture, Tourism and Hospitality Research*, 16(1), pp. 20–34. Available at: https://doi.org/10.1108/IJCTHR-12-2020-0285.

Al-Naser, Y.A. (2023) 'The impact of artificial intelligence on radiography as a profession: A narrative review', *Journal of Medical Imaging and Radiation Sciences*, 54(1), pp. 162–166. Available at: https://doi.org/10.1016/j.jmir.2022.10.196.

Alsop, S. (2013) *Continuing professional development in health and social care: strategies for lifelong learning*. 2d edn. Chichester: Wiley-Blackwell.

Anderson, C. and Rouse, L. (1988) 'Intervention in Cases of Woman Battering: An Application of Symbolic Interactionism and Critical Theory', *Clinical Sociology Review*, 6(1). Available at: https://digitalcommons.wayne.edu/csr/vol6/iss1/17.

Anderson, M. *et al.* (2022) 'Promoting innovation while controlling cost: The UK's approach to health technology assessment', *Health Policy*, 126(3), pp. 224–233. Available at: https://doi.org/10.1016/j.healthpol.2022.01.013.

Andrews, T. (2022) *Innovation-Decision Model (also known as Diffusion of Innovations)*. Available at: https://ascnhighered.org/ASCN/change_theories/collection/innovation_decision.html (Accessed: 12 July 2023).

Anesi, G.L. and Kerlin, M.P. (2021) ‘The impact of resource limitations on care delivery and outcomes: routine variation, the coronavirus disease 2019 pandemic, and persistent shortage’, *Current Opinion in Critical Care*, 27(5), pp. 513–519. Available at: https://doi.org/10.1097/MCC.0000000000000859.

Applied Research Collaboration and North East and North Cumbria (2024) ‘Peer Research Community of Practice - Useful Documents’. Available at: https://arc-nenc.nihr.ac.uk/nihr-arc-nenc-peer-research-community-of-practice-repository/.

Archer, M. *et al.* (2013) *Critical Realism: Essential Readings*. Hoboken: Taylor and Francis.

Arslan Dönmez, S. and Şahin, A. (2022) ‘Peer-coaching Based Professional Development: A Sample of a School of Foreign Languages’, *Georgia Educational Researcher*, 19(1). Available at: https://doi.org/10.20429/ger.2022.190102.

Arteaga, E. *et al.* (2024) ‘Across the Great Divide: A Systematic Literature Review to Address the Gap Between Theory and Practice’, *Sage Open*, 14(1), p. 21582440241228019. Available at: https://doi.org/10.1177/21582440241228019.

Badache, F., Kimber, L. and Maertens, L. (eds) (2023) *International Organizations and Research Methods: An Introduction*. Erscheinungsort nicht ermittelbar: University of Michigan Press.

Bai, J. *et al.* (2021) ‘Applying deep learning in digital breast tomosynthesis for automatic breast cancer detection: A review’, *Medical Image Analysis*, 71, p. 102049. Available at: https://doi.org/10.1016/j.media.2021.102049.

Bairstow, P.J. *et al.* (2010) ‘Reducing inappropriate diagnostic practice through education and decision support’, *International Journal for Quality in Health Care*, 22(3), pp. 194–200. Available at: https://doi.org/10.1093/intqhc/mzq016.

Bansal, G.J. (2006) ‘Digital radiography. A comparison with modern conventional imaging’, *Postgraduate Medical Journal*, 82(969), pp. 425–428. Available at: https://doi.org/10.1136/pgmj.2005.038448.

Barnett, J. *et al.* (2011) ‘Understanding innovators’ experiences of barriers and facilitators in implementation and diffusion of healthcare service innovations: a qualitative study’, *BMC Health Services Research*, 11(1), p. 342. Available at: https://doi.org/10.1186/1472-6963-11-342.

Baron, J. (2018) ‘A Brief History of Evidence-Based Policy’, *The Annals of the American Academy of Political and Social Science*, 678, pp. 40–50.

Bauer, M.S. *et al.* (2015) ‘An introduction to implementation science for the non-specialist’, *BMC Psychology*, 3(1), p. 32. Available at: https://doi.org/10.1186/s40359-015-0089-9.

Bauer, M.S. and Kirchner, J. (2020) ‘Implementation science: What is it and why should I care?’, *Psychiatry Research*, 283, p. 112376. Available at: https://doi.org/10.1016/j.psychres.2019.04.025.

Baxter, G. and Sommerville, I. (2011) ‘Socio-technical systems: From design methods to systems engineering’, *Interacting with Computers*, 23(1), pp. 4–17. Available at: https://doi.org/10.1016/j.intcom.2010.07.003.

Berthelsen, C. and Hølge-Hazelton, B. (2021) ‘The Importance of Context and Organization Culture in the Understanding of Nurses’ Barriers Against Research Utilization: A Systematic Review’, *Worldviews on Evidence-Based Nursing*, 18(2), pp. 111–117. Available at: https://doi.org/10.1111/wvn.12488.

Berthelsen, C.B., Lindhardt, T. and Frederiksen, K. (2017) ‘A discussion of differences in preparation, performance and postreflections in participant observations within two grounded theory approaches’, *Scandinavian Journal of Caring Sciences*, 31(2), pp. 413–420. Available at: https://doi.org/10.1111/scs.12353.

Bhaskar, R. (1975) *A Realist Theory of Science*. London: Verso.

Bhaskar, R. (1979) *The possibility of naturalism: A philosophical critique of the contemporary human sciences*. Atlantic Highlands: Humanities Press.

Bick, D. and Graham, I. (2010) *Evaluating the impact of implementing evidence-based practice*. Chichester: Wiley-Blackwell.

Bisel, R.S. and Adame, E.A. (2017) ‘Post-Positivist/Functionalist Approaches’, in C.R. Scott et al. (eds) *The International Encyclopedia of Organizational Communication*. 1st edn. Wiley, pp. 1–22. Available at: https://doi.org/10.1002/9781118955567.wbieoc168.

Bleiker, J. *et al.* (2016) ‘Compassionate care in radiography recruitment, education and training: A post-Francis Report review of the current literature and patient perspectives’, *Radiography*, 22(3), pp. 257–262. Available at: https://doi.org/10.1016/j.radi.2015.12.008.

Bluff, R. (2005) *Grounded theory: the methodology. In I. Holloway (Eds.), Qualitative Research in Health Care*. London: Open University Press.

Blumer, H. (1969) *Symbolic Interactionism: Perspective and Method*. Englewood Cliffs: Prentice-Hall, Inc.

Bockhold, S. *et al.* (2022) ‘Exploring the translational challenge for medical applications of ionising radiation and corresponding radiation protection research’, *Journal of Translational Medicine*, 20(1), p. 137. Available at: https://doi.org/10.1186/s12967-022-03344-4.

Bolejko, A. *et al.* (2022) ‘Facilitators for and barriers to radiography research in public healthcare in Nordic countries’, *Radiography*, 28(1), pp. 88–94. Available at: https://doi.org/10.1016/j.radi.2021.08.007.

Booij, R. *et al.* (2019) ‘Accuracy of automated patient positioning in CT using a 3D camera for body contour detection’, *European Radiology*, 29(4), pp. 2079–2088. Available at: https://doi.org/10.1007/s00330-018-5745-z.

Boone, D. *et al.* (2015) ‘Assessment of the Incremental Benefit of Computer-Aided Detection (CAD) for Interpretation of CT Colonography by Experienced and Inexperienced Readers’, *PLOS ONE*. Edited by H. Suzuki, 10(9), p. e0136624. Available at: https://doi.org/10.1371/journal.pone.0136624.

Booth, A. and Brice, A. (2004) *Evidence-based practice for information professionals: a handbook*. London: Facet.

Bosswell, C. and Cannon, S. (2018) *Introduction to Nursing Research: Incorporating Evidence-Based Practice*. Burlington: Jones & Bartlett Learning, LLC.

Botha, N. and Atkins, K. (2005) *An assessment of five different theoretical frameworks to study the uptake of innovations*. Available at: https://core.ac.uk/download/pdf/6455731.pdf (Accessed: 12 July 2023).

Brage, K. *et al.* (2025) ‘Reporting radiographers in CT and MRI: A literature review with a systematic approach’, *Radiography*, 31(2), p. 102901. Available at: https://doi.org/10.1016/j.radi.2025.102901.

Braithwaite, J. (2024) ‘The Healthcare Regulatory Ecosystem’, in J.-C. Le Coze and B. Journé (eds) *The Regulator–Regulatee Relationship in High-Hazard Industry Sectors*. Cham: Springer Nature Switzerland (SpringerBriefs in Applied Sciences and Technology), pp. 33–43. Available at: https://doi.org/10.1007/978-3-031-49570-0_4.

Brettle, A. (2020) ‘Implementing evidence-based practice: A guide for radiographers’, *Radiography*, 26, pp. S37–S41. Available at: https://doi.org/10.1016/j.radi.2020.05.013.

British Institute of Radiology (2020) ‘Guidance on using shielding on patients for diagnostic radiology applications’. Available at: https://www.bir.org.uk/media/414334/final_patient_shielding_guidance.pdf (Accessed: 20 April 2020).

British Medical Association (2020) *The hidden impact of COVID-19 on patient care in the NHS in England*. Available at: https://www.bma.org.uk/media/2840/the-hidden-impact-of-covid_web-pdf.pdf (Accessed: 17 June 2023).

British Medical Association (2023) *An NHS under pressure*, *The British Medical Association is the trade union and professional body for doctors in the UK.* Available at: https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/pressures/an-nhs-under-pressure (Accessed: 17 June 2023).

British Medical Association (2025) ‘NHS medical staffing data analysis’. Available at: https://www.bma.org.uk/advice-and-support/nhs-delivery-and-workforce/workforce/nhs-medical-staffing-data-analysis#:~:text=The%20most%20valuable%20resource%20the,and%20lack%20of%20government%20accountability. (Accessed: 22 March 2025).

Brockmann, E.N. and Anthony, W.P. (2002) ‘Tacit Knowledge and Strategic Decision Making’, *Group & Organization Management*, 27(4), pp. 436–455. Available at: https://doi.org/10.1177/1059601102238356.

Brooks, N. (2021) ‘How to undertake effective record-keeping and documentation’, *Nursing Standard*, 36(4), pp. 31–33. Available at: https://doi.org/10.7748/ns.2021.e11700.

Brown, J.S. and Duguid, P. (2000) *The social life of information*. Boston: Harvard Business School Press.

Bryman, A. (2012) *Social research methods*. 4th ed. Oxford: Oxford University Press.

Buijs, E. *et al.* (2024) ‘Clinical impact of AI in radiology department management: a systematic review’, *La radiologia medica*, 129(11), pp. 1656–1666. Available at: https://doi.org/10.1007/s11547-024-01880-1.

Burbank, P.M. and Martins, D.C. (2010) ‘Symbolic interactionism and critical perspective: divergent or synergistic?: Symbolic Interactionism and Critical Perspective’, *Nursing Philosophy*, 11(1), pp. 25–41. Available at: https://doi.org/10.1111/j.1466-769X.2009.00421.x.

Burkhardt, MA. and Nathaniel, AK. (2014) *Ethics and issues in contemporary nursing*. 4th edn. Stanford: Cengage Learning.

Callaway, M. *et al.* (2021) ‘Accelerated implementation of remote reporting during the COVID-19 pandemic’, *Clinical Radiology*, 76(6), pp. 443–446. Available at: https://doi.org/10.1016/j.crad.2021.01.004.

Campbell, S. *et al.* (2020) ‘Purposive sampling: complex or simple? Research case examples’, *Journal of Research in Nursing*, 25(8), pp. 652–661. Available at: https://doi.org/10.1177/1744987120927206.

Campos-Zamora, M. *et al.* (2022) ‘Continuing professional development challenges in a rural setting: A mixed-methods study’, *Perspectives on Medical Education*, 11(5), pp. 1–8. Available at: https://doi.org/10.1007/S40037-022-00718-8.

Care Quality Commission (2018) ‘Radiology review: a national review of radiology reporting within the NHS in England’. Available at: https://www.cqc.org.uk/sites/default/files/20180718-radiology-reporting-review-report-final-for-web.pdf (Accessed: 9 May 2025).

Care Quality Commission (2023a) *Our Purpose and Role*. Available at: https://www.cqc.org.uk/about-us (Accessed: 16 June 2023).

Care Quality Commission (2023b) *The Five Key Questions We Ask*. Available at: https://www.cqc.org.uk/about-us/how-we-do-our-job/five-key-questions-we-ask (Accessed: 16 June 2023).

Care Quality Commission (2024) ‘Ionising Radiation (Medical Exposure) Regulations (IR(ME)R)’. Available at: https://www.cqc.org.uk/guidance-providers/ionising-radiation/ionising-radiation-medical-exposure-regulations-irmer (Accessed: 5 April 2025).

Care Quality Commission Compliance (2022) ‘Clinical Governance’, *CQC Compliance*. Available at: https://cqc-compliance.com/clinical-governance/ (Accessed: 16 June 2023).

Carlier, S. *et al.* (2025) ‘The extended and advanced clinical practices of radiographers worldwide: A scoping review’, *Journal of Medical Imaging and Radiation Sciences*, 56(2), p. 101818. Available at: https://doi.org/10.1016/j.jmir.2024.101818.

Carroll, N. and Crawford, A. (2024) ‘Cultivating “communities of practice” to tackle civic policy challenges: insights from local government-academic collaboration in Leeds’, *Evidence & Policy*, 20(4), pp. 421–439. Available at: https://doi.org/10.1332/17442648Y2024D000000022.

Cassell, C., Cunliffe, A.L. and Grandy, G. (eds) (2018) *The SAGE handbook of qualitative business and management research methods*. Los Angeles: SAGE Publications Ltd.

Chaddad, A., Katib, Y. and Hassan, L. (2021) ‘Future artificial intelligence tools and perspectives in medicine’, *Current Opinion in Urology*, 31(4), pp. 371–377. Available at: https://doi.org/10.1097/MOU.0000000000000884.

Chai, P.R. *et al.* (2021) ‘Assessment of the Acceptability and Feasibility of Using Mobile Robotic Systems for Patient Evaluation’, *JAMA Network Open*, 4(3), p. e210667. Available at: https://doi.org/10.1001/jamanetworkopen.2021.0667.

Chapman, E. *et al.* (2021) ‘Assessing the impact of knowledge communication and dissemination strategies targeted at health policy-makers and managers: an overview of systematic reviews’, *Health Research Policy and Systems*, 19(1), p. 140. Available at: https://doi.org/10.1186/s12961-021-00780-4.

