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Narrative Review

# Economic, ethical and legal implications of evidence-based practice and continuing professional development in radiography: A narrative review

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ABSTRACT

*Objectives:* There is an increasing need to engage with evidence-based practice (EBP) and continuing professional development (CPD) to effectively respond to the current healthcare demands and challenges. This review highlights barriers to applying EBP and CPD, and synthesises the economic, ethical and legal implications of EBP and CPD in radiography.
*Key findings:* Inconsistent application of EBP and engagement in CPD may not only result in compromised professional development and gaps in knowledge in practice, but also affect patients, healthcare services and health organisations unfavourably from an economic, ethical and legal perspective. Leaders such as managers in radiology departments may play a key role in fostering an evidence-based culture.
*Conclusion:* Consistent application of EBP and CPD in daily practice is beneficial to patients, professionals and healthcare organisations from an economic, legal and intellectual perspectives. *Morally and ethically, although it has some conflicting views to EBP, applying an evidence-based approach may be considered a professional's responsibility to ensure the provision of prime quality care and treatment.*
*Implications for practice:* The delay in translation of evidence-based interventions into everyday practice has several consequences and leads to possible missed opportunities including failure to provide best available care, reduction of unnecessary imaging procedures and cost. Hence, it is crucial for radiographers to regularly engage in EBP and CPD, and for healthcare organisations and radiology managers to educate themselves on EBP and CPD, and act as knowledgeable leaders for developing, enhancing, and sustaining EBP and CPD as the norm, create an environment that facilitates and empowers staff, and support staff to appreciate the rationale for any organisational changes associated with EBP.


## Introduction

The aim of evidence-based practice (EBP) is to deliver the most effective healthcare and maximise the use of finite healthcare resources, improving healthcare services and service users' health outcome.[1] Research evidence, however, has shown an extensive delay in translation of evidence-based interventions into every day practice.[2,3] Additionally, studies have recorded challenges in sustaining innovations over time.[4] 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.[5] This article discusses the importance of EBP and continuing professional development (CPD), reviews the barriers to implementing EBP in radiography and synthesises the economic, ethical and legal implications of EBP and CPD.

## Literature search

This review places an emphasis on the economic, ethical and legal implications of EBP and CPD, with the aim of highlighting the consequences and missed opportunities of irregular application

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and engagement of EBP and CPD in radiography, and to encourage radiography departments to reflect on the use of EBP and CPD in their practice. Additionally, the article aims to stimulate further research and discussion on the economic, ethical and legal implication of EBP and CPD in radiography. Literature searches were performed in October 2024 with PubMed, ScienceDirect, Medline and Google Scholar. To broaden the search, key words such as "healthcare" and "radiology" were also included. Commonly reported barriers to the theory-practice gap were related to negative attitudes and beliefs, lack of knowledge and skills to undertake research and apply EBP, limited resources, and a lack of support and authority. These barriers were utilised as a basis for the debate, and yielded discussion on the economic, ethical and legal implications of EBP and CPD. Original research articles, reviews, reports, editorials, commentaries, and legislations related to radiography practice were included. Studies which were not written in English, or where a translation was not provided were excluded.

## Evidence-based practice and continuing professional development

EBP is derived from evidence-based medicine (EBM), which was outlined in various publications by American and Canadian researchers and physicians since the 1980s.[6] EBP is the process for decision-making whereby the best available research evidence, along with the health professional's clinical expertise and patient preferences and values are considered.[7] For successful application of EBP, healthcare professionals are expected to continuously question the current ways of practice.[8] 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.[9] 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 Fig. 1).

CPD emerged from continuing education (CE), which refers to "lifelong learning" associated with didactic learning methods with the purpose of updating and reinforcing knowledge to ultimately improve patient care.[10] CPD is a broader concept referring to the process of engaging in learning activities to develop and enhance abilities in a specific field.[11] 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.[10,12] The need for a more disciplined and structured approach to further learning became essential due to healthcare becoming an increasingly litigious and professional environment, with rapid technological advancements.[13,14] Over the past two decades, continuous learning and development has been considered a fundamental element to the role of any healthcare professional including radiographers to develop and maintain skills, knowledge, and attributes to practice safely, effectively, and legally within radiographers' evolving scope of practice.[15,16]

There is 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.

## The theory-practice gap in radiography

Although the importance of evidence-based practice is widely recognised and included in the curriculum in radiographers' education, the theory-practice gap in radiography remains existent. Barriers recorded relate to negative attitudes and beliefs, a lack of knowledge and skills, limited resources and a lack of support and authority.

