



## Factors of importance for the development of evidence-based practice amongst radiographers in public healthcare



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### ABSTRACT

**Introduction:** Research evidence suggests that radiographers often rely on previous training, traditional practices, work experience and protocols developed within the department rather than up-to-date research-based evidence in their daily practice. The aim of the study was to investigate factors that might impact the development of evidence-based practice amongst radiographers in clinical public settings in the Nordic countries.

**Methods:** An online survey was performed amongst 640 radiographers in four Nordic countries. Multivariate logistic regression was performed to investigate the odds ratio (OR) of facilitators for and barriers to radiographers' development of evidence-based practice.

**Results:** A reflective approach in everyday practice and being aware of the current research evidence were significant facilitators for radiographers' development of evidence-based practice (OR  $\geq 3.10$ ,  $p < 0.001$ ). Discussing research with colleagues and managers was associated with engagement in the utilisation of evidence (OR 7.21,  $p < 0.001$ ). Difficulties in evaluating research evidence represented the only significant barrier (OR 1.84,  $p 0.009$ ).

**Conclusion:** A critical approach amongst radiographers in their performance of healthcare in diagnostic imaging, and the development of their academic skills to improve awareness of the available research evidence are important factors for developing evidence-based practice in radiography. Leadership is crucial for the engagement of radiographers in the development of evidence-based practice. Management should facilitate the development of a learning culture within diagnostic imaging.

**Implications for practice:** The results provide suggestions for the development of a learning culture, proactive and person-centred leadership, and strategic management for the provision of research infrastructure, all of which contribute to the further integration of evidence-based practice in radiography. Also, the study results suggest the importance of shared responsibility for creating a critical fellowship in diagnostic imaging.

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## Introduction

Evidence-based practice (EBP) amongst radiographers is a fundamental pillar of the identity and credibility of radiography as a distinct profession in healthcare<sup>1,2</sup>. EBP in healthcare means the use of the available, current, and most valid and relevant research evidence together with clinical expertise and the patient's preferences and values in shared decision-making<sup>3–5</sup>. A recently published review<sup>6</sup> identified numerous barriers to EBP and research implementation in radiography including insufficient time allocation for research, lack of other resources, lack of research culture and inadequate research-related skills and knowledge. At the same time, radiographers in healthcare reported being motivated and interested in research activities<sup>6–8</sup>. Our previously published findings in the context of healthcare in the Nordic countries reported rather low engagement in research amongst radiographers, therefore we suggested the implementation of a research culture in radiography for the development of EBP<sup>9,10</sup>. However, the facilitators of and barriers to the utilisation of research evidence and thus radiographers' engagement in the development of EBP in the Nordic countries are unknown but of great importance to investigate in order to allocate suitable resources. Such knowledge would presumably be of equal importance in similar contexts in other countries.

According to the World Health Organization, the quality of care is the degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes<sup>11</sup>. The quality of care provided to patients can be measured and continuously improved through the provision of EBP<sup>11</sup>. There is a common agreement that high-quality healthcare services (preventive, promotive, curative, rehabilitative and palliative) should involve person-centred care, patient safety, effectiveness, as well as equitable and integrated care<sup>5,11–13</sup>. The European Commission recognises quality as an important component of the performance of healthcare systems<sup>14,15</sup>. Sufficient healthcare resources are vital to a sustainable healthcare system in order to provide access to high-quality care for the whole population, regardless of their socio-economic circumstances<sup>16</sup>. In parallel, healthcare systems are facing multiple challenges today which are connected to healthcare costs, human resources, leadership and governance, healthcare service delivery and access, the ageing population and multimorbidity, and technological advancements to mention a few factors<sup>16–21</sup>. About every tenth patient is harmed and every twentieth patient is exposed to preventable harm in medical care<sup>22,23</sup>. Committing to patient safety positively influences healthcare outcomes and leads to service quality improvements in care, which could also be more cost-effective<sup>23–25</sup>.