Charmaz, K. (2000) *Grounded theory: Objectivist and constructivist methods. In N. Denzin, & Y. Lincoln*. 2d edn. London: SAGE Publications.

Charmaz, K. (2006) *Constructing grounded theory: a practical guide through qualitative analysis*. Los Angeles: SAGE Publications.

Charmaz, K. (2008) *Grounded theory as an emergent method. In S. N. Hesse-Biber & P. Leavy*. New York: Guliford Press.

Charmaz, K. (2014) *Constructing grounded theory*. 2d edition. Thousand Oaks: SAGE Publications.

Charon, J.M. (2007) *Symbolic interactionism: an introduction, an interpretation, an integration*. 9th ed. Upper Saddle River: Pearson Prentice Hall.

Chau, M. *et al.* (2022) ‘Research demographics of Australian medical radiation practitioners’, *Journal of Medical Imaging and Radiation Sciences*, 53(4), pp. 591–598. Available at: https://doi.org/10.1016/j.jmir.2022.07.009.

Chun Tie, Y., Birks, M. and Francis, K. (2019) ‘Grounded theory research: A design framework for novice researchers’, *SAGE Open Medicine*, 7, p. 205031211882292. Available at: https://doi.org/10.1177/2050312118822927.

Clarke, A. (2005) *Situational Analysis: grounded theory after the postmodern turn*. Thousand Oaks: SAGE Publications.

Connor, L. *et al.* (2023) ‘Evidence-based practice improves patient outcomes and healthcare system return on investment: Findings from a scoping review’, *Worldviews on Evidence-Based Nursing*, 20(1), pp. 6–15. Available at: https://doi.org/10.1111/wvn.12621.

Corbin, J. and Strauss, A. (1996) ‘Analytic Ordering for Theoretical Purposes’, *Qualitative Inquiry*, 2(2), pp. 139–150. Available at: https://doi.org/10.1177/107780049600200201.

Cowper, A. (2018) ‘Why didn’t the budget include tax rises to pay for the NHS funding boost?’, *BMJ*, p. k4772. Available at: https://doi.org/10.1136/bmj.k4772.

Crable, E.L. *et al.* (2018) ‘Standardizing an approach to the evaluation of implementation science proposals’, *Implementation Science*, 13(1), p. 71. Available at: https://doi.org/10.1186/s13012-018-0770-5.

Craig, J. and Dowding, D. (2020) *Evidence-based practice in nursing*. 3d edn. Edinburgh: Elsevier.

Creswell, J. (2013) *Qualitative inquiry and research design: choosing among five approaches*. 3d ed. Los Angeles: SAGE Publications.

Cristea, M. *et al.* (2020) ‘The Impact of Population Aging and Public Health Support on EU Labor Markets’, *International Journal of Environmental Research and Public Health*, 17(4), p. 1439. Available at: https://doi.org/10.3390/ijerph17041439.

Crotty, M. (1998) *The foundations of social research: meaning and perspective in the research process*. London: Sage Publications.

Cunningham, F.C. *et al.* (2012) ‘Health professional networks as a vector for improving healthcare quality and safety: a systematic review’, *BMJ Quality & Safety*, 21(3), pp. 239–249. Available at: https://doi.org/10.1136/bmjqs-2011-000187.

Curran, G.M. *et al.* (2012) ‘Effectiveness-implementation Hybrid Designs: Combining Elements of Clinical Effectiveness and Implementation Research to Enhance Public Health Impact’, *Medical Care*, 50(3), pp. 217–226.

Dadich, A. and Doloswala, N. (2018) ‘What can organisational theory offer knowledge translation in healthcare? A thematic and lexical analysis’, *BMC Health Services Research*, 18(1), p. 351. Available at: https://doi.org/10.1186/s12913-018-3121-y.

Dagne, A.H. and Beshah, M.H. (2021) ‘Implementation of evidence-based practice: The experience of nurses and midwives’, *PloS One*, 16(8), p. e0256600. Available at: https://doi.org/10.1371/journal.pone.0256600.

Dang, D. and Dearholt, S. (2018) *Johns Hopkins nursing evidence-based practice: model and guidelines*. 3d edn. Indianapolis, Indiana: Sigma Theta Tau International.

Davis, D. and McMahon, G. (2018) ‘Translating evidence into practice: Lessons for CPD’, *Medical Teacher*, 40, pp. 1–4. Available at: https://doi.org/10.1080/0142159X.2018.1481285.

Dawe, J., Cronshaw, H. and Frerk, C. (2024) ‘Learning from the multidisciplinary team: advancing patient care through collaboration’, *British Journal of Hospital Medicine*, 85(5), pp. 1–4. Available at: https://doi.org/10.12968/hmed.2023.0387.

Dearing, J.W. and Cox, J.G. (2018) ‘Diffusion Of Innovations Theory, Principles, And Practice’, *Health Affairs*, 37(2), pp. 183–190. Available at: https://doi.org/10.1377/hlthaff.2017.1104.

Dennett, A.M. *et al.* (2021) ‘Research interest, experience and confidence of allied health professionals working in medical imaging: a cross-sectional survey’, *Journal of Medical Radiation Sciences*, 68(2), pp. 121–130. Available at: https://doi.org/10.1002/jmrs.432.

Department of Health & Social Care (2025) ‘Fit for the future: 10 Year Health Plan for England - executive summary (accessible version)’. Available at: https://www.gov.uk/government/publications/10-year-health-plan-for-england-fit-for-the-future/fit-for-the-future-10-year-health-plan-for-england-executive-summary (Accessed: 4 January 2026).

Di Michele, L. *et al.* (2020) ‘Knowledge translation: Radiographers compared to other healthcare professionals’, *Radiography*, 26, pp. S27–S32. Available at: https://doi.org/10.1016/j.radi.2020.06.007.

Di Michele, L. *et al.* (2024) ‘Evidence-based practice in radiography: A strategy for shifting our culture’, *Journal of Medical Radiation Sciences*, 71(3), pp. 323–325. Available at: https://doi.org/10.1002/jmrs.801.

Dilling, J.A. *et al.* (2013) ‘Accelerating the use of best practices: the Mayo Clinic Model of Diffusion’, *Joint Commission Journal on Quality and Patient Safety*, 39(4), pp. 167–176. Available at: https://doi.org/10.1016/s1553-7250(13)39023-0.

Doherty, G. *et al.* (2024) ‘Radiographer Education and Learning in Artificial Intelligence (REAL-AI): A survey of radiographers, radiologists, and students’ knowledge of and attitude to education on AI’, *Radiography*, 30, pp. 79–87. Available at: https://doi.org/10.1016/j.radi.2024.10.010.

Duff, J. *et al.* (2020) ‘Determinants of an evidence-based practice environment: an interpretive description’, *Implementation Science Communications*, 1(1), p. 85. Available at: https://doi.org/10.1186/s43058-020-00070-0.

Dunbar, P., Keyes, L.M. and Browne, J.P. (2023) ‘Determinants of regulatory compliance in health and social care services: A systematic review using the Consolidated Framework for Implementation Research’, *PLOS ONE*. Edited by E.

Iadanza, 18(4), p. e0278007. Available at: https://doi.org/10.1371/journal.pone.0278007.

Dusin, J., Melanson, A. and Mische-Lawson, L. (2023) ‘Evidence-based practice models and frameworks in the healthcare setting: a scoping review’, *BMJ Open*, 13(5), p. e071188. Available at: https://doi.org/10.1136/bmjopen-2022-071188.

Dutton, B., Humphrey, N. and Qualter, P. (2023) ‘Getting the pieces to fit: NHS and third sector collaboration to enhance crisis mental health service provision for young people’, *BMC Health Services Research*, 23(1), p. 307. Available at: https://doi.org/10.1186/s12913-023-09198-w.

Eccles, M.P. and Mittman, B.S. (2006) ‘Welcome to Implementation Science’, *Implementation Science*, 1(1), pp. 1, 1748-5908-1–1. Available at: https://doi.org/10.1186/1748-5908-1-1.

Elliott, V. *et al.* (2009) ‘Research utilisation in sonographic practice: Attitudes and barriers’, *Radiography*, 15(3), pp. 187–195. Available at: https://doi.org/10.1016/j.radi.2008.06.003.

Elshami, W. *et al.* (2021) ‘Radiography doctorates in Arabia: Current position and opportunities to transform research practice in the Middle East’, *Radiography*, 27(1), pp. 142–149. Available at: https://doi.org/10.1016/j.radi.2020.07.008.

Endalamaw, A. *et al.* (2024) ‘A scoping review of continuous quality improvement in healthcare system: conceptualization, models and tools, barriers and facilitators, and impact’, *BMC Health Services Research*, 24(1), p. 487. Available at: https://doi.org/10.1186/s12913-024-10828-0.

European Federation of Radiographer Societies (2011) *Development of the Radiographer Role*. Available at: https://api.efrs.eu/api/assets/posts/128 (Accessed: 16 June 2023).

European Society of radiology (2010) ‘The future role of radiology in healthcare’. Insights Imaging. Available at: https://link.springer.com/article/10.1007/s13244-009-0007-x (Accessed: 16 January 2010).

Evans, G. (2013) ‘A novice researchers first walk through the maze of grounded theory: rationalization for classical grounded theory’, *Grounded Theory Review*, 12(1), pp. 37–55.

Fazakarley, C.A. *et al.* (2023) ‘Experiences of using artificial intelligence in healthcare: a qualitative study of UK clinician and key stakeholder perspectives’, *BMJ Open*, 13(12), p. e076950. Available at: https://doi.org/10.1136/bmjopen-2023-076950.

Fenn, P. and Egan, T. (2012) ‘Risk management in the NHS: governance, finance and clinical risk’, *Clinical Medicine*, 12(1), pp. 25–28. Available at: https://doi.org/10.7861/clinmedicine.12-1-25.

Field, L.J. and Snaith, B.A. (2013) ‘Developing radiographer roles in the context of advanced and consultant practice’, *Journal of Medical Radiation Sciences*, 60(1), pp. 11–15. Available at: https://doi.org/10.1002/jmrs.2.

Figueroa, C.A. *et al.* (2019) ‘Priorities and challenges for health leadership and workforce management globally: a rapid review’, *BMC Health Services Research*, 19(1), p. 239. Available at: https://doi.org/10.1186/s12913-019-4080-7.

Filipe, H.P. *et al.* (2014) ‘Continuing Professional Development: Best Practices’, *Middle East African Journal of Ophthalmology*, 21(2), pp. 134–141. Available at: https://doi.org/10.4103/0974-9233.129760.

Fletcher, A.J. (2017) ‘Applying critical realism in qualitative research: methodology meets method’, *International Journal of Social Research Methodology*, 20(2), pp. 181–194. Available at: https://doi.org/10.1080/13645579.2016.1144401.

Fontanarosa, P.B. and DeAngelis, C.D. (2002) ‘Basic science and translational research in JAMA’, *JAMA*, 287(13), p. 1728. Available at: https://doi.org/10.1001/jama.287.13.1728.

Friel, M. *et al.* (2025) ‘Clinical insights into cross-sectional imaging integration in radiography education’, *Radiography*, 31(1), pp. 20–26. Available at: https://doi.org/10.1016/j.radi.2024.10.019.

Gagné, M. (2014) *The Oxford handbook of work engagement, motivation, and self-determination theory*. New York, NY: Oxford University Press.

Gainforth, H.L. *et al.* (2014) ‘The role of interpersonal communication in the process of knowledge mobilization within a community-based organization: a network analysis’, *Implementation Science*, 9(1), p. 59. Available at: https://doi.org/10.1186/1748-5908-9-59.

Galdas, P. (2017) ‘Revisiting Bias in Qualitative Research: Reflections on Its Relationship With Funding and Impact’, *International Journal of Qualitative Methods*, 16(1), p. 160940691774899. Available at: https://doi.org/10.1177/1609406917748992.

Gallagher, L. (2007) ‘Continuing education in nursing: a concept analysis’, *Nurse Education Today*, 27(5), pp. 466–473. Available at: https://doi.org/10.1016/j.nedt.2006.08.007.

Gambling, T., Brown, P. and Hogg, P. (2003) ‘Research in our practice—a requirement not an option: discussion paper’, *Radiography*, 9(1), pp. 71–76. Available at: https://doi.org/10.1016/S1078-8174(03)00007-5.

Garcia, R. *et al.* (2015) ‘Does a too risk-averse approach to the implementation of new radiotherapy technologies delay their clinical use?’, *The British Journal of Radiology*, 88(1051), p. 20150124. Available at: https://doi.org/10.1259/bjr.20150124.

García Villar, C. (2011) 'Evidence-based radiology for diagnostic imaging: What it is and how to practice it', *Radiología (English Edition)*, 53(4), pp. 326–334. Available at: https://doi.org/10.1016/j.rxeng.2011.02.001.

Garlock-Heuer, A. and Clark, K. (2020) 'Medical Imaging and Radiation Therapy Professionals' Perceptions of Conducting Research', *Radiol Technol*, 91(3), pp. 240–248.

Gesme, D.H., Towle, E.L. and Wiseman, M. (2010) 'Essentials of Staff Development and Why You Should Care', *Journal of Oncology Practice*, 6(2), pp. 104–106. Available at: https://doi.org/10.1200/JOP.091089.

Gilliland, C.T. *et al.* (2019) 'The Fundamental Characteristics of a Translational Scientist', *ACS Pharmacology & Translational Science*, 2(3), pp. 213–216. Available at: https://doi.org/10.1021/acsptsci.9b00022.

Girling, J. (2024) 'Update patients on gonadal and fetal shielding for diagnostic imaging', *Drug and Therapeutics Bulletin*, 62(6), pp. 82–82. Available at: https://doi.org/10.1136/dtb.2024.000004.

Given, L. (2008) *The SAGE Encyclopedia of Qualitative Research Methods*. California: SAGE. Available at: https://doi.org/10.4135/9781412963909.

Glaser, B.G. (1978) *Theoretical sensitivity*. California: Sociology Press (Advances in the methodology of grounded theory).

Glaser, B.G. (1992) *Basics of grounded theory analysis: emergence vs. forcing*. Mill Valley, Calif: Sociology Press.

Glaser, B.G. (2002) 'Constructivist Grounded Theory?', *Forum Qualitative Social Research*, 3. Available at: https://doi.org/10.17169/FQS-3.3.825.

Glaser, B.G. and Strauss, A.L. (1967) *The discovery of grounded theory: strategies for qualitative research*. Chicago: Aldine.