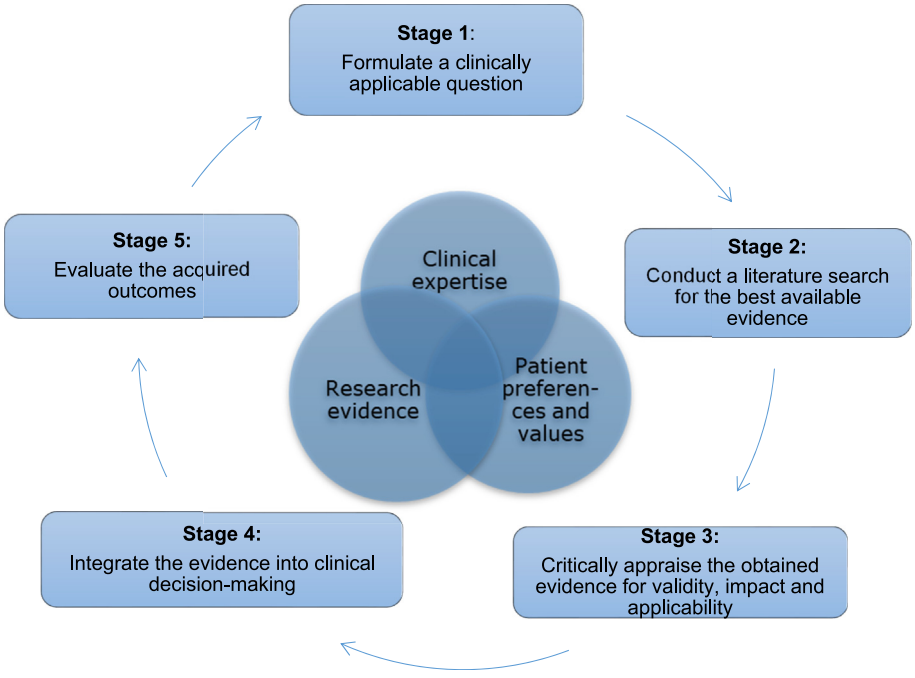


**Figure 1.** Principles and process of evidence-based practice.
Adapted from Ramazan, Aarts and Widdowfield.[10]

*Negative attitude and beliefs towards evidence-based practice and research*

Studies have reported a negative attitude towards EBP including a lack of motivation.[17–19] Moreover, research shows 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.[17,19] Similarly, 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.[17,20] Additionally, research suggests reliance on peers, traditions and subjective beliefs.[20,21] 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.,[20] leading to sporadic and inconsistent application of lead shielding to protect service users from ionising radiation. Although factors such as limited resources and time may influence a negative attitude, a lack of confidence or low professional self-esteem may also contribute to a hesitant attitude towards EBP and research. Ultimately, radiography has not long been recognised as a profession and the role development is continuing.[22,23]

*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.[17,24] 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.[25,26] 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.[17,18,26] 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.

*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.[27,28] Ahonen and Liikanen[17] 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.[24]

*Lack of support and authority*

Research evidence has shown a lack of support from peers, immediate superiors, physicians, and physicists to implementing EBP. Time, increased workloads and workforce shortages are considered significant obstacles among healthcare professionals including radiographers.[26–29] There is a nationally acknowledged shortage of healthcare professionals which has been predicted to escalate over the years.[30] 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.[21,29] For example, in the study by Rawle et al.,[21] 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 study by Ramazan, Aarts and Widdowfield[28] 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.[31] Additionally, there is an increasing interest in employing theories such as translational science, implementation science and communities of practice to bridge the theory-practice gap.[27,32,33]

## Economic, ethical and legal implications of evidence-based practice and continuing professional development

Inconsistent application of EBP and irregular engagement in CPD could not only result in compromised professional development and gaps in knowledge, but also affect patients, healthcare services and health organisations unfavourably from an economic, ethical and legal perspective.

*Economic implications of evidence-based practice and continuing professional development*

In the UK, healthcare spending has historically increased significantly yearly.[34] This is due to a combination of factors including a growing and ageing population with increasingly complex healthcare needs, increasing patient expectations and continuous medical and technological advancements.[35] The growth in health funding over the past decade was below long-term average and could not keep pace with the demand.[36] This resulted in pressures on services including staff shortages, increasing waiting times and reduced performance standards.[37,38] 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 (Fig. 2).[39]

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.[40,41] Imaging is identified as a highly overused test.[41–44] 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.[43–46] 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).[40,42,47]

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.,[48] in which the implementation of evidence-based care reduced the number of unnecessary medical procedures and healthcare costs

