CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	Awareness, perceptions, and educational preferences for AI among radiography students: A cross sectional survey
Authors	Oglat, Ammar A.;Abukhalil, Tala;Isawi, Israa H.;Alzyoud, Kholoud;Oqlat, Ahmed A.;Salman, Mohammed Dawood;Alnawafleh, Tasnim M.;Bani-Ahmad, Mo'men
Publication date	2026-06-06
Original Citation	Oglat, A.A. et al. (2026) "Awareness, perceptions, and educational preferences for AI among radiography students: A cross sectional survey," Journal of Medical Imaging and Radiation Sciences, 57(4), (7pp), https://doi.org/10.1016/j.jmir.2026.102452.
Type of publication	Article (peer-reviewed);journal-article
Link to publisher's version	10.1016/j.jmir.2026.102452
Rights	© 2026, authors. Published by Elsevier Inc. on behalf of Canadian Association of Medical Radiation Technologists. This is an open access article under the CC BY license. - http://creativecommons.org/licenses/by/4.0/
Download date	2026-10-24 21:04:59
Item downloaded from	https://hdl.handle.net/10468/19497

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Journal of Medical Imaging and Radiation Sciences 57 (2026) 102452

Journal of Medical Imaging and Radiation Sciences

Journal de l'imagerie médicale et des sciences de la radiation

www.elsevier.com/locate/jmir

Research Article

Awareness, perceptions, and educational preferences for AI among radiography students: A cross sectional survey

Ammar A. Oglat[a], Tala Abukhalil[a], Israa H. Isawi[b], Kholoud Alzyoud[a], Ahmed A. Oqlat[c], Mohammed Dawood Salman[d], Tasnim M. Alnawafleh[e] and Mo'men Bani-Ahmad[f,*]

[a] *Department of Medical Imaging, Faculty of Applied Medical Sciences, The Hashemite University, Zarqa, 13133, Jordan*
[b] *Department of Medicinal Chemistry and Pharmacognosy, Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, 22110, Jordan*
[c] *Department of Accident and Emergency Medicine, Faculty of Medicine, Jordan University of Science and Technology, Irbid, 22110, Jordan*
[d] *Department of Medical Physics, College of Applied Sciences, University of Fallujah, Iraq*
[e] *School of Physics, Universiti Sains Malaysia, 11700, Penang, Malaysia*
[f] *Discipline of Medical Imaging and Radiation Therapy, University College Cork, Cork, Ireland*

ABSTRACT

Background: Artificial intelligence (AI) is gaining increasing significance in radiography. However, undergraduate radiography students often have limited exposure to AI principles and an incomplete understanding of its capabilities and limitations. This study evaluated radiography students' self-reported familiarity with AI, perceptions of its role in medical imaging, and educational preferences.

Methods: A descriptive cross-sectional survey was conducted at a single institution in Jordan between March and August 2024. A self-administered, in-person paper questionnaire, adapted from a previously published survey, was distributed to students attending scheduled teaching sessions. Responses were analysed descriptively using frequencies and percentages.

Results: Of the 217 students approached, 180 participated (response rate 82.9%). Only 46.1% of respondents reported good familiarity with AI. Most students perceived AI as having useful applications in medical imaging and supported its integration into university training. However, when AI output conflicted with human judgement, 60.0% of students indicated that they would seek expert opinion, reflecting a cautious approach to AI-supported decision-making.

Conclusion: Radiography students reported positive attitudes toward AI and strong support for curricular integration, alongside caution about routine reliance on AI for decision making. Structured educational activities that provide practical exposure, clarify appropriate use cases, and emphasise human oversight may help students use AI safely and effectively in future practice.

Plain Language Summary: Artificial intelligence is being used more often in medical imaging, but students may not fully understand it. This study surveyed radiography students in Jordan to understand their knowledge of artificial intelligence, how they view its role, and how they want to learn about it. This study found that students welcomed its use but had limited understanding and preferred to seek expert advice when unsure. This matters because better teaching can help students use these tools safely and confidently in practice.