Gleadhill, C. *et al.* (2022) 'Physiotherapists' opinions, barriers, and enablers to providing evidence-based care: a mixed-methods study', *BMC Health Services Research*, 22(1), p. 1382. Available at: https://doi.org/10.1186/s12913-022-08741-5.

Gómez-Sánchez, A. *et al.* (2022) 'The Influence of the COVID-19 Pandemic on the Clinical Application of Evidence-Based Practice in Health Science Professionals', *International Journal of Environmental Research and Public Health*, 19(7), p. 3821. Available at: https://doi.org/10.3390/ijerph19073821.

Gottwald, M. and Lansdown, G. (2021) *Clinical Governance: Improving the Quality of Healthcare for Patients and Service Users.* Maidenhead: McGraw-Hill Education.

Goyal, D.K. *et al.* (2021) 'Restricted access to the NHS during the COVID-19 pandemic: Is it time to move away from the rationed clinical response?', *The Lancet Regional Health - Europe*, 8, p. 100201. Available at: https://doi.org/10.1016/j.lanepe.2021.100201.

Green, L.W. *et al.* (2009) 'Diffusion theory and knowledge dissemination, utilization, and integration in public health', *Annual Review of Public Health*, 30(1), pp. 151–174. Available at: https://doi.org/10.1146/annurev.publhealth.031308.100049.

Green, L.W. *et al.* (2014) 'Diffusion theory and knowledge dissemination, utilization and integration', *Front Public Health Serv Syst Res*, 3(1). Available at: https://doi.org/10.13023/FPHSSR.0301.03.

Grehan, J. *et al.* (2018) 'The introduction of mandatory CPD for newly state registered diagnostic radiographers: An Irish perspective', *Radiography*, 24(2), pp. 115–121. Available at: https://doi.org/10.1016/j.radi.2017.09.007.

Grehan, J., Rainford, L. and Ryan, M.-L. (2023) 'The evolution of mandatory continuing professional development (CPD) for diagnostic radiographers in Ireland - A longitudinal study', *Radiography*, 29(6), pp. 1054–1062. Available at: https://doi.org/10.1016/j.radi.2023.09.002.

Grix, J. (2004) *The foundations of research*. Basingstoke: Palgrave Macmillan (Palgrave study guides).

Grose, L. (2016) 'Moving Evidence Forward: Addressing the Barriers to Evidence-Based Practice in Radiotherapy', *Journal of Medical Imaging and Radiation Sciences*, 47(3), pp. 221–226. Available at: https://doi.org/10.1016/j.jmir.2016.04.005.

Grzywacz, J.G. and Allen, J.W. (2017) 'Adapting the Ideas of Translational Science for Translational Family Science: Translational Family Science', *Family Relations*, 66(4), pp. 568–583. Available at: https://doi.org/10.1111/fare.12284.

Guba, E. and Lincoln, Y. (1989) *Fourth generation evaluation*. Newbury Park: SAGE.

Gupta, M. (2014) *Is evidence-based psychiatry ethical?* Oxford: Oxford University Press (International perspectives in philosophy and psychiatry).

Guyatt, G. (1991) 'Evidence-based medicine', *ACP Journal Club*, 114(2), p. A16. Available at: https://doi.org/10.7326/ACPJC-1991-114-2-A16.

Guyatt, G. Cairns, J. Churchill, D. et al. (1992) 'Evidence-Based Medicine: A New Approach to Teaching the Practice of Medicine', *JAMA*, 268(17), p. 2420. Available at: https://doi.org/10.1001/jama.1992.03490170092032.

Hafslund, B. *et al.* (2008) 'Evidence-based radiography', *Radiography*, 14(4), pp. 343–348. Available at: https://doi.org/10.1016/j.radi.2008.01.003.

Haigh, F. *et al.* (2019) 'Developing a critical realist informed framework to explain how the human rights and social determinants of health relationship works', *BMC Public Health*, 19(1), p. 1571. Available at: https://doi.org/10.1186/s12889-019-7760-7.

Hajjaj, F. *et al.* (2010) 'Non-clinical influences on clinical decision-making: a major challenge to evidence-based practice', *Journal of the Royal Society of Medicine*, 103(5), pp. 178–187. Available at: https://doi.org/10.1258/jrsm.2010.100104.

Hakvoort, L. *et al.* (2022) ‘Factors that influence continuing professional development over a nursing career: A scoping review’, *Nurse Education in Practice*, 65, p. 103481. Available at: https://doi.org/10.1016/j.nepr.2022.103481.

Halkett, G.K.B. *et al.* (2017) ‘Radiation therapists’ perspectives on participating in research’, *Journal of Medical Radiation Sciences*, 64(4), pp. 299–309. Available at: https://doi.org/10.1002/jmrs.237.

Hallberg, L.R.-M. (2006) ‘The “core category” of grounded theory: Making constant comparisons’, *International Journal of Qualitative Studies on Health and Well-being*, 1(3), pp. 141–148. Available at: https://doi.org/10.1080/17482620600858399.

Ham, C. (2020) ‘The challenges facing the NHS in England in 2021’, *BMJ*, p. m4973. Available at: https://doi.org/10.1136/bmj.m4973.

Harding, K.E. *et al.* (2014) ‘Not Enough Time or a Low Priority? Barriers to Evidence-Based Practice for Allied Health Clinicians’, *Journal of Continuing Education in the Health Professions*, 34(4), pp. 224–231. Available at: https://doi.org/10.1002/chp.21255.

Hardy, M. *et al.* (2016) ‘Does radiography advanced practice improve patient outcomes and health service quality? A systematic review’, *The British Journal of Radiology*, 89(1062), p. 20151066. Available at: https://doi.org/10.1259/bjr.20151066.

Hardy, M. and Harvey, H. (2020) ‘Artificial intelligence in diagnostic imaging: impact on the radiography profession’, *The British Journal of Radiology*, 93(1108), p. 20190840. Available at: https://doi.org/10.1259/bjr.20190840.

Hardy, M., Hutton, J. and Snaith, B. (2013) ‘Is a radiographer led immediate reporting service for emergency department referrals a cost effective initiative?’, *Radiography*, 19(1), pp. 23–27. Available at: https://doi.org/10.1016/j.radi.2012.11.002.

Hardy, M. and Snaith, B. (2006) ‘Role extension and role advancement – Is there a difference? A discussion paper’, *Radiography*, 12(4), pp. 327–331. Available at: https://doi.org/10.1016/j.radi.2005.09.004.

Harris, R. and Paterson, A. (2016) ‘Exploring the research domain of consultant practice: Perceptions and opinions of consultant radiographers’, *Radiography*, 22(1), pp. 12–20. Available at: https://doi.org/10.1016/j.radi.2015.03.002.

Hayre, C.M. *et al.* (2018) ‘Attitudes and perceptions of radiographers applying lead (Pb) protection in general radiography: An ethnographic study’, *Radiography*, 24(1), pp. e13–e18. Available at: https://doi.org/10.1016/j.radi.2017.07.010.

Health and Care Professions Council (2018a) *Continuing Professional Development*. Available at: https://www.hcpc-uk.org/cpd/ (Accessed: 16 June 2023).

Health and Care Professions Council (2018b) *Our standards for CPD*. Available at: https://www.hcpc-uk.org/cpd/your-cpd/our-standards-for-cpd/ (Accessed: 16 June 2023).

Health and Care Professions Council (2018c) *Standards of conduct, performance and ethics* |. Available at: https://www.hcpc-uk.org/standards/standards-of-conduct-performance-and-ethics/ (Accessed: 19 June 2023).

Health and Care Professions Council (2018d) *Standards of Proficiency*. Available at: https://www.hcpc-uk.org/standards/standards-of-proficiency/ (Accessed: 27 June 2023).

Health and Care Professions Council (2019) *What activities count as CPD?* Available at: https://www.hcpc-uk.org/cpd/your-cpd/cpd-activities/ (Accessed: 16 June 2023).

Health Education England (2022) *Allied Health Professions' Research and Innovation Strategy for England*, *Health Education England*. Available at: https://www.hee.nhs.uk/our-work/allied-health-professions/enable-workforce/allied-health-professions%E2%80%99-research-innovation-strategy-england (Accessed: 27 June 2023).

Health Education England (2023) *Continuous Professional Development*. Available at: https://www.hee.nhs.uk/our-work/population-health/south-west-population-public-health-academy/continuous-professional-development (Accessed: 16 June 2023).

Healthcare Commission (2009) 'Annual Report: Our work to improve healthcare for patients and the public'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/229151/0718.pdf (Accessed: 16 June 2023).

Henwood, S.M. and Flinton, D.M. (2012) '5 years on: Have attitudes towards continuing professional development in radiography changed?', *Radiography*, 18(3), pp. 179–183. Available at: https://doi.org/10.1016/j.radi.2012.04.001.

Heron, J. (1996) *Co-operative Inquiry: Research into the Human Condition*. London: SAGE.

Herzberg, F. (1966) *Work and the nature of man*. New York: World Publishing Company.

Holmén, J. (2020) 'Navigating Sustainability Transformations: Backcasting, transdisciplinarity and social learning'. Available at: https://doi.org/10.13140/RG.2.2.36804.86407.

Holmes, A. (2020) 'Researcher Positionality - A Consideration of Its Influence and Place in Qualitative Research - A New Researcher Guide', *Shanlax International Journal of Education*, 8(4), pp. 1–10. Available at: https://doi.org/10.34293/education.v8i4.3232.

Hong, B. *et al.* (2019) 'Motivators and barriers to engagement with evidence-based practice among medical and dental trainees from the UK and Republic of Ireland: a national survey', *BMJ Open*, 9(10), p. e031809. Available at: https://doi.org/10.1136/bmjopen-2019-031809.

Howell, K. (2013) *An Introduction to the Philosophy of Methodology*. London: SAGE Publications Ltd. Available at: https://doi.org/10.4135/9781473957633.

Hudson, D. and Sahibbil, J.P. (2022) ‘Remote scanning support in magnetic resonance imaging: Friend or foe?’, *Radiography*, 28(3), pp. 739–745. Available at: https://doi.org/10.1016/j.radi.2022.03.010.

Hudson, D.M., Heales, C. and Meertens, R. (2022) ‘Review of claustrophobia incidence in MRI: A service evaluation of current rates across a multi-centre service’, *Radiography*, 28(3), pp. 780–787. Available at: https://doi.org/10.1016/j.radi.2022.02.010.

Hughes, J.A. and Sharrock, W.W. (2014) *The philosophy of social research*. Third edition. Abingdon: Routledge.

Hull, L. *et al.* (2019) ‘Designing high-quality implementation research: development, application, feasibility and preliminary evaluation of the implementation science research development (ImpRes) tool and guide’, *Implementation Science*, 14(1), p. 80. Available at: https://doi.org/10.1186/s13012-019-0897-z.

Huxley, T. (1889) *Agnosticism and Christianity: Collected Essays V*.

Hyde, E. (2015) ‘A critical evaluation of student radiographers’ experience of the transition from the classroom to their first clinical placement’, *Radiography*, 21(3), pp. 242–247. Available at: https://doi.org/10.1016/j.radi.2014.12.005.

Hyde, E. and Hardy, M. (2021a) ‘Patient centred care in diagnostic radiography (Part 1): Perceptions of service users and service deliverers’, *Radiography*, 27(1), pp. 8–13. Available at: https://doi.org/10.1016/j.radi.2020.04.015.

Hyde, E. and Hardy, M. (2021b) ‘Patient centred care in diagnostic radiography (Part 2): A qualitative study of the perceptions of service users and service deliverers’, *Radiography*, 27(2), pp. 322–331. Available at: https://doi.org/10.1016/j.radi.2020.09.008.

Iacobucci, G. (2018) ‘NHS staff shortages could reach 250 000 by 2030 without urgent action, experts warn’, *BMJ*, p. k4831. Available at: https://doi.org/10.1136/bmj.k4831.

Iaquinto, B., Ison, R. and Faggian, R. (2011) ‘Creating communities of practice: scoping purposeful design’, *Journal of Knowledge Management*, 15(1), pp. 4–21. Available at: https://doi.org/10.1108/13673271111108666.

Institute of Medicine (2010) *Redesigning Continuing Education in the Health Professions*. Washington, DC: The National Academies Press.

Iweka, E. and Hyde, E. (2023) ‘Promotion of research culture among radiographers in one UK NHS trust through journal club activities – An autoethnographic study’, *Radiography*, 29(4), pp. 800–806. Available at: https://doi.org/10.1016/j.radi.2023.05.014.

Jahn, W.T. (2011) ‘The 4 basic ethical principles that apply to forensic activities are respect for autonomy, beneficence, nonmaleficence, and justice’, *Journal of Chiropractic Medicine*, 10(3), pp. 225–226. Available at: https://doi.org/10.1016/j.jcm.2011.08.004.

James-McAlpine, J., Larkins, S. and Nagle, C. (2023) ‘Exploring the evidence base for Communities of Practice in health research and translation: a scoping review’, *Health Research Policy and Systems*, 21(1), p. 55. Available at: https://doi.org/10.1186/s12961-023-01000-x.

Jamieson, M.K., Govaart, G.H. and Pownall, M. (2023) ‘Reflexivity in quantitative research: A rationale and beginner’s guide’, *Social and Personality Psychology Compass*, 17(4), p. e12735. Available at: https://doi.org/10.1111/spc3.12735.

Jones, C.H. and Dolsten, M. (2024) ‘Healthcare on the brink: navigating the challenges of an aging society in the United States’, *npj Aging*, 10(1), p. 22. Available at: https://doi.org/10.1038/s41514-024-00148-2.

Kakar, Z.U.H. *et al.* (2023) ‘Criteria for assessing and ensuring the trustworthiness in qualitative research’, *International Journal of Business Reflections*, 4(2), pp. 150–173. Available at: https://doi.org/10.56249/ijbr.03.01.44.

Kalenda, J. (2016) ‘Situational analysis as a framework for interdisciplinary research in the social sciences’, *Human Affairs*, 26(3), pp. 340–355. Available at: https://doi.org/10.1515/humaff-2016-0029.

Kalidindi, S. and Gandhi, S. (2023) ‘Workforce Crisis in Radiology in the UK and the Strategies to Deal With It: Is Artificial Intelligence the Saviour?’, *Cureus* [Preprint]. Available at: https://doi.org/10.7759/cureus.43866.

Kammies, C. and Archer, E. (2022) ‘Understanding of caring - Radiography educators’ perspectives’, *Radiography*, 28(3), pp. 668–673. Available at: https://doi.org/10.1016/j.radi.2022.05.003.