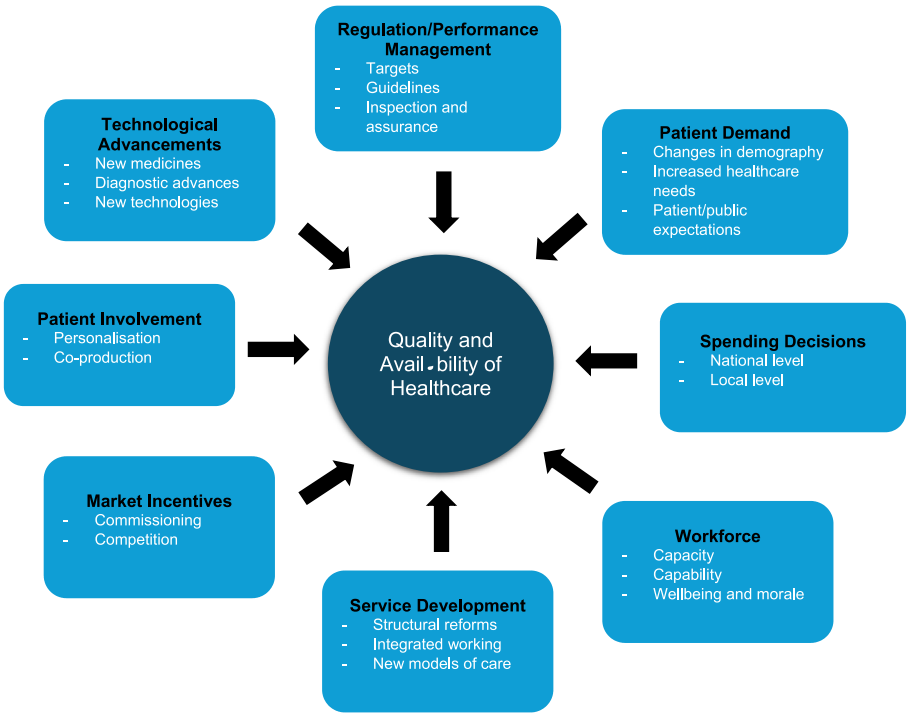


**Figure 2.** Factors affecting the quality and availability of healthcare.
Adapted from Robertson et al.[37]

while not affecting patient satisfaction. These results are in line with a recent scoping review by Connor et al.,[49] in which many reviewed articles showed improved patient outcomes and return on investments as a result of implementing EBPs.

*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".[50] 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.[51] 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".[50] In radiography, both the Society of Radiographers (SoR) and the professional regulator Health and Care Professions Council (HCPC) provide guidelines on codes of conduct, performance and ethics.[52,53]

The four basic principles of ethics; beneficence, nonmaleficence, autonomy and justice, are commonly used within healthcare to guide professionals' behaviour and support decision making, particularly when facing ethical dilemmas.[54] These principles also apply to research involving human subjects.[55] 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".[51] Autonomy refers to respecting individuals' choices, which also links to the importance of consent, informed decision making, truth-telling and confidentiality.[54] The principles of beneficence and non-maleficence relate to maximising benefits while minimising risk of harm to individuals.[51] 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.[55] Finally, justice obliges to "equitably distribute benefits, risks, costs, and resources".[56] In research, this includes avoiding bias and exposing individuals to a disadvantageous research protocol.[55]

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 tested by randomised control trials; and iv) rationing and allocation decisions tend to "favour existence of evidence over the presence of need", thus can be unjust.[57] Hence, research emphasises the importance of professionals integrating their clinical expertise in decision making, and to empower patients to discuss their preferences and values.[58,59] Additionally, it is suggested that EBPs, similar to research, should be ethical in all areas including the design, implementation and evaluation.[51]

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.[58] This, being executed in an ethical manner with best interest of the patient. A similar statement is argued by Gupta,[60] who discusses ethics and EBM in psychiatry. Gupta[61] 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.

### *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.[62] 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.[63–65] To reflect this demand, research methods and statistics are included in undergraduate and postgraduate curricula for healthcare professionals' education including radiographers.[66]

Clinical governance makes explicit references to the use and implementation of EBP and CPD (Fig. 3).[67,68] Additionally, organisations such as the National Institute for Health and Care Excellence provide evidence-based guidelines to inform practice, and the Care Quality Commission (CQC) audits the evidence-based approaches in practice. Should the EBP be inadequate, or worse non-existent, the CQC will intervene.[66] 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.[69]

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).[70] 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. Similarly, 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.[71,72] 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 to minimise risks to patients, optimise diagnostic accuracy and improve patient pathway and experience.[28,73]