Healthcare includes diagnostic imaging that is crucial in the diagnosis, management and treatment of patients<sup>26,27</sup>. In order to support and enable quality improvement in medical imaging services, the Quality Standard for Imaging (QSI) has been developed in collaboration between the Royal College of Radiologists and the College of Radiographers<sup>28</sup>. The QSI articulates the expectations of good imaging services and sets out the importance of EBP in order to provide and continuously improve patient care and outcomes in diagnostic imaging. Radiographers are often the first healthcare professionals that patients encounter during diagnostic imaging, nuclear medicine and radiation therapy<sup>2</sup>. The profession of radiographers comprises patient care during the diagnostic examination and safe use of radiation in the provision of diagnostic imaging, interventions, and treatment procedures, all implemented in accordance with the principles of professional ethics and EBP<sup>2,29–31</sup>. However, research evidence suggests that radiographers often rely on previous training, traditional practices, work experience and protocols developed within the department rather than up-to-date research-based evidence in their daily practice<sup>32–37</sup>. The

aim of the study was to investigate factors that might impact the development of EBP amongst radiographers in clinical public settings in the Nordic countries.

## Methods

This was a cross-sectional observational study.

### Data collection

An online data collection via a survey was performed amongst 640 radiographers who work in clinical settings in four Nordic countries: Denmark, Finland, Norway, and Sweden. Three specific research questions were investigated: i) radiographers' opinion on radiography research, ii) radiographers' involvement in research activities, and iii) their utilisation of research evidence for the development of EBP in public service. Details of the survey and the study sample have been published elsewhere<sup>9,10</sup>. Also, the study results of the first two research questions have been previously reported<sup>9,10</sup>. The current paper reports results corresponding to the third question of the study and refers to the responses from 507 radiographers working in public healthcare. Characteristics of the sample are presented in Table 1.

The responses were collected anonymously, and no sensitive data were recorded. Therefore, in accordance with the regulations of the European Union<sup>38</sup> and the Nordic countries<sup>39–42</sup> no ethical approval was required. However the Helsinki declaration was applied, that is the respondents were informed about the study via an invitation letter and they gave informed consent by responding voluntarily to the questionnaire<sup>43</sup>.

### Data analysis

Data were analysed using IBM SPSS Statistics for Windows, Version 26 (IBM Corp. 2019, Armonk, NY, USA) with a two-tailed significance level of  $p < 0.05$ . Multivariate logistic regression<sup>44</sup> was performed to investigate the OR of facilitators for and

**Table 1**  
Characteristics of the current study sample.

	Radiographers who develop EBP on the basis of research evidence	Radiographers who do not develop EBP on the basis of research evidence
<b>Age, mean (SD)</b>	41.2 (11.2)	41.3 (11.3)
<b>Gender<sup>a</sup></b>		
Male	55 (18)	43 (21)
Female	211 (82)	196 (79)
<b>Workplace</b>		
Health centre, regional or central hospital	144 (54)	127 (53)
University hospital	122 (46)	114 (47)
<b>Academic degree<sup>b</sup></b>		
No academic degree	48 (18)	61 (26)
Bachelor degree	180 (68)	163 (68)
Master's degree or higher	37 (14)	15 (6)
<b>Years as a graduated radiographer<sup>c</sup>, mean (SD)</b>	13.6 (11.3)	13.0 (11.6)
<b>Country</b>		
Denmark	47 (17)	101 (42)
Finland	113 (43)	66 (27)
Norway	45 (17)	19 (8)
Sweden	61 (23)	55 (23)

Data are given as n (%) unless otherwise noted. n = 507.

Missing data.

<sup>a</sup> 2.

<sup>b</sup> 3.

<sup>c</sup> 1.

barriers to radiographers' development of EBP on the basis of research evidence. The response to a survey question on whether the radiographer develops current practice on the basis of research evidence was used as the dependent variable in each analysis. The response categories to this question were dichotomised as follows: 'completely agree', 'strongly agree' and 'somewhat agree' were assigned the value of 1, and the disagreement responses were assigned the value of 0. The potential facilitators for and barriers to radiographers' development of EBP on the basis of research were treated as independent variables and were investigated by two types of questions: multiple-choice and ordered response categories questions. The list of all independent variables included in the analyses is presented in [Appendix A](#).