Kaptchuk, T.J. (2003) ‘Effect of interpretive bias on research evidence’, *BMJ*, 326(7404), pp. 1453–1455. Available at: https://doi.org/10.1136/bmj.326.7404.1453.

Karaferis, D. *et al.* (2022) ‘Factors Influencing Motivation and Work Engagement of Healthcare Professionals’, *Materia Socio Medica*, 34(3), p. 216. Available at: https://doi.org/10.5455/msm.2022.34.216-224.

Karas, M. *et al.* (2020) ‘Continuing professional development requirements for UK health professionals: a scoping review’, *BMJ Open*, 10(3), p. e032781. Available at: https://doi.org/10.1136/bmjopen-2019-032781.

Kassan, A. *et al.* (2020) ‘Capturing the Shadow and Light of Researcher Positionality: A Picture-Prompted Poly-Ethnography’, *International Journal of Qualitative Methods*, 19, p. 160940692097732. Available at: https://doi.org/10.1177/1609406920977325.

Kennedy, A. (2005) ‘Models of Continuing Professional Development: a framework for analysis’, *Journal of In-service Education*, 31(2), pp. 235–250. Available at: https://doi.org/10.1080/13674580500200277.

Kenny, M. and Fourie, R. (2015) ‘Contrasting Classic, Straussian, and Constructivist Grounded Theory: Methodological and Philosophical Conflicts’, *The Qualitative Report* [Preprint]. Available at: https://doi.org/10.46743/2160-3715/2015.2251.

Khalifa, M. and Albadawy, M. (2024) ‘AI in diagnostic imaging: Revolutionising accuracy and efficiency’, *Computer Methods and Programs in Biomedicine Update*, 5, p. 100146. Available at: https://doi.org/10.1016/j.cmpbup.2024.100146.

Khan, Z. (2023) ‘The Emerging Challenges and Strengths of the National Health Services: A Physician Perspective’, *Cureus*, 5(15). Available at: https://doi.org/10.7759/cureus.38617.

Kinnunen, J. (1996) ‘Gabriel Tarde as a Founding Father of Innovation Diffusion Research’, *Acta Sociologica*, 39(4), pp. 431–442. Available at: https://doi.org/10.1177/000169939603900404.

Kiryu, S. *et al.* (2023) ‘Clinical Impact of Deep Learning Reconstruction in MRI’, *RadioGraphics*, 43(6), p. e220133. Available at: https://doi.org/10.1148/rg.220133.

Kjelle, E. *et al.* (2022) ‘Characterizing and quantifying low-value diagnostic imaging internationally: a scoping review’, *BMC Medical Imaging*, 22(1), p. 73. Available at: https://doi.org/10.1186/s12880-022-00798-2.

Knapp, K.M. and Courtier, N. (2021) ‘The future role of radiographers’, *Radiography*, 27, pp. S1–S2. Available at: https://doi.org/10.1016/j.radi.2021.08.005.

Kothari, A. *et al.* (2015) ‘Communities of practice for supporting health systems change: a missed opportunity’, *Health Research Policy and Systems*, 13(1), p. 33. Available at: https://doi.org/10.1186/s12961-015-0023-x.

Kothari, A.R. *et al.* (2011) ‘Uncovering Tacit Knowledge: A Pilot Study to Broaden the Concept of Knowledge in Knowledge Translation’, *BMC Health Services Research*, 11(1), p. 198. Available at: https://doi.org/10.1186/1472-6963-11-198.

Kristensen, N., Nymann, C. and Konradsen, H. (2015) ‘Implementing research results in clinical practice- the experiences of healthcare professionals’, *BMC Health Services Research*, 16(1), p. 48. Available at: https://doi.org/10.1186/s12913-016-1292-y.

Kwee, R.M., Toxopeus, R. and Kwee, T.C. (2024) ‘Imaging overuse in the emergency department: The view of radiologists and emergency physicians’, *European Journal of Radiology*, 176, p. 111536. Available at: https://doi.org/10.1016/j.ejrad.2024.111536.

Kyei, K., Antwi, W. and Suapim, J. (2015) ‘Evidence-Based Practice in Radiography: Attitudes, Beliefs, Knowledge and Practices of Radiographers in Ghana’, *OMICS Journal of Radiology*, 04(01). Available at: https://doi.org/10.4172/2167-7964.1000176.

Kyngäs, H., Kääriäinen, M. and Elo, S. (2020) 'The Trustworthiness of Content Analysis', in H. Kyngäs, K. Mikkonen, and M. Kääriäinen (eds) *The Application of Content Analysis in Nursing Science Research*. Cham: Springer International Publishing, pp. 41–48. Available at: https://doi.org/10.1007/978-3-030-30199-6_5.

Lau, R. *et al.* (2015) 'Achieving change in primary care—causes of the evidence to practice gap: systematic reviews of reviews', *Implementation Science*, 11(1), p. 40. Available at: https://doi.org/10.1186/s13012-016-0396-4.

Lave, J. and Wenger, E. (1991) *Situated learning: legitimate peripheral participation*. Cambridge [England] ; New York: Cambridge University Press (Learning in doing).

Lawani, A. (2021) 'Critical realism: what you should know and how to apply it', *Qualitative Research Journal*, 21(3), pp. 320–333. Available at: https://doi.org/10.1108/QRJ-08-2020-0101.

Le Bon, G. (1895) *The Crowd: A Study of the Popular Mind*. Available at: https://www.files.ethz.ch/isn/125518/1414_LeBon.pdf (Accessed: 6 July 2023).

Ledger, J. (2010) 'The gold standard of management? Evidence-based management and healthcare delivery', *London Journal of Primary Care*, 3(2), pp. 93–97. Available at: https://doi.org/10.1080/17571472.2010.11493310.

Lee, M.T. and Raschke, R.L. (2016) 'Understanding employee motivation and organizational performance: Arguments for a set-theoretic approach', *Journal of Innovation & Knowledge*, 1(3), pp. 162–169. Available at: https://doi.org/10.1016/j.jik.2016.01.004.

Lehane, E. *et al.* (2019) 'Evidence-based practice education for healthcare professions: an expert view', *BMJ Evidence-Based Medicine*, 24(3), pp. 103–108. Available at: https://doi.org/10.1136/bmjebm-2018-111019.

Levitt, H.M. *et al.* (2021) 'Intersubjective recognition as the methodological enactment of epistemic privilege: A critical basis for consensus and intersubjective confirmation procedures.', *Qualitative Psychology*, 8(3), pp. 407–427. Available at: https://doi.org/10.1037/qup0000206.

Li, L.C. *et al.* (2009) 'Evolution of Wenger's concept of community of practice', *Implementation Science*, 4(1), p. 11. Available at: https://doi.org/10.1186/1748-5908-4-11.

Lien, A.S. and Jiang, Y. (2017) 'Integration of diffusion of innovation theory into diabetes care', *Journal of Diabetes Investigation*, 8(3), pp. 259–260. Available at: https://doi.org/10.1111/jdi.12568.

Lincoln, Y. and Guba, E. (1985) *Naturalistic Inquiry*. Newbury Park: SAGE Publications.

Liu, X. *et al.* (2019) 'A comparison of deep learning performance against health-care professionals in detecting diseases from medical imaging: a systematic review and meta-analysis', *The Lancet Digital Health*, 1(6), pp. e271–e297. Available at: https://doi.org/10.1016/S2589-7500(19)30123-2.

Lloyd, A. *et al.* (2023) 'Critical Reflections on the COVID-19 Pandemic from the NHS Frontline', *Sociological Research Online*, p. 136078042311562. Available at: https://doi.org/10.1177/13607804231156293.

Lockwood, P. *et al.* (2025) 'An implementation facilitation intervention to improve the musculoskeletal X-ray reporting by radiographers across London', *BMC Health Services Research*, 25(1), p. 248. Available at: https://doi.org/10.1186/s12913-025-12356-x.

Looi, M.-K. (2024) 'The European healthcare workforce crisis: how bad is it?', *BMJ*, p. q8. Available at: https://doi.org/10.1136/bmj.q8.

MacGregor, F., Breckons, M. and Swainston, K. (2024) 'Organisational barriers and facilitators to the implementation of best practices within paediatric forensic radiographic practice – A scoping review', *Radiography*, 30(1), pp. 43–51. Available at: https://doi.org/10.1016/j.radi.2023.09.011.

Malamateniou, C. *et al.* (2021) 'Artificial intelligence in radiography: Where are we now and what does the future hold?', *Radiography*, 27, pp. S58–S62. Available at: https://doi.org/10.1016/j.radi.2021.07.015.

Mandrola, J. and Morgan, D.J. (2019) 'The Important but Rarely Studied Cascade of Care', *JAMA Network Open*, 2(10), p. e1913315. Available at: https://doi.org/10.1001/jamanetworkopen.2019.13315.

Marques, L., Yan, T. and Matthews, L. (2020) 'Knowledge Diffusion in a Global Supply Network: A Network of Practice View', *Journal of Supply Chain Management*, 56(1), pp. 33–53. Available at: https://doi.org/10.1111/jscm.12214.

Maslow, A.H. (1943) 'A theory of human motivation.', *Psychological Review*, 50(4), pp. 370–396. Available at: https://doi.org/10.1037/h0054346.

Masoodi, M. (2017) 'A Comparative Analysis of Two Qualitative Methods: Deciding Between Grounded Theory and Phenomenology for Your Research', *Vocational Training: Research And Realities*, 28(1), pp. 23–40.

Mathieson, A., Grande, G. and Luker, K. (2019) 'Strategies, facilitators and barriers to implementation of evidence-based practice in community nursing: a systematic mixed-studies review and qualitative synthesis', *Primary Health Care Research & Development*, 20, p. e6. Available at: https://doi.org/10.1017/S1463423618000488.

Maynard, A. (2017) 'Shrinking the state: The fate of the NHS and social care', *Journal of the Royal Society of Medicine*, 110(2), pp. 49–51. Available at: https://doi.org/10.1177/0141076816686923.

McAlearney, A.S. *et al.* (2016) 'Challenges of implementation and implementation research: Learning from an intervention study designed to improve tumor registry reporting', *SAGE Open Medicine*, 4, p. 2050312116666215. Available at: https://doi.org/10.1177/2050312116666215.

McArthur, C. *et al.* (2021) 'Barriers and facilitators to implementing evidence-based guidelines in long-term care: a qualitative evidence synthesis', *Implementation Science*, 16(1), p. 70. Available at: https://doi.org/10.1186/s13012-021-01140-0.

McEntee, M.F. and Kinsella, C. (2010) 'An examination of practice during radiography of the clavicle', *Radiography*, 16(2), pp. 125–130. Available at: https://doi.org/10.1016/j.radi.2009.12.002.

McNamara, J. and Julka-Anderson, N. (2023) 'Rad Chat letter to the editor', *Radiography*, 29, pp. S138–S139. Available at: https://doi.org/10.1016/j.radi.2022.12.004.

McNeill, P. and Chapman, S. (2005) *Research methods*. 3rd ed. London: Routledge.

McNulty, J.P., England, A. and Shanahan, M.C. (2021) 'International perspectives on radiography practice education', *Radiography*, 27(4), pp. 1044–1051. Available at: https://doi.org/10.1016/j.radi.2021.04.004.

McSherry, R. and Pearce, P. (2007) *Clinical governance: a guide to implementation for healthcare professionals*. 2d edn. Oxford: Blackwell Science.

Medicines and Healthcare products Regulatory Agency (2021) *Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/958486/MRI_guidance_2021-4-03c.pdf (Accessed: 27 June 2023).

Mello-Thoms, C. and Mello, C.A.B. (2023) 'Clinical applications of artificial intelligence in radiology', *The British Journal of Radiology*, 96(1150), p. 20221031. Available at: https://doi.org/10.1259/bjr.20221031.

Melnikovas, A. (2018) 'Towards an Explicit Research Methodology: Adapting Research Onion Model for Futures Studies', *Journal of Futures Studies*, 23(2). Available at: https://doi.org/10.6531/JFS.201812_23(2).0003.

Metcalf, K. *et al.* (2010) 'Survey of R.T.s with doctorates: barriers to conducting research', *Radiol Technol*, 81(5), pp. 417–427.

Mezirow, J. (1991) *Transformative dimensions of adult learning*. 1st ed. San Francisco, California: Jossey-Bass (The Jossey-Bass higher and adult education series).

Mills, J. *et al.* (2007) 'Grounded theory: a methodological spiral from positivism to postmodernism', *Journal of Advanced Nursing*, 58(1), pp. 72–79. Available at: https://doi.org/10.1111/j.1365-2648.2007.04228.x.

Mitchell, M. and Lockwood, P. (2023) 'An investigation into the clinical scope of practice of MRI reporting radiographers within the United Kingdom', *Radiography*, 29(3), pp. 489–495. Available at: https://doi.org/10.1016/j.radi.2023.02.015.

Mitchell, S.A. *et al.* (2010) 'A thematic analysis of theoretical models for translational science in nursing: Mapping the field', *Nursing Outlook*, 58(6), pp. 287–300. Available at: https://doi.org/10.1016/j.outlook.2010.07.001.

Mohajan, D. and Mohajan, H. (2023) ‘Glaserian Grounded Theory and Straussian Grounded Theory: Two Standard Qualitative Research Approaches in Social Science’, *Journal of Economic Development, Environment and People*, 12(1), pp. 72–81.

Moran, K. and Davis, C.-A. (2020) ‘Pan-Canadian Survey of Medical Radiation Technologist’s Views Toward Evidence-Based Practice, Research, Barriers, and Enablers’, *Journal of Medical Imaging and Radiation Sciences*, 51(1), pp. 29–39. Available at: https://doi.org/10.1016/j.jmir.2019.11.141.

Morley, D. (2016) ‘Applying Wenger’s communities of practice theory to placement learning’, *Nurse Education Today*, 39, pp. 161–162. Available at: https://doi.org/10.1016/j.nedt.2016.02.007.

Morris, Z.S., Wooding, S. and Grant, J. (2011) ‘The answer is 17 years, what is the question: understanding time lags in translational research’, *Journal of the Royal Society of Medicine*, 104(12), pp. 510–520. Available at: https://doi.org/10.1258/jrsm.2011.110180.

Morris-Stiff, G., Stiff, R. and Morris-Stiff, H. (2006) ‘Abdominal Radiograph Requesting in the Setting of Acute Abdominal Pain: Temporal Trends and Appropriateness of Requesting’, *The Annals of The Royal College of Surgeons of England*, 88(3), pp. 270–274. Available at: https://doi.org/10.1308/003588406X98586.

Morse, J.M. (ed.) (2021) *Developing grounded theory: the second generation revisited*. 2d edn. New York: Routledge.

Mun, K., Lee, M. and Shim, J. (2024) ‘Effects of Work Engagement and Barriers on Evidence-Based Practice Implementation for Clinical Nurses: A Cross-Sectional Study’, *Healthcare*, 12(22), p. 2223. Available at: https://doi.org/10.3390/healthcare12222223.

Murphy, L., Nightingale, J. and Calder, P. (2022) ‘Difficulties associated with Reporting Radiographer working practices – A narrative evidence synthesis’, *Radiography*, 28(4), pp. 1101–1109. Available at: https://doi.org/10.1016/j.radi.2022.08.007.

Müskens, J.L.J.M. *et al.* (2022) ‘Overuse of diagnostic testing in healthcare: a systematic review’, *BMJ Quality & Safety*, 31(1), pp. 54–63. Available at: https://doi.org/10.1136/bmjqs-2020-012576.

Najjar, R. (2023) ‘Redefining Radiology: A Review of Artificial Intelligence Integration in Medical Imaging’, *Diagnostics*, 13(17), p. 2760. Available at: https://doi.org/10.3390/diagnostics13172760.

Nalweyiso, D.I. *et al.* (2019) ‘Knowledge, attitudes and practices towards evidence based practice: A survey amongst radiographers’, *Radiography*, 25(4), pp. 327–332. Available at: https://doi.org/10.1016/j.radi.2019.03.004.

National Academies of Sciences, Engineering, and Medicine (2005) *The Successful Adoption of Web-Based Collaborative Software*. Washington, D.C.: Transportation Research Board, p. 23304. Available at: https://doi.org/10.17226/23304.

National Aeronautics and Space Administration (2025) ‘Community of Practice’. Available at: https://www.nasa.gov/stmd-flight-opportunities/fo-resources/community-of-practice-webinars/ (Accessed: 26 May 2025).

National Health Service (2017) ‘Multi-professional framework for advanced clinical practice in England’. Available at: https://www.hee.nhs.uk/sites/default/files/documents/multi-professionalframeworkforadvancedclinicalpracticeinengland.pdf (Accessed: 11 March 2025).

National Health Service. (2019) *The NHS Long Term Plan*. Available at: https://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf (Accessed: 16 June 2023).

National Health Service (2021) *Clinical Governance*. Available at: https://nwpgmd.nhs.uk/sites/default/files/Clinical%20Governance.pdf (Accessed: 16 June 2023).

National Health Service (2022) *Turning the vision into action*. Available at: https://www.england.nhs.uk/future-of-human-resources-and-organisational-development/the-future-of-nhs-human-resources-and-organisational-development-report/turning-the-vision-into-action/ (Accessed: 18 June 2023).

National Health Service (2024) ‘Communities of practice’. Available at: https://library.hee.nhs.uk/knowledge-mobilisation/knowledge-mobilisation-toolkit/communities-of-practice (Accessed: 4 June 2025).

National Health Service (2025) ‘Technical guide to allocation formulae and convergence for 2025/26 allocations’. NHS England. Available at: https://www.england.nhs.uk/wp-content/uploads/2025/02/PRN01601-technical-guide-to-allocation-formulae-and-convergence-for-2025-to-2026-revenue-allocations.pdf (Accessed: 24 September 2025).

National Institute for Health and Care Excellence (2023) *What we do*. Available at: https://www.nice.org.uk/about/what-we-do (Accessed: 16 June 2023).

Niemi, A. and Paasivaara, L. (2007) ‘Meaning contents of radiographers’ professional identity as illustrated in a professional journal – A discourse analytical approach’, *Radiography*, 13(4), pp. 258–264. Available at: https://doi.org/10.1016/j.radi.2006.03.009.

Nightingale, J. *et al.* (2023) ‘Retention of radiographers in the NHS: Influencing factors across the career trajectory’, *Radiography*, 29(1), pp. 76–83. Available at: https://doi.org/10.1016/j.radi.2022.10.003.

Nunes, R. (2003) ‘Evidence-Based Medicine: A new tool for resource allocation?’, *Medicine, Health Care and Philosophy*, 6(3), pp. 297–301. Available at: https://doi.org/10.1023/A:1025969303573.

Obayi, E. *et al.* (2024) 'Accuracy of Outsourced Radiology Reports in Emergency Surgical Care: Do They Provide a High-Quality, Cost-Effective Service?', *Cureus* [Preprint]. Available at: https://doi.org/10.7759/cureus.73152.

Office for National Statistics (2023) 'Healthcare expenditure, UK Health Accounts: 2021'. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthcaresystem/bulletins/ukhealthaccounts/2021 (Accessed: 4 August 2023).

Okwor, I.A. *et al.* (2024) 'Digital Technologies Impact on Healthcare Delivery: A Systematic Review of Artificial Intelligence (AI) and Machine-Learning (ML) Adoption, Challenges, and Opportunities', *AI*, 5(4), pp. 1918–1941. Available at: https://doi.org/10.3390/ai5040095.

Omidvar, O. and Kislov, R. (2014) 'The Evolution of the Communities of Practice Approach: Toward Knowledgeability in a Landscape of Practice—An Interview with Etienne Wenger-Trayner', *Journal of Management Inquiry*, 23(3), pp. 266–275. Available at: https://doi.org/10.1177/1056492613505908.

Ongori, D.M. and Kabo, J.W. (2024) 'Barriers and enablers to implementation of evidence-based practice in nursing: A systematic review of literature', *International Journal of Science and Research Archive*, 13(1), pp. 3036–3046. Available at: https://doi.org/10.30574/ijsra.2024.13.1.1932.

Ooi, C.-C., Lee, S.H.-E. and Soh, B.P. (2012) 'A survey on the research awareness and readiness among radiographers in Singapore General Hospital (SGH)', *Radiography*, 18(4), pp. 264–269. Available at: https://doi.org/10.1016/j.radi.2012.06.004.

Paci, M. *et al.* (2021) 'Barriers to evidence-based practice implementation in physiotherapy: a systematic review and meta-analysis', *International Journal for Quality in Health Care*, 33(2), p. mzab093. Available at: https://doi.org/10.1093/intqhc/mzab093.

Panchal, S. and Hendrick, P. (2023) 'The lived experiences of musculoskeletal physiotherapists managing patient expectations for diagnostic imaging: A qualitative study using a phenomenological analysis', *Musculoskeletal Science and Practice*, 67, p. 102833. Available at: https://doi.org/10.1016/j.msksp.2023.102833.

Pandey, S.C. and Dutta, A. (2013) 'Communities of practice and organizational learning: case study of a global IT solutions company', *Strategic HR Review*, 12(5), pp. 255–261. Available at: https://doi.org/10.1108/SHR-02-2013-0010.

Panhwar, A., Ansari, S. and Shah, A. (2017) 'Post-positivism: an effective paradigm for social and educational research', *International Research Journal of Arts and Humanities*, 45(45), pp. 253–259.

Pedersen, M.R.V. *et al.* (2024) 'Reporting radiographers in Europe survey: Support, role satisfaction, and advanced clinical practice within the European federation of radiographer society (EFRS) member countries', *Radiography*, 30(1), pp. 87–94. Available at: https://doi.org/10.1016/j.radi.2023.10.008.

Pervin, N. and Mokhtar, M. (2022) 'The Interpretivist Research Paradigm: A Subjective Notion of a Social Context', *International Journal of Academic Research in Progressive Education and Development*, 11(2), p. Pages 419-428. Available at: https://doi.org/10.6007/IJARPED/v11-i2/12938.

Peters, D.H. *et al.* (2013) 'Implementation research: what it is and how to do it', *BMJ*, 347, p. f6753. Available at: https://doi.org/10.1136/bmj.f6753.

Piro, D. *et al.* (2020) 'Radiation therapy technologists' involvement and opinion in research: A national survey in Italy', *Technical Innovations & Patient Support in Radiation Oncology*, 15, pp. 11–14. Available at: https://doi.org/10.1016/j.tipsro.2020.05.002.

Pitsillidou, M. *et al.* (2021) 'Factors Affecting the Application and Implementation of Evidence-based Practice in Nursing', *Acta Informatica Medica*, 29(4), p. 281. Available at: https://doi.org/10.5455/aim.2021.29.281-287.

Polanyi, M. (2009) *The tacit dimension*. Revised ed. Chicago: University of Chicago press.

Powell, B.J. *et al.* (2015) 'A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project', *Implementation Science*, 10(1), p. 21. Available at: https://doi.org/10.1186/s13012-015-0209-1.

Proctor, E. *et al.* (2011) 'Outcomes for Implementation Research: Conceptual Distinctions, Measurement Challenges, and Research Agenda', *Administration and Policy in Mental Health and Mental Health Services Research*, 38(2), pp. 65–76. Available at: https://doi.org/10.1007/s10488-010-0319-7.

Proctor, E.K. *et al.* (2012) 'Writing implementation research grant proposals: ten key ingredients', *Implementation Science*, 7(1), p. 96. Available at: https://doi.org/10.1186/1748-5908-7-96.

Public Accounts Committee (2025) 'NHS financial sustainability'. Available at: https://committees.parliament.uk/publications/46303/documents/233234/default/ (Accessed: 23 March 2025).

Pyrko, I., Dörfler, V. and Eden, C. (2019) 'Communities of practice in landscapes of practice', *Management Learning*, 50(4), pp. 482–499. Available at: https://doi.org/10.1177/1350507619860854.

Quinsten, A.S., Apel, M. and Oliveira, S. (2023) 'Remote MR scanning – A solution for shortage of skilled radiographers', *Journal of Medical Imaging and Radiation Sciences*, 54(3), pp. 410–414. Available at: https://doi.org/10.1016/j.jmir.2023.05.046.

Rainey, C. *et al.* (2022) 'UK reporting radiographers' perceptions of AI in radiographic image interpretation – Current perspectives and future developments', *Radiography*, 28(4), pp. 881–888. Available at: https://doi.org/10.1016/j.radi.2022.06.006.

Ramazan, F., Aarts, S. and Widdowfield, M. (2022) ‘Exploring the implementation of evidence-based optimisation strategies: A qualitative study of the experience of diagnostic radiographers’, *Radiography*, 28(3), pp. 804–810. Available at: https://doi.org/10.1016/j.radi.2022.02.003.

Ramazan, F. and Graham, Y. (2025) ‘Economic, ethical and legal implications of evidence-based practice and continuing professional development in radiography: A narrative review’, *Radiography*, 31(2), p. 102886. Available at: https://doi.org/10.1016/j.radi.2025.102886.

Ranmuthugala, G. *et al.* (2011) ‘How and why are communities of practice established in the healthcare sector? A systematic review of the literature’, *BMC Health Services Research*, 11(1), p. 273. Available at: https://doi.org/10.1186/1472-6963-11-273.

Rawle, M. *et al.* (2023) ‘Radiographic technique modification and evidence-based practice: A qualitative study’, *Journal of Medical Radiation Sciences*, 70(1), pp. 56–63. Available at: https://doi.org/10.1002/jmrs.616.

Rieger, K.L. (2019) ‘Discriminating among grounded theory approaches’, *Nursing Inquiry*, 26(1), p. e12261. Available at: https://doi.org/10.1111/nin.12261.

Ritchie, A.J. *et al.* (2016) ‘Computer Vision Tool and Technician as First Reader of Lung Cancer Screening CT Scans’, *Journal of Thoracic Oncology*, 11(5), pp. 709–717. Available at: https://doi.org/10.1016/j.jtho.2016.01.021.

Roberts, J.M. (2014) ‘Critical Realism, Dialectics, and Qualitative Research Methods’, *Journal for the Theory of Social Behaviour*, 44(1), pp. 1–23. Available at: https://doi.org/10.1111/jtsb.12056.

Robertson, R. *et al.* (2017) *Understanding NHS financial pressures*. Available at: https://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/Understanding%20NHS%20financial%20pressures%20-%20full%20report.pdf (Accessed: 17 June 2023).

Robinson, S. *et al.* (2012) ‘Priority-setting and rationing in healthcare: Evidence from the English experience’, *Social Science & Medicine*, 75(12), pp. 2386–2393. Available at: https://doi.org/10.1016/j.socscimed.2012.09.014.

Rogers, E.M. (1962) *Diffusion of Innovations*. New York: Free Press.

Rogers, E.M. (2003) *Diffusion of innovations*. 5th ed. New York: Free Press.

Röhrig, B. *et al.* (2009) ‘Types of Study in Medical Research’, *Deutsches Arzteblatt International*, 106(15), pp. 262–268. Available at: https://doi.org/10.3238/arztebl.2009.0262.

Saarni, S.I. and Gylling, H.A. (2004) ‘Evidence based medicine guidelines: a solution to rationing or politics disguised as science?’, *Journal of Medical Ethics*, 30(2), pp. 171–175. Available at: https://doi.org/10.1136/jme.2003.003145.

Sackett, D.L. *et al.* (1996) ‘Evidence based medicine: what it is and what it isn’t’, *BMJ*, 312(7023), pp. 71–72. Available at: https://doi.org/10.1136/bmj.312.7023.71.

Salter, K.L. and Kothari, A. (2016) ‘Knowledge “Translation” as social learning: negotiating the uptake of research-based knowledge in practice’, *BMC Medical Education*, 16(1), p. 76. Available at: https://doi.org/10.1186/s12909-016-0585-5.

Sanbonmatsu, D.M., Cooley, E.H. and Butner, J.E. (2021) ‘The Impact of Complexity on Methods and Findings in Psychological Science’, *Frontiers in Psychology*, 11, p. 580111. Available at: https://doi.org/10.3389/fpsyg.2020.580111.

Saunders, M.N.K., Lewis, P. and Thornhill, A. (2012) *Research methods for business students*. 6th ed. Harlow, England ; New York: Pearson.

Sayer, A. (2000) *Realism and social science*. London: SAGE Publications.

Sayer, A. (2010) *Method in Social Science*. 2d edn. Routledge. Available at: https://doi.org/10.4324/9780203850374.

Schön, D.A. (1984) *The reflective practitioner: how professionals think in action*. New York: Basic Books.

Schuur, F., Rezazade Mehrizi, M.H. and Ranschaert, E. (2021) ‘Training opportunities of artificial intelligence (AI) in radiology: a systematic review’, *European Radiology*, 31(8), pp. 6021–6029. Available at: https://doi.org/10.1007/s00330-020-07621-y.

Seah, J.C.Y. *et al.* (2021) ‘Effect of a comprehensive deep-learning model on the accuracy of chest x-ray interpretation by radiologists: a retrospective, multireader multicase study’, *The Lancet Digital Health*, 3(8), pp. e496–e506. Available at: https://doi.org/10.1016/S2589-7500(21)00106-0.

Sebastian, K. (2019) ‘Distinguishing between the types of grounded theory: cassical, interpretive and constructivist’, *Journal for Social Thought*, 3(1), pp. 1–9.

Seibert, S. (2015) ‘The Meaning of a Healthcare Community of Practice: Healthcare Community of Practice’, *Nursing Forum*, 50(2), pp. 69–74. Available at: https://doi.org/10.1111/nuf.12065.

Sekhar, C., Patwardhan, M. and Singh, R.Kr. (2013) ‘A literature review on motivation’, *Global Business Perspectives*, 1(4), pp. 471–487. Available at: https://doi.org/10.1007/s40196-013-0028-1.

Senecal, J.B. *et al.* (2021) ‘Barriers to translational research in Windsor Ontario: a survey of clinical care providers and health researchers’, *Journal of Translational Medicine*, 19(1), p. 479. Available at: https://doi.org/10.1186/s12967-021-03097-6.

Seyhan, A.A. (2019) ‘Lost in translation: the valley of death across preclinical and clinical divide – identification of problems and overcoming obstacles’, *Translational Medicine Communications*, 4(1), p. 18. Available at: https://doi.org/10.1186/s41231-019-0050-7.

Shaheen, A.M. *et al.* (2019) ‘Predictors of quality of care provided for older adults’, *Journal of Nursing Management*, 27(8), pp. 1747–1755. Available at: https://doi.org/10.1111/jonm.12869.

Sharma, S. *et al.* (2020) ‘Clinician and patient beliefs about diagnostic imaging for low back pain: a systematic qualitative evidence synthesis’, *BMJ Open*, 10(8), p. e037820. Available at: https://doi.org/10.1136/bmjopen-2020-037820.

Shemtob, L. *et al.* (2023) ‘What needs to be done to address staffing shortages in health and social care?’, *British Journal of General Practice*, 73(728), pp. 102–103. Available at: https://doi.org/10.3399/bjgp23X732045.

Sheng, K. (2020) ‘Artificial intelligence in radiotherapy: a technological review’, *Frontiers of Medicine*, 14(4), pp. 431–449. Available at: https://doi.org/10.1007/s11684-020-0761-1.

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*, 22(1), p. 70. Available at: https://doi.org/10.1186/s12873-022-00616-6.

Shepherd, S. (2016) ‘Coordinated care: a patient perspective on the impact of a fragmented system of care on experiences and outcomes, drawing on practical examples’, *Future Hospital Journal*, 3(2), pp. 136–138. Available at: https://doi.org/10.7861/futurehosp.3-2-136.

Shi, F. *et al.* (2021) ‘Review of Artificial Intelligence Techniques in Imaging Data Acquisition, Segmentation, and Diagnosis for COVID-19’, *IEEE Reviews in Biomedical Engineering*, 14, pp. 4–15. Available at: https://doi.org/10.1109/RBME.2020.2987975.

Singh, S. and Estefan, A. (2018) ‘Selecting a Grounded Theory Approach for Nursing Research’, *Global Qualitative Nursing Research*, 5, p. 233339361879957. Available at: https://doi.org/10.1177/2333393618799571.

Skrabal Ross, X. *et al.* (2020) ‘Online psychosocial interventions for posttreatment cancer survivors: an international evidence review and update’, *Current Opinion in Supportive & Palliative Care*, 14(1), pp. 40–50. Available at: https://doi.org/10.1097/SPC.0000000000000478.

Slevitch, L. (2011) ‘Qualitative and Quantitative Methodologies Compared: Ontological and Epistemological Perspectives’, *Journal of Quality Assurance in Hospitality & Tourism*, 12(1), pp. 73–81. Available at: https://doi.org/10.1080/1528008X.2011.541810.

Smith, R. and Rennie, D. (2014) ‘Evidence-Based Medicine—An Oral History’, *JAMA*, 311(4), p. 365. Available at: https://doi.org/10.1001/jama.2013.286182.

Snaith, B. (2016) ‘Evidence based radiography: Is it happening or are we experiencing practice creep and practice drift?’, *Radiography*, 22(4), pp. 267–268. Available at: https://doi.org/10.1016/j.radi.2016.06.004.

Snaith, B., Hardy, M. and Lewis, E.F. (2015) ‘Radiographer reporting in the UK: A longitudinal analysis’, *Radiography*, 21(2), pp. 119–123. Available at: https://doi.org/10.1016/j.radi.2014.10.001.

Sobiecka, A. *et al.* (2016) ‘Clinically Unjustified Diagnostic Imaging – a Worrisome Tendency in Today’s Medical Practice’, *Polish Journal of Radiology*, 81, pp. 325–330. Available at: https://doi.org/10.12659/PJR.896847.

Society of Radiographers (2013) *Code of Professional Conduct*. Available at: https://www.sor.org/learning-advice/professional-body-guidance-and-publications/documents-and-publications/policy-guidance-document-library/code-of-professional-conduct (Accessed: 19 June 2023).

Society of Radiographers (2020a) ‘Advancing Practice in Radiography SIG’. Available at: https://www.sor.org/about/get-involved/special-interest-groups/advancing-practice-in-radiography-sig (Accessed: 4 June 2025).

Society of Radiographers (2020b) ‘Special Interest Groups (SIGs)’. Available at: https://www.sor.org/about/get-involved/special-interest-groups (Accessed: 6 June 2025).

Society of Radiographers (2021) *Current and Future Role of Diagnostic Radiographers*. Available at: : https://www.sor.org/getmedia/bfd03897-1a20-4b56-abc5-7463a7cc635e/Current-and-Future-Roles-of-Diagnostic-Radiographers-v1 (Accessed: 16 June 2023).

Society of Radiographers (2022) *Education and Career Framework for the Radiography Workforce | SoR*. Available at: https://www.sor.org/learning-advice/professional-body-guidance-and-publications/documents-and-publications/policy-guidance-document-library/education-and-career-framework-fourth (Accessed: 27 June 2023).

Society of Radiographers (2024) ‘Radiography from home’. Available at: https://www.sor.org/news/imaging/radiography-from-home (Accessed: 11 May 2025).

Spiers, G. *et al.* (2019) ‘Impact of social care supply on healthcare utilisation by older adults: a systematic review and meta-analysis’, *Age and Ageing*, 48(1), pp. 57–66. Available at: https://doi.org/10.1093/ageing/afy147.

Sporsem, T. *et al.* (2021) ‘Using Guilds to Foster Internal Startups in Large Organizations: A case study’. arXiv. Available at: https://doi.org/10.48550/ARXIV.2108.07618.

Stein, A.M. (1998) ‘History of Continuing Nursing Education in the United States’, *The Journal of Continuing Education in Nursing*, 29(6), pp. 245–252. Available at: https://doi.org/10.3928/0022-0124-19981101-04.

Stenfors, T., Kajamaa, A. and Bennett, D. (2020) ‘How to … assess the quality of qualitative research’, *The Clinical Teacher*, 17(6), pp. 596–599. Available at: https://doi.org/10.1111/tct.13242.

Stephens, M., Robinson, L. and McGrath, D. (2013) ‘Extending inter-professional learning through the use of a multi-disciplinary Wiki’, *Nurse Education in Practice*, 13(6), pp. 492–498. Available at: https://doi.org/10.1016/j.nepr.2013.01.009.

Sterling, S. (1988) ‘Automatic exposure control: a primer’, *Radiol Technol*, 59, pp. 421–427.

Stogiannos, N. *et al.* (2025) ‘R-AI-diographers: a European survey on perceived impact of AI on professional identity, careers, and radiographers’ roles’, *Insights into Imaging*, 16(1), p. 43. Available at: https://doi.org/10.1186/s13244-025-01918-6.

Stone, E.G. (2018) ‘Evidence-Based Medicine and Bioethics: Implications for Health Care Organizations, Clinicians, and Patients’, *The Permanente Journal*, 22(4), pp. 18–030. Available at: https://doi.org/10.7812/TPP/18-030.

Strauss, A.L. and Corbin, J. (1990) *Basics of qualitative research: grounded theory procedures and techniques*. Newbury Park: Sage.

Strauss, A.L. and Corbin, J. (1994) *Grounded theory methodology: An overview. In N. K. Denzin & Y. S. Lincoln (Eds.)*. Thousand Oaks: SAGE Publications (Handbook of qualitative research).

Stutchbury, K. (2021) ‘Critical realism: an explanatory framework for small-scale qualitative studies or an “unhelpful edifice”?’, *International Journal of Research & Method in Education*, 45(2), pp. 113–128. Available at: https://doi.org/10.1080/1743727X.2021.1966623.

Su, N.M., Wilensky, H.N. and Redmiles, D.F. (2012) ‘Doing Business with Theory: Communities of Practice in Knowledge Management’, *Computer Supported Cooperative Work (CSCW)*, 21(2–3), pp. 111–162. Available at: https://doi.org/10.1007/s10606-011-9139-x.

Sullivan, EJ. and Garland, G. (2013) *Practical leadership and management in healthcare : for nurses and allied health professionals*. 2d edn. Harlow: Pearson.

Sussex, J. *et al.* (2024) ‘Supporting Patients’ Use of Digital Services in Primary Health Care in England: Synthesis of Evidence From a Mixed Methods Study of “Digital Facilitation”’, *JMIR Human Factors*, 11, pp. e52516–e52516. Available at: https://doi.org/10.2196/52516.

Sutherland, B.L. *et al.* (2022) ‘Good working relationships: how healthcare system proximity influences trust between healthcare workers’, *Journal of Interprofessional Care*, 36(3), pp. 331–339. Available at: https://doi.org/10.1080/13561820.2021.1920897.

Talafian, H. *et al.* (2025) ‘Responsive professional development: A facilitation approach for teachers’ development in a physics teaching community of practice’, *Teaching and Teacher Education*, 153, p. 104812. Available at: https://doi.org/10.1016/j.tate.2024.104812.

Taylor, F. *et al.* (2022) ‘Uptake of advanced clinical practice roles in the health service in England: Perspectives at the micro level’, *SSM - Qualitative Research in Health*, 2, p. 100141. Available at: https://doi.org/10.1016/j.ssmqr.2022.100141.

The British Medical Ultrasound Society (2020) *Guidelines for Professional Ultrasound Practice*. Available at: https://www.bmus.org/static/uploads/resources/2020_Guidelines_for_Professional_Ultrasound_Practice.pdf (Accessed: 27 June 2023).

The College of Radiographers (2010) ‘Medical image interpretation by radiographers: definitive guidance’. Available at: https://www.sor.org/getmedia/7f0ef7a1-2f56-4c4b-b163-24375105cd0c/sor_Definitive_Guidance_May_2010.pdf_1 (Accessed: 14 May 2025).

The Ionising Radiation (Medical Exposure) Regulations (2017) *The Ionising Radiation (Medical Exposure) Regulations 2017*. King’s Printer of Acts of Parliament. Available at: https://www.legislation.gov.uk/uksi/2017/1322/contents/made (Accessed: 27 June 2023).

The Lancet (1995) ‘Evidence-based medicine, in its place’, 346(8978), p. 785. Available at: https://doi.org/10.1016/S0140-6736(95)91610-5.

The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979) *The Belmont Report*. Available at: https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/read-the-belmont-report/index.html (Accessed: 19 June 2023).

The Royal College of Radiologists (2025) ‘Sub-specialties & Special Interest Groups (SIGs)’. Available at: https://www.rcr.ac.uk/career-development/professional-networks/sub-specialties-special-interest-groups-sigs/ (Accessed: 6 June 2025).

Thoma, A. and Eaves, F.F. (2015) ‘A Brief History of Evidence-Based Medicine (EBM) and the Contributions of Dr David Sackett’, *Aesthetic Surgery Journal*, 35(8), pp. NP261–NP263. Available at: https://doi.org/10.1093/asj/sjv130.

Thompson, M.J. (2017) ‘Introduction: What Is Critical Theory?’, in M.J. Thompson (ed.) *The Palgrave Handbook of Critical Theory*. New York: Palgrave Macmillan US, pp. 1–14. Available at: https://doi.org/10.1057/978-1-137-55801-5_1.

Thurm, M. *et al.* (2021) ‘Reducing the number of unnecessary laboratory tests within hospital through the use of educational interventions’, *Annals of Clinical Biochemistry: International Journal of Laboratory Medicine*, 58(6), pp. 632–637. Available at: https://doi.org/10.1177/00045632211040670.

Topousis, D.E., Dennehy, C.J. and Lebsock, K.L. (2012) ‘Nasa’s Experiences Enabling the Capture and Sharing of Technical Expertise Through Communities of Practice’, *Acta Astronautica*, 81(2), pp. 499–511. Available at: https://doi.org/10.1016/j.actaastro.2012.08.008.

Translational Research Institute (2023) *What is Translational Research?*, *https://tri.uams.edu/*. Available at: https://tri.uams.edu/about-tri/what-is-translational-research/ (Accessed: 5 July 2023).

Tucker, S. *et al.* (2021) 'Implementation Science: Application of Evidence-Based Practice Models to Improve Healthcare Quality', *Worldviews on Evidence-Based Nursing*, 18(2), pp. 76–84. Available at: https://doi.org/10.1111/wvn.12495.

Tung, M. *et al.* (2018) 'Factors associated with imaging overuse in the emergency department: A systematic review', *The American Journal of Emergency Medicine*, 36(2), pp. 301–309. Available at: https://doi.org/10.1016/j.ajem.2017.10.049.

Turner, A., D'Alimonte, L. and Fitch, M. (2013) 'Promoting radiation therapy research: understanding perspectives, transforming culture', *Journal of Radiotherapy in Practice*, 12(2), pp. 92–99. Available at: https://doi.org/10.1017/S1460396912000088.

Turon, H. *et al.* (2023) 'Dissemination of public health research to prevent non-communicable diseases: a scoping review', *BMC Public Health*, 23(1), p. 757. Available at: https://doi.org/10.1186/s12889-023-15622-x.

Upton, D. *et al.* (2014) 'Occupational Therapists' Attitudes, Knowledge, and Implementation of Evidence-Based Practice: A Systematic Review of Published Research', *British Journal of Occupational Therapy*, 77(1), pp. 24–38. Available at: https://doi.org/10.4276/030802214x13887685335544.

Uri, T. (2015) 'The strengths and limitations of using situational analysis grounded theory as research methodology', *Journal of Ethnographic & Qualitative Research*, 10, pp. 135–151.

Van De Venter, R. *et al.* (2023) 'Artificial intelligence education for radiographers, an evaluation of a UK postgraduate educational intervention using participatory action research: a pilot study', *Insights into Imaging*, 14(1), p. 25. Available at: https://doi.org/10.1186/s13244-023-01372-2.

Van Leeuwen, K.G. *et al.* (2022) 'How does artificial intelligence in radiology improve efficiency and health outcomes?', *Pediatric Radiology*, 52(11), pp. 2087–2093. Available at: https://doi.org/10.1007/s00247-021-05114-8.

Varkey, B. (2020) 'Principles of Clinical Ethics and Their Application to Practice', *Medical Principles and Practice*, 30(1), pp. 17–28. Available at: https://doi.org/10.1159/000509119.

Veenstra, G.L. *et al.* (2022) 'Health care professionals' motivation, their behaviors, and the quality of hospital care: A mixed-methods systematic review', *Health Care Management Review*, 47(2), pp. 155–167. Available at: https://doi.org/10.1097/HMR.0000000000000284.

Vils Pedersen, M.R. (2023) 'What motivates radiographers to start working with research?', *Radiography*, 29(1), pp. 215–220. Available at: https://doi.org/10.1016/j.radi.2022.11.003.

Vo, T.T.D., Tuliao, K.V. and Chen, C.-W. (2022) ‘Work Motivation: The Roles of Individual Needs and Social Conditions’, *Behavioral Sciences*, 12(2), p. 49. Available at: https://doi.org/10.3390/bs12020049.

Vom, J. and Williams, I. (2017) ‘Justification of radiographic examinations: What are the key issues?’, *Journal of Medical Radiation Sciences*, 64(3), pp. 212–219. Available at: https://doi.org/10.1002/jmrs.211.

Walewska-Zielecka, B. *et al.* (2021) ‘Evidence-Based Care Reduces Unnecessary Medical Procedures and Healthcare Costs in the Outpatient Setting’, *Value in Health Regional Issues*, 25, pp. 23–28. Available at: https://doi.org/10.1016/j.vhri.2020.07.577.

Walshe, K. and Rundall, T. (2001) ‘Evidence-based Management: From Theory to Practice in Health Care’, *The Millbank Quarterly*, 79(3), pp. 429–457. Available at: https://doi.org/10.1111/1468-0009.00214.

Wang, C. (2012) ‘8th FY Khoo Memorial Lecture 2012--Why radiologists need philosophy’, *Ann Acad Med Singap*, 41(7), pp. 315–322.

Watt, T., Charlesworth, A. and Gershlick, B. (2019) ‘Health and care spending and its value, past, present and future’, *Future Healthcare Journal*, 6(2), pp. 99–105. Available at: https://doi.org/10.7861/futurehosp.6-2-99.

Watts, H. and Snaith, B. (2023) ‘Evidence based practice, research and the diagnostic radiographer role. An exploration of engagement, expectations and attitudes at a single centre’, *Radiography*, 29(1), pp. 124–130. Available at: https://doi.org/10.1016/j.radi.2022.10.014.

Wenger, É. (1998) *Communities of practice: learning, meaning, and identity*. Cambridge: Cambridge University Press (Learning in doing social, cognitive, and computational perspectives).

Wenger, E. (2004) ‘Communities of practice: a brief introduction’. Ivey Business Journal. Available at: https://mwcasc.umn.edu/sites/mwcasc.umn.edu/files/2024-12/communities_practice_intro_wenger.pdf (Accessed: 24 May 2025).

Wenger, E. (2013) *Learning in landscapes of practice*. Available at: https://www.youtube.com/watch?v=qn3joQSQm4o (Accessed: 19 July 2023).

Wenger, E., McDermott, R.A. and Snyder, W. (2002) *Cultivating communities of practice: a guide to managing knowledge*. Boston, Mass: Harvard Business School Press.

Wenger-Trayner, E. (2012) *Levels of participation*. Available at: https://www.wenger-trayner.com/slide-forms-of-participation/ (Accessed: 19 July 2023).

Wenger-Trayner, E. (2015) *Introduction to communities of practice*. Available at: https://www.wenger-trayner.com/introduction-to-communities-of-practice/ (Accessed: 16 July 2023).

Wenger-Trayner, E. *et al.* (eds) (2015) *Learning in landscapes of practice: boundaries, identity, and knowledgeability in practice-based learning*. London ; New York: Routledge.

Wieten, S.E. (2015) 'Is Evidence-Based Psychiatry Ethical? by Mona Gupta. Oxford University Press, Oxford, 2014, $52.95, 224 pp. ISBN 978 0 199 64111 6.', *Journal of Evaluation in Clinical Practice*, 21(3), pp. 538–541. Available at: https://doi.org/10.1111/jep.12349.

Willmington, C. *et al.* (2022) 'The contribution of benchmarking to quality improvement in healthcare. A systematic literature review', *BMC Health Services Research*, 22(1), p. 139. Available at: https://doi.org/10.1186/s12913-022-07467-8.

Wilson, C., Janes, G. and Williams, J. (2022) 'Identity, positionality and reflexivity: relevance and application to research paramedics', *British Paramedic Journal*, 7(2), pp. 43–49. Available at: https://doi.org/10.29045/14784726.2022.09.7.2.43.

Wise, J. (2020) 'Patient safety: NHS trusts report multiple risks linked to lack of staff and funding', *BMJ*, p. m3885. Available at: https://doi.org/10.1136/bmj.m3885.

Wolf, P., Späth, S. and Haefliger, S. (2011) 'Participation in intra-firm communities of practice: a case study from the automotive industry', *Journal of Knowledge Management*, 15(1), pp. 22–39. Available at: https://doi.org/10.1108/13673271111108675.

Wood, K. (2022) 'How is the reporting radiographer role portrayed in published studies? A scoping review', *Radiography*, 28(1), pp. 215–221. Available at: https://doi.org/10.1016/j.radi.2021.07.027.

World Health Organisation (2010) 'Framework for Action on Interprofessional Education & Collaborative Practice'. Available at: https://iris.who.int/bitstream/handle/10665/70185/WHO_HRH_HPN_10.3_eng.pdf (Accessed: 12 June 2025).

Worum, H. *et al.* (2020) 'Physiotherapists' perceptions of challenges facing evidence-based practice and the importance of environmental empowerment in fall prevention in the municipality – a qualitative study', *BMC Geriatrics*, 20(1), p. 432. Available at: https://doi.org/10.1186/s12877-020-01846-8.

Woznitza, N., Steele, R., Groombridge, H., *et al.* (2021) 'Clinical reporting of radiographs by radiographers: Policy and practice guidance for regional imaging networks', *Radiography*, 27(2), pp. 645–649. Available at: https://doi.org/10.1016/j.radi.2020.08.004.

Woznitza, N., Steele, R., Hussain, A., *et al.* (2021) 'Reporting radiographer peer review systems: A cross-sectional survey of London NHS Trusts', *Radiography*, 27(1), pp. 173–177. Available at: https://doi.org/10.1016/j.radi.2020.07.014.

Yada, N. and Head, M. (2019) 'Attitudes Toward Health Care Virtual Communities of Practice: Survey Among Health Care Workers', *Journal of Medical Internet Research*, 21(12), p. e15176. Available at: https://doi.org/10.2196/15176.

Youngblut, J.M. and Brooten, D. (2001) ‘Evidence-based Nursing Practice: Why Is It Important?’:, *AACN Clinical Issues: Advanced Practice in Acute and Critical Care*, 12(4), pp. 468–476. Available at: https://doi.org/10.1097/00044067-200111000-00003.

Zerhouni, E. (2003) ‘The NIH Roadmap’, *Science*, 302(5642), pp. 63–72. Available at: https://doi.org/10.1126/science.1091867.

Zimpel-Leal, K. (2020) ‘Emergent Business Models for Homecare in England’, *Innovation in Aging*, 4(Supplement_1), pp. 434–434. Available at: https://doi.org/10.1093/geroni/igaa057.1402.

Appendices

Appendix A – Approval for site observations at Alliance Medical Limited

Alliance Medical

Intelligent imaging

FAO: Ethics Committee
Faculty of Health Sciences and Wellbeing
Sciences Complex
University of Sunderland
Chester Road
Sunderland
SR1 3SD

Re: Ferdouz Ramazan, PhD Study, researching Communities of Practice in Radiography

Dear Committee

Please accept this letter as confirmation that, in order to support Ferdouz in her studies, Ferdouz will be granted access to our Units, Mobiles and Sites as required to carry out activities related to the research.

Your sincerely

James

James Fletcher
Head of Learning & Development

INVESTOR IN PEOPLE

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Appendix B – Observation participant information sheet

Participant Information Sheet
(Observations)

Exploration of Communities of Practice in Radiography

We would like to invite you to participate in this PhD research project. Participation is voluntary; deciding not to participate will not disadvantage you. Before you decide whether you want to take part, it is important to understand why the research is being undertaken and what your participation will involve. Please read the following information carefully. You can contact us if any of the information is unclear or if you wish to obtain more information.

Background and objectives of the project

Evidence-based Practice (EBP) and Continuing Professional Development (CPD) are essential components for the delivery of superior quality healthcare. In radiography, there is a demand to engage in EBP and CPD due to the continuing developing profession and technology. Moreover, continuous use of EBP and CPD are important from a legal, economic, and ethical perspectives associated with the radiography profession.

It is crucial to understand the factors that prohibit or promote EBP and CPD and their operationalisation in order to bridge the gap between research and practice. The project aims to understand and investigate this gap through the theory of Communities of Practice (CoPs) in the radiography setting. CoP is a social learning theory that engages professionals in the process of collective learning. The theory could potentially promote knowledge dissemination, EBP and CPD to ultimately improve personal and organisational performance in radiography.

What will happen during the observations?

The PhD Researcher, Ferdouz Ramazan, will spend two days at the unit to observe the clinical staff through the lens of CoP, EBP, learning and knowledge dissemination and/or sharing. Ferdouz may ask you questions during the observations. Additionally, you may be invited for an interview to further discuss the subject. Participation is voluntary.

What will happen to the results?

Ferdouz will be making notes of any comments or observations related to CoP, EBP, learning and knowledge dissemination and/or sharing. The analysis will involve merging all the field notes and identifying common trends. Once the analysis has been undertaken, we intend to produce a report on the findings. This may be presented at conference proceedings and published in a peer-reviewed academic journal. You or the unit you work at will not be identified in these reports as these will be suitably pseudonymised (i.e., given a moniker such as RAD1 or UNIT1). A copy of the report is sent to you if this is wished.

What about confidentiality?

Any data you provide will be treated in accordance with the Data Protection Act 2018 and the General Data Protection Regulation. We will not tell anyone that you have taken part in this project and will not name you in any of the reports or publications. In the reports, we may use quotes from any comments made during the observations to illustrate the points that are being made. Some of these quotes may come from you. Any references made to non-identifiable personal information (e.g., years of clinical experience, operating modality or modalities, qualifications) during a conversation with the researcher may be recorded. However, any comments or quotes that might reveal who you are will not be recorded or used. Your data will be securely archived after the project due to its possible historical value. Your data will be held confidentially, with access restricted to individuals working on the project. It is possible that, in the future, researchers at Sunderland University working on related projects may use data from the field notes to support their project. Therefore, if you are participating, we would like your approval to share the field notes and use the data in other projects.

What do I do if I want to withdraw from the project?
If you agree to participate but then decide to withdraw, you can email or tell Ferdouz Ramazan (framazan@alliance.co.uk) on the day of the observations. You cannot withdraw your data after it has been collected as the field notes related to you will be non-identifiable, therefore, the researchers are unable to track which notes came from you.

How can I participate?
If you are interested in participating or if you have any questions, please contact Ferdouz Ramazan (framazan@alliance.co.uk). Consent forms are signed on the day of the observations.
If you have any concerns or have been harmed as consequence of participation in this project in any way, you can contact the Director of Studies for further advice and information: Professor Yitka Graham, Sunderland University, Faculty of Health Sciences and Wellbeing, Helen McArdle House, Silksworth Row, Sunderland, SR1 3SD. Email: yitka.graham@sunderland.ac.uk

Appendix C – Observation participant consent form

Consent Form for Participants
(Observations)

Please complete this form after you have read the participant information sheet and/or listened to an explanation about the study.
Title of study: Exploration of Communities of Practice in Radiography
Thank you for considering participating in this study. You will be given a copy of this consent form to keep and refer to at any time.

	Please tick or initial
1. I have read and understood the information sheet for the above study and have had the opportunity to ask questions. I understand that the study is undertaken as part of a PhD research project.	☐
2. I consent to be observed for the purposes of the study. I understand that the data generated will be handled in accordance with the terms of the Data Protection Act 2018 and the General Data Protection Regulation.	☐
3. I consent for my non-identifiable personal information to be used in the project. I understand that the data will not have my name or anything identifiable in it. I am aware that this consent form will be kept until the end of the study (maximum 1/05/2029).	☐
4. I am aware that I have the right to withdraw at any time before data collection without giving reasons and without any of my rights being affected. I am aware that I cannot withdraw my data after it has been collected as the field notes related to me are non-identifiable.	☐
5. I understand that confidentiality will need to be breached if there is a cause for concern and it will be dealt with through the normal policy procedures.	☐
6. I understand that the outcomes of this study may be published in the future, and if I would like to receive a copy, I will contact the researcher.	☐
7. I understand that the field notes will be stored for use in future research.	☐
8. I agree to take part in this study.	☐

______________________	______________________	______________________
Name of Participant	Date	Signature
______________________	______________________	______________________
Name of Researcher	Date	Signature

Appendix D – Field notes example

IDC PET CT
27/06/2024
1 GE PET CT scanner
1 Senior Radiographer
1 Graduate Radiographer
1 CA

Radiographer mentioned being unwell but did not call in sick due to understaffed.

Using a board to keep on track-rads discuss Patient flow. Lead radiographer on the day directs the junior radiographer and CA.

Senior radiographer moves to different site to help with demand.
CA training to be a radiographer explained she changed universities (same country) it does not match so has to do an additional year.

She feels she'll have the benefit being a CA before in the company having a lot of knowledge going into it.

No drawing up machine, hence dose to rads is greater. Although best practice having one of those machines, it is not mandatory as the cost of having one is not justified. Rads wear PPE.

All rads/techs must do training/assessment on PET modality as they start with the company which requires completing in 6 months. As do a safety training (online) with PET CT Christie. CA's get some training in spill kits. CA investigates implants when rads busy in MRI and looks after them, keeps notes/documents together.

CA positions patients under instruction of rad. CA strapped/position patient radiation dose increased. Graduate rad has issues with scanner - scanner not moving. Solved by herself.

Graduate radiographer teaching CA regard printing certain paperwork. Grad rad preparing details for tomorrow's patients.

IDC MRI
9/6/24
2x 1.5T GE scanners
2 CAs
4 Senior Radiographers

Patient pressed buzzer, CAs and radiographers explained the process to the patient as she was claustrophobic. They took the time with the patient to ensure the patient goes ahead with the scan.

CA explained that the slots are very tight in MRI – especially if patient are immobile, claustrophobic etc. Especially being a people person, she feels that patients can be rushed. There is little time for catch up and staff can leave late. The CA said that the job ''should not take over your life''.

One of the radiographers explained he had to get used to the scanner as used different ones before – but they pick it up fairly quickly. The radiographers explained they learn from each other when, for example, there is a special case and ask each other for advice/support.

One of the radiographers was showing the other images of cardiac scanning and discussing his experience. The conversation surrounded technique and anatomy.

The radiographer who positioned the patient advised the radiographer scans to be quick as the patient is uncomfortable. The radiographers appropriately positioned the patient and used pads to avoid skin contact with the scanner.

Radiographers trained abroad – radiographer explained that in India, where he trained, CAs position and scan as well depending on the hospital. Radiographers had more freedom in giving contrast when needed or scan other parts of the patient if required. The radiographer explained that due to this, his knowledge of pathology had to be high to make such decisions and ensure everything was covered. During special cases, radiologists would be with them, guiding the radiographers where a lot of knowledge also came from. In the UK it is rather strictly ‘protocolled’ and policies and procedures require following.

Patient abandoned due to claustrophobia – one radiographer was explaining to the other how to ‘abandon’ the patient in the system.

Radiographer explained his experiences with cannulating a patient and work relationship with the radiographer he worked with at the time of the incident. This was at a different site at AML staff were inflexible and staff clashing within the team. Radiographer explained an incident where he shouted an administrator for help as the patient fainted, admin staff came and left but never helped out with the reason being ''I could not understand you''. The radiographer explained that especially at that site, there was a preconception about being Indian. At the same site, he was the one being asked to do the special case scans, but radiographers never wanted to learn it themselves.

CT GE 2 scanners
5 senior radiographers and 2 CAs.
Environment is rather small – little workplace for radiographers.

Radiographer explained that she does not understand why all the e-learning is on multiple platforms – this is rather confusing to them. Senior radiographer explained that she has been in CT her whole life and does not know if she could learn a new modality now.

CAs ask the radiographers to help cannulating as patient had poor veins. Fast paced environment. The radiographers explained that CT has more consequences if done wrong due to the radiation i.e., high dose is given etc. Whereas with MR, it can simply be repeated. The CT radiographers feel that they must concentrate more in CT, whereas you get time in MR to plan and think.

Appendix E – Reflexive diary example

IDC – 5/6/2024

The team appeared to get along well, and there was easy friendliness among them that I noticed almost immediately. Walking into the unit and the control rooms, I found my attention repeatedly drawn to the modern environment, the layout, the spacious rooms, a large staff break room(!), and particularly the high-spec equipment. It was noticeably more advanced than in my own units, which is based within an NHS hospital, rather than a stand-alone building. I caught myself imagining how my team would respond to working in a space like this. I felt that they would thrive here, and part of me even wondered whether the environment itself might lift morale and confidence in ways I haven't fully appreciated before.

At the same time, the radiographers, CAs, and AP's initially felt a little stand-offish. I sensed an initial subtle guardedness around me, which may be due to my managerial position. I suspect that they were concerned that I might observe something and feed it back to their manager, or act as an inspector, even though that was not the purpose of my visit. One AP declined to participate in the observations, saying she had ''only recently started''. The reasoning felt more like apprehension about being judged, rather than a genuine lack of readiness. I reassured her about confidentiality of the research.

As the day progressed, the atmosphere softened. Once the team became used to me having there, conversations flowed more naturally, and the initial distance seemed to ease. Because the site is new, I had the impression that the team was still settling in, testing the waters, working out their roles, and slightly unfamiliar with how everything fits together. In moments, they appeared to be observing one another just as much as I was observing them. My own MRI background made it difficult not to get involved, and I did find myself helping the radiographer with decisions about implant safety. Interestingly, my involvement seemed to put the radiographers and assistants at ease, perhaps because it signalled that I understood their world and wasn't there to scrutinise them from a distance. This made me feel that I made the correct decision to act as a partially participating observer, gaining the participants' trust.

During quieter moments, I spoke with several radiographers who had been sponsored to work in the country, but completed their training elsewhere. They described the challenge of learning new local policies, unfamiliar procedures and adapting to a different culture within the workplace. It made sense to me that the learning curve would be steep, probably even steeper than those who simply join a different organisation and trained in the country, and probably at times overwhelming. Not only do they have to get used to a new team, policies, procedures and company expectations, but also dealing with a new environment, language, and culture.

I noticed many inexperienced staff, and those who needed support as they were uncertain about scans or processes.

Throughout the day, I became increasingly aware of the hierarchical structure in the unit. The clinical assistants and assistant practitioners looked to the radiographers for direction, and the radiographers, in turn, relied on the clinical leads and management. It was not surprising, I see similar patterns in my units, and some of the other units I observed so far. I wondered to what extent they support stability and clarity, and to what extent they might limit initiative or confidence, particularly for staff who are new or still developing their identity in the unit. This is probably something I need to consider and question further in the interviews.

Reliance on peers, training and education, effects of environment on learning, communication with others.

Appendix F – Interview guide

Interview Guide

Topic	Questions	Aim
Clinical staff's demographics	1. What is your job role? 2. What is your age? 3. How many years of clinical experience do you have? 4. What modality are you specialised in? 5. What is your highest obtained qualification? 6. What type of site are you based? (i.e., CDC, IDC, mobile or static unit?)	For context purposes
Evidence-based Practice and Continuing Professional Development	1. Could you explain what EBP entails and its importance? 2. How do you engage in CPD? How often? 3. Where do you get your evidence-based information or practices from? Prompt: colleagues? In what way? 4. What does the department or AML do to promote EBP and CPD? 5. In your opinion, how can an evidence-based culture be promoted? Prompt: regulations, policies? 6. How can this be enforced or regulated to ensure engagement? 7. What support do you receive to improve CPD and EBP? Prompt: Who from?	To explore knowledge and understanding of CPD and EBP. To explore application of EBP and CPD in practice.
Barriers and facilitators	1. Could you tell me about the barriers to EBP and CPD you encounter? 2. Could you give me an example of a time or situation you or a colleague attempted to apply an EBP? Outcomes?	To explore barriers and facilitators of EBP and CPD.

	3. What support or resources would help you in engaging with EBP and CPD more?	
Communities of Practice	1. Understanding of CoP 2. What groups/meetings do you attend where knowledge is shared? (in and outside of AML). 3. Could you describe whether somebody in your unit or company has a role to sharing knowledge? 4. How do you imagine participation in a CoP would be? How frequent should this be organised? 5. What about the role of technology in this concept? 6. In your opinion, how will this meet organisational goals and benefits? 7. How could this concept benefit/not benefit patients? 8. How could this concept benefit/not benefit the radiography profession? 9. Do you feel you learn anything from radiographers/clinical staff in other companies such as NHS? How would you feel about their involvement? 10. What about involvement of other healthcare disciplines? 11. What about involvement of universities? IDC/CDC only: 1. Do you feel you learn from colleagues in other modalities/sectors? 2. If yes, when are discussions taken place?	To explore pre-existing roles and CoPs. To explore the understanding and CoP concept. To explore the role of technology in CoPs. To explore involvement of clinical staff in other companies/sectors.

The future	1. How do you imagine the radiography profession in the future? 2. How would you like knowledge dissemination to occur? 3. In terms of AML, how would you like to see the company grow in terms of knowledge sharing and dissemination?	To explore expectations of the radiography profession. To explore expectations of the workplace/company.

Appendix G – Interview participant information sheet

Participant Information Sheet

(Interviews)

Exploration of Communities of Practice in Radiography

We would like to invite you to participate in this PhD research project. Participation is voluntary; deciding not to participate will not disadvantage you. Before you decide whether you want to take part, it is important to understand why the research is being undertaken and what your participation will involve. Please read the following information carefully. You can contact us if any of the information is unclear or if you wish to obtain more information.

Background and objectives of the project

Evidence-based Practice (EBP) and Continuing Professional Development (CPD) are essential components for the delivery of superior quality healthcare. In radiography, there is a demand to engage in EBP and CPD due to the continuing developing profession and technology. Moreover, continuous use of EBP and CPD are important from a legal, economic, and ethical perspectives associated with the radiography profession.

It is crucial to understand the factors that prohibit or promote EBP and CPD and their operationalisation in order to bridge the gap between research and practice. The project aims to understand and investigate this gap through the theory of Communities of Practice (CoPs) in the radiography setting. CoPs is a social learning theory that engages professionals in the process of collective learning. The theory could potentially promote knowledge dissemination, EBP and CPD to ultimately improve personal and organisational performance in radiography.

What will happen during the interviews?

The interview will encompass questions regarding barriers and facilitators of learning in practice, EBP and knowledge dissemination and/or sharing and the concept of Communities of Practice. The PhD researcher, Ferdouz Ramazan, will undertake the interview and guide you through each section. There are no right or wrong answers – we are simply interested in your experiences, perceptions, and opinions. The interview will be undertaken at the unit you are based or on Teams at a convenient time depending on your preferences.

What will happen to the results?

The interview will be audio recorded, and a transcript of each recording will then be produced. A copy of the transcript will be emailed to you to check and make any additional comments. The analysis will involve merging all the transcripts from each interview and observing and identifying common trends in what the clinical staff have mentioned. Once the analysis has been undertaken, we intend to produce a report on the findings. This may be presented at conference proceedings and published in a peer-reviewed academic journal. You will not be identified in these reports as you will be suitably pseudonymised (i.e., given a moniker such as RAD1). A copy of the report is sent to you if this is wished.

What about confidentiality?

Any data you provide will be treated in accordance with the Data Protection Act 2018 and the General Data Protection Regulation. The audio recordings will be destroyed once a transcript of the interview is produced. The transcript will be linked to your participant number (on the consent form) for a period of 14 days where you will be able to withdraw your data. After this period, the transcript will be non-identifiable. We will not tell anyone that you have taken part in this project and will not name you in any of the reports or publications. Due to the objectives of the project, we will need to collect and present some demographics. The demographics necessary for the project are whether you are based at a static, mobile, IDC or CDC unit; years of clinical experience, highest qualification obtained, your age, job role, and operating modality or modalities. However, any direct link to you as an individual is avoided.

In the reports, we will use quotes from the interviews to illustrate the points that are being made. Some of these quotes may come from you. However, any quotes that might reveal who you are will not be used.

Your data will be securely archived after the project due to its possible historical value. Your data will be held confidentially, with access restricted to individuals working on the project. It is possible that, in the future, researchers at Sunderland University working on related projects may use data from the transcripts to support their project. Therefore, if you are participating, we would like your approval to share the transcript and use the data in other projects.

What do I do if I want to withdraw from the project?

If you agree to participate but then decide to withdraw, you can email Ferdouz Ramazan (framazan@alliance.co.uk) to take your name off the list. If you want to withdraw the data after it has been collected, please quote the unique participant number on your consent form in the email to Ferdouz. Please remember, withdrawal of data is possible within 14 days after the date your interview took place.

How can I participate?

If you are interested in participating or if you have any questions, please contact Ferdouz Ramazan (framazan@alliance.co.uk). We can then discuss a suitable date and time for the interview. The consent form is signed on the day of the interview.

If you have any concerns or have been harmed as consequence of participation in this project in any way, you can contact the Director of Studies for further advice and information: Professor Yitka Graham, Sunderland University, Faculty of Health Sciences and Wellbeing, Helen McArdle House, Silksworth Row, Sunderland, SR1 3SD. Email: yitka.graham@sunderland.ac.uk

Appendix H – Interview participant consent form

Consent Form for Participants

(Interviews)

Please complete this form after you have read the participant information sheet and/or listened to an explanation about the study.

Title of study: Exploration of Communities of Practice in Radiography

Thank you for considering participating in this study. You will be given a copy of this consent form to keep and refer to at any time. Your **unique participant number** is on the bottom of this consent form, please keep this number safe and quote this if withdrawal of data is wished 14 days following your interview.

Please tick or initial

1. I have read and understood the information sheet for the above study and have had the opportunity to ask questions. I understand that the study is undertaken as part of a PhD research project. ☐

2. I consent to the processing of my personal information for the purposes explained to me. I consent for the interview to be audio recorded. I understand that such information will be handled in accordance with the terms of the Data Protection Act 2018 and the General Data Protection Regulation. ☐

3. I consent for my non-identifiable personal information to be used in the project. I am aware that the demographics and this consent form will be kept until the end of the study (maximum 1/05/2029). ☐

4. I am aware that I have the right to withdraw at any time up to 14 days following my interview without giving reasons and without any of my rights being affected and all data will be deleted. ☐

5. I understand that the data will not have my name or anything identifiable in it but will be linked to me by a unique participant number which will be stored separately from the data and deleted 14 days following my interview. ☐

6. I understand that confidentiality will need to be breached if there is a cause for concern and it will be dealt with through the normal policy procedures. ☐

7. I understand that the outcomes of this study may be published in the future, and if I would like to receive a copy, I will contact the researcher. ☐

8. I understand that my interview transcript will be stored for use in future research in an anonymised form. ☐

9. I agree to take part in this study. ☐

____________________	____________________	____________________
Name of Participant	Date	Signature
____________________	____________________	____________________
Name of Researcher	Date	Signature

Unique Participant Number: [to be inserted for each participant]

Appendix I – Ethical approval

University of Sunderland

Downloaded: 28/04/2024
Approved: 23/04/2024

Ferdos Ramazan
School of Nursing and Health Sciences
Programme: Doctor of Philosophy

Dear Ferdos

PROJECT TITLE: Exploration of Communities of Practice in Radiography
APPLICATION: Reference Number 024897

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 23/04/2024 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 024897 (form submission date: 02/04/2024); (expected project end date: 31/05/2025).
- Participant information sheet 1032395 version 2 (23/03/2024).
- Participant consent form 1032396 version 2 (23/03/2024).

If during the course of the project you need to deviate significantly from the above-approved documentation please email ethics.review@sunderland.ac.uk

For more information please visit: https://www.sunderland.ac.uk/research/governance/researchethics/

Yours sincerely

Mrs Andrea Howell
Ethics Administrator
University of Sunderland