## Recommendations for practice

The theory-practice gap in radiography appears to be multifactorial, with barriers related to negative attitudes and beliefs, a lack of knowledge and skills, limited resources and a lack of support and authority. Healthcare faces several challenges including increasing and more complex healthcare needs whilst improving accessibility, and keep up with the rapidly advancing technology, diagnostics and therapeutic procedures.[33] Additionally, increasingly quality-conscious patients and healthcare regulators expect effective, high-quality services.[74] To respond to the current healthcare demands, regular use of EBP and CPD in practice is highly recommended to improve the quality of care, patient experience, enhance efficiency and optimise resources. However, engaging in EBP and CPD requires time and resources, which may be challenging to allocate due to persistent staff shortages and financial constraints.[75] Hence, the role of management may be particularly essential to promote and factor for EBP and CPD in practice. Managers can play a key role in fostering an evidence-based culture by

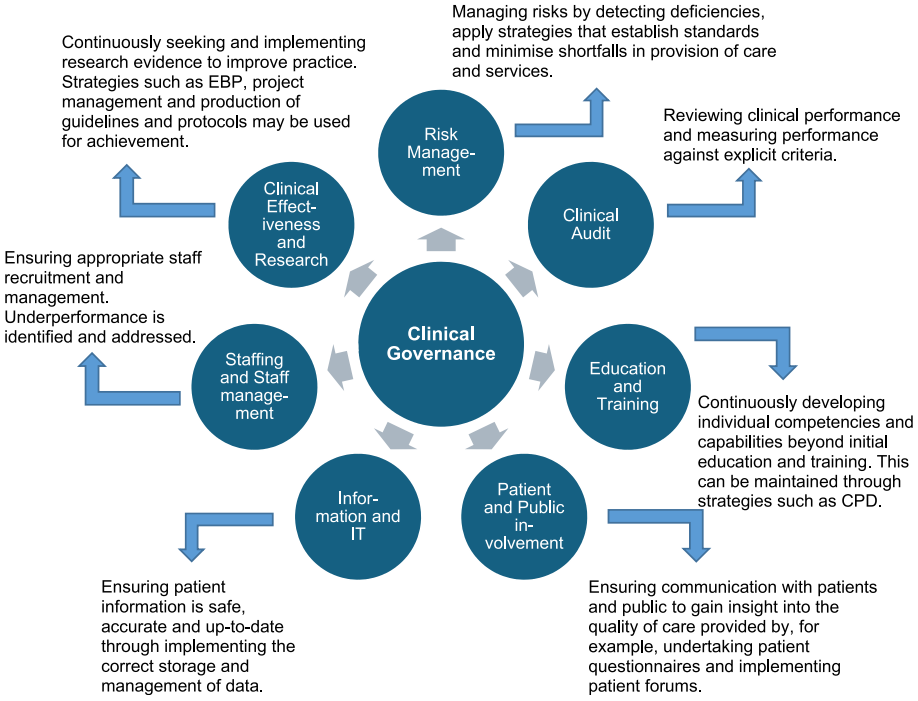


**Figure 3.** Main elements of clinical governance.
Based on literature of National Health Service and McSherry and Pearce.[65,66]

intentional leadership, supportive policies, and establishing an environment where EBP is valued, encouraged, and sustained. This may be achieved by i) broadening their own knowledge and understanding of EBP, and lead by example by demonstrating the use of research, data, and evidence in their strategic and operational decisions; ii) establishing EBP and CPD as a core organisational value; iii) provide education and training, and strengthen their workforce's knowledge on the principles and benefits of EBP and CPD; iii) facilitate access to resources; iv) encourage (interdisciplinary) collaboration and communication, and foster an (inter) professional council concerned with sharing, assessing and implementing best practices; v) build an infrastructure for EBP and CPD ensuring organisational policies and protocols are rooted in the latest research and continuously updated; vi) creating an environment where ideas and change are welcomed and considered; and vii) incentivise and recognise EBP and CPD efforts (i.e., celebrate success and offer professional growth opportunities), which may also contribute positively to staff retention.[76] Due to the flexible and holistic approach of a narrative review, further research is recommended considering an in-depth analysis of possible economic, ethical and legal effects and implication of EBP and CPD in radiography.

## Conclusion

In conclusion, the theory-practice gap remains existent in radiography practices with causes related to negative attitudes and beliefs, a lack of knowledge and skills, limited resources and a lack of support and authority. The article argues that EBP is best practice and discusses the importance and benefits of integrating EBP in daily practice and ensuring engagement in CPD from an economic, legal, and intellectual point of view in radiography. 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. It is critical for radiographers to routinely engage in EBP and CPD, and for healthcare organisations and radiology managers to broaden their knowledge on EBP and CPD, and act as knowledgeable leaders to create and facilitate and environment in which EBP and CPD is developed, enhanced and sustained.

## Conflict of interest statement

None.

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