Nagelkerke's pseudo R-square was calculated for each multivariate logistic regression model in order to assess to what extent the outcome might be explained by the model, where values range between 0 and 1, with a value closer to 1 indicating that the outcome is highly explained by the model<sup>44</sup>. All models were controlled for differences between countries (Denmark, Finland, Norway, and Sweden).

**Results**

The survey responses demonstrated that being involved in research facilitated participating in the development of EBP on the basis of research evidence (OR 9.45, 95 % CI 2.05–43.61, p 0.004). The Nagelkerke's pseudo R-square of the model was 0.298. The workplace of the radiographer and academic degree, as well as reading scientific articles, participation in a journal club and whether the responder finds participation useful were not significantly associated with taking part in the development.

The motivational facilitators for radiographers' development of EBP are listed in [Table 2](#). In this table, reflecting on current practice on the basis of research evidence is the most important facilitator (OR 7.21). Dedicated time and support from radiographers and others in the department were not significantly associated with evidence-based development of the current practice.

Regarding the barriers to developing EBP, difficulties in evaluating research evidence was the only significant finding of the outcome (OR 1.84, 95 % CI 1.12–2.89, p 0.009). The Nagelkerke's pseudo R-square of the model was 0.07.

**Discussion**

In this observational study, the aim was to identify factors of importance for the development of EBP amongst radiographers in public healthcare in the Nordic countries. The results showed that reflecting on the present EBP and being aware of the current research evidence are important facilitators for radiographers' development of EBP. It was also found that discussing research with

colleagues and managers was associated with engagement. These outcomes are supported by quite a high explanation level of the statistical models conducted in the study. The identified significant barrier to the development of current EBP was perception of the difficulty in evaluating research, which suggests a need for further education in critical appraisal of research evidence. This has also been previously noted by others<sup>45–47</sup>. The analysis of barriers shows quite a low explanation level of the model, which suggests there are other impacting factors that we are not aware of. Those factors might be identified via additional studies using an explorative design.

In light of the study results, we propose that managers purposely and continuously provide long-term strategies to develop and maintain academic competence amongst radiographers, thereby adding to the development of EBP in radiography and diagnostic imaging services for the public. Advanced academic education would also presumably strengthen the professional self-confidence of radiographers, and so encourage them to engage in discussions about research evidence with colleagues, managers and other professionals. For this to commence, usually the provision of dedicated work time for research and other external resources is emphasised<sup>7,45–48</sup>. Certainly, having adequate conditions at the workplace for the engagement in and performance of clinical research studies, evaluation of research and eventually the development of EBP is of great importance. However, advancing one's self-confidence to a level of feeling ready and empowered to discuss and evaluate current evidence across professions and academic levels requires rather other resources such as strategic steering and purposeful leadership as well as supportive fellowship and proactivity of the individual, altogether for the development of a learning culture in the organization. What is essential here is strong and dedicated leadership. In our previous paper, we proposed a strategy for establishing a research culture emphasising the role of the managers in healthcare, who need to be aware of the importance of research evidence and should be dedicated to the promotion of radiographers' engagement in research<sup>10</sup>. As such, it is essential to have leadership in radiography that should stress the engagement of radiographers in master's and doctoral studies, their leadership in research, and consequently their contribution to EBP as the norm<sup>49</sup>, rather than merely as a goal, expectation, or exception. Radiographers hold academic degrees and have the prerequisites for the development of their skills to perform and advance EBP<sup>50–52</sup>. Consequently, leadership encouraging, enabling and promoting radiographers to perform and discuss evidence whilst also ensuring that EBP is embedded into departmental policy and procedures, is likely to provide the basis for the shift from passive dissemination of research results into a practice where evidence is transferred into clinical practice by the radiographers<sup>53</sup>.