Contributors: Conceptualization and study design: Ammar A. Oglat. Data collection: Tala Abukhalil; Ammar A. Oglat. Data analysis and interpretation: Israa H. Isawi; Ahmed A. Oqlat, Mo'men Bani-Ahmad. Supervision and revision of the manuscript: Mohammed Dawood Salman. Writing, original draft: Ammar A. Oglat; Kholoud Alzyoud; Tasnim M. Alnawafleh. Writing, review and editing: All authors. All authors approved the final version and agree to be accountable for all aspects of the work.

Ethics approval and consent to participate: The Institutional Review Board (IRB) at the Faculty of Applied Medical Sciences, The Hashemite University, Zarqa, 13133, Jordan, revised and approved this study under IRB No 13/5/2023/2024 (IRB number). Informed consent was obtained from all subjects involved in the study.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work, the author(s) used Microsoft Copilot for Microsoft 365 to assist with improving readability and language. After using Microsoft Copilot, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

Declaration of competing interest: The authors declare no conflicts of interest.

* Corresponding author.
E-mail address: Momen.AlAhmad@umail.ucc.ie (M. Bani-Ahmad).

1939-8654/$ - see front matter © 2026 Published by Elsevier Inc. on behalf of Canadian Association of Medical Radiation Technologists. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/)
https://doi.org/10.1016/j.jmir.2026.102452

RÉSUMÉ

Contexte: L'intelligence artificielle (IA) prend une importance croissante en radiologie. Cependant, les étudiants en radiologie de premier cycle ont souvent une connaissance limitée des principes de l'IA et une compréhension incomplète de ses capacités et de ses limites. Cette étude a évalué le niveau de familiarité déclaré par les étudiants en radiologie avec l'IA, leur perception de son rôle en imagerie médicale et leurs préférences en matière de formation.

Méthodologie: Une enquête descriptive transversale a été menée dans un seul établissement en Jordanie entre mars et août 2024. Un questionnaire papier auto-administré en personne, adapté d'une enquête précédemment publiée, a été distribué aux étudiants assistant à des cours programmés. Les réponses ont été analysées de manière descriptive à l'aide de fréquences et de pourcentages.

Résultats: Sur les 217 étudiants sollicités, 180 ont participé (taux de réponse de 82,9 %). Seuls 46, % des répondants ont déclaré bien connaître l'IA. La plupart des étudiants percevaient l'IA comme ayant des applications utiles en imagerie médicale et soutenaient son intégration dans la formation universitaire. Cependant, lorsque les résultats de l'IA entraient en conflit avec le jugement humain, 60,0 % des étudiants ont indiqué qu'ils solliciteraient l'avis d'un expert, ce qui reflète une approche prudente de la prise de décision assistée par l'IA.

Conclusion: Les étudiants en radiographie ont fait part d'une attitude positive envers l'IA et d'un soutien marqué à son intégration dans les programmes d'études, tout en émettant des réserves quant au recours systématique à l'IA pour la prise de décision. Des activités pédagogiques structurées, permettant une mise en pratique, clarifiant les cas d'utilisation appropriés et mettant l'accent sur la supervision humaine, pourraient aider les étudiants à utiliser l'IA de manière sûre et efficace dans leur future pratique.

Résumé en langage simple: L'intelligence artificielle est de plus en plus utilisée en imagerie médicale, mais les étudiants ne la comprennent peut-être pas pleinement. Les auteurs de cette étude ont interrogé des étudiants en radiologie en Jordanie afin de mieux cerner leurs connaissances en matière d'intelligence artificielle, leur perception de son rôle et leurs préférences en matière d'apprentissage. L'étude a révélé que les étudiants étaient favorables à son utilisation, mais qu'ils en avaient une compréhension limitée et préféraient demander l'avis d'un expert en cas de doute. Ces résultats sont importants, car un meilleur enseignement peut aider les étudiants à utiliser ces outils en toute sécurité et en toute confiance dans leur pratique.

Keywords: Artificial intelligence; Radiography students; Radiography education; Perceptions; Curriculum

Introduction

Artificial intelligence (AI) is widely used in healthcare for pattern identification, decision assistance, and workflow optimisation [1]. In radiology, AI systems have improved reporting consistency and efficiency through image interpretation, lesion detection, and quantitative analysis [2]. Within radiography practice, AI applications supporting image quality assessment, protocol optimisation, and automated segmentation are increasingly integrated into routine workflows [3–5]. Given the growing integration of AI within imaging workflows, radiography students require an understanding of AI principles, capabilities, and limitations before entering clinical environments, as early perceptions and expectations are formed during undergraduate training [6]. Early educational exposure may help students interpret AI outputs appropriately, recognise common sources of error, and maintain professional accountability when working with automated systems [7]. In parallel, universities must ensure that students acquire the competencies needed to critically evaluate AI–generated information and integrate it with clinical reasoning [8,9].

Several international studies have examined radiographers and reported varying levels of awareness, training needs, and confidence in using AI tools [10,11]. Previous work has noted that radiographers often needed to educate themselves about AI because formal training opportunities were limited [12]. A scoping review further highlighted the scarcity of validated AI educational resources designed specifically for medical imaging professionals [13]. Although professional bodies have encouraged the integration of AI into imaging curricula, the availability of comprehensive, structured AI education remains limited [14,15].

Evidence specifically relating to undergraduate radiography students remains limited, particularly in Middle Eastern and Arab educational contexts. Although recent multinational surveys have included radiography students from Jordan, these studies have primarily reported aggregated regional findings and have not examined local educational contexts or student expectations at the institutional level [16]. Consequently, institution–specific evidence describing radiography students' familiarity with AI, perceptions of its role within medical imaging, sources of information, and educational preferences within Jordanian radiography programmes remains limited. This study, therefore, evaluated undergraduate radiography students' self–reported familiarity with AI, perceptions of its role, sources of information, and educational preferences at a single university in Jordan. The findings are intended to inform curriculum development and support educational planning for AI engagement in future professional practice.

Methods

Ethical approval

The study was reviewed and approved by the Institutional Review Board (IRB) of the Faculty of Applied Medical Sciences, The Hashemite University, Zarqa, Jordan (IRB No 13/5/2023/2024). Informed consent was obtained from all participants prior to data collection.

Study design

A cross–sectional survey was conducted among undergraduate radiography students at a single institution (The Hashemite University, Jordan) between March and August 2024. A cross–sectional survey design was selected as it is appropriate for describing radiography students' self–reported familiarity with AI, perceptions, and educational preferences at a single point in time. Data were collected using a self–administered, in–person paper questionnaire completed during scheduled teaching sessions without personal identifiers.

Participants and recruitment

A convenience sample of enrolled undergraduate students in the medical imaging programme who were present during scheduled teaching sessions was invited to participate. Recruitment was conducted in classrooms immediately before or after teaching sessions; the study was introduced by a researcher, information sheets were provided, and paper questionnaires were distributed to consenting students. Students absent from class at the time of data collection, and those who declined consent, were excluded. Returned questionnaires with substantial missing data (>20% of items unanswered) were excluded from analysis. In total, 217 students were approached, and 180 usable questionnaires were obtained (response rate 82.9%). Questionnaires contained no names, student numbers, or other direct identifiers; responses were anonymous.

Questionnaire development and adaptation

The questionnaire was adapted from a previously published survey assessing radiographers' familiarity with, perceptions of, and training preferences regarding AI in medical imaging [17]. Items and domains relevant to students were retained and reworded for an educational context. The final instrument comprised 14 items across four domains: (1) demographics (age band; year of study), (2) familiarity with AI (Likert–type), (3) education and training (Yes/No), and (4) perceptions of AI in radiology and decision–making (Likert–type and multiple choice). The questionnaire items were reviewed by senior academic staff for clarity and relevance to the student context, providing face and content validity. However, the adapted instrument was not subjected to pilot testing or formal psychometric validation, including reliability assessment, in this student population, which may affect measurement precision.

Statistical analysis

All analyses were performed using IBM SPSS Statistics, version 20.0. Categorical variables are summarised as frequencies and percentages. Of the returned questionnaires