Keeping this line of reasoning, to ensure the motivation, professional competence development and advances in self-confidence, approaches to promote the development of a culture of learning in the organisations have been emphasised<sup>5,54</sup>. Indeed, we have stressed in our previous paper the value of knowledge-driven and learning organisation<sup>10</sup>. The culture of learning, individually and as a team, and most importantly from each other in the organisation, has the potential to support "human flourishing" in the workplace<sup>54</sup>. It has been described as promoting person-centred care and practice in healthcare, thereby enabling positive emotions, engagement, cooperation and relationships, and allowing personnel to find meaning in work and a determination to succeed. There is growing evidence of the value of person-centred care in general healthcare, also in regard to the effects on quality assurance<sup>55,56</sup>, and consequently the development of EBP on the basis of person-centred research is needed in radiography<sup>57</sup>.

**Table 2**  
Multivariate logistic regression model of motivational facilitators for radiographers' development of EBP on the basis of research evidence.

Facilitators	Odds ratio	p-value	95 % CI
Awareness of current research evidence	2.17	0.001	1.37–3.43
Reflecting on current practice on the basis of research evidence	7.21	<0.001	3.83–13.55
Discussing research evidence with colleague radiographers	3.10	<0.001	1.90–5.06
Discussing research evidence with department managers	3.24	<0.001	1.85–5.65

Nagelkerke's pseudo R-square, 0.489; n = 507. CI, confidence interval.

However, being proactive, inclusive and supportive of colleagues, but also humbly challenging in order to create a critical fellowship is not an obvious behaviour in organisations. Dedicated leadership to motivate and promote a learning culture is needed. In the context of promoting person-centredness in healthcare, person-centred leadership has also been proposed<sup>5</sup>. In this regard, thinking aloud together with the employees, being proactive and physically and mentally present in the team, and also having a standpoint<sup>5</sup> by taking a clear and intentional position about the significance of a learning culture and how to establish it in the organization, are altogether important features of a leader. As such, managers should often articulate the importance of radiography research and EBP in radiography in the working group. Managers who hold a higher academic degree have prerequisites for this to commence. It is a matter of taking pride in the research undertaken by employee radiographers and radiography colleagues as well<sup>10</sup>. The concept of learning has been described to encourage the advancement of one's self-awareness and reflexivity, and being oriented towards others<sup>5,54</sup>, which also represent the skills of importance in the sustainable development and performance of EBP. Overall, we claim that these aspects might to some extent explain the factors of importance, which when absent, make it difficult to engage in research and develop EBP amongst radiographers, presumably equally challenging amongst other academics in diagnostic imaging and healthcare.

We also would like to emphasise the importance of strategic steering at all levels of diagnostic imaging departments, promoting the development of EBP and a learning infrastructure in the clinic (e.g. support for the collaborative partnership in research and EBP, research opportunities and encouragement, research support functions including funding and support to apply for external funding, and development of continuing education programs) for advanced education in radiography, as well as doctoral and post-doctoral competence development in the profession of radiographers. The provision of a learning environment and a strong research culture in radiography certainly has the potential to encourage radiographers to engage in research and evaluation<sup>10</sup>, and to foster the development of EBP in diagnostic imaging for high-quality patient care and service to society. High-quality, safe, and accurate medical imaging services are a collective responsibility. Collaboration amongst various stakeholders, including healthcare providers, medical imaging personnel, regulatory bodies, and equipment manufacturers, not only enhances patient outcomes but also fosters a culture of safety and continuous improvement within the healthcare system. By focusing on research<sup>28</sup>, medical imaging services can maintain high standards of quality and effectively respond to evolving healthcare needs.

#### Limitations of the study

The use of convenience sampling may restrict the representativeness of the findings, limiting their generalizability to the broader population of radiographers. The number of potential impacting factors used in the statistical models was rather high in relation to the sample size of the study (Appendix A), which might have influenced validity. On the other hand, some models in the study demonstrated a high explanation level. The study encompassed only one data type. Data triangulation with the application of other data types from interviews or similar might have improved the validity.

#### Conclusion

A critical approach amongst radiographers in their performance of healthcare in diagnostic imaging, and the development of their academic skills to promote the awareness of the available research

evidence is important factors in the development of EBP in radiography. Leadership is crucial for the engagement of radiographers in the development of EBP. Management should facilitate the development of a learning culture within diagnostic imaging.

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#### Conflict of interest statement

None.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radi.2024.10.011>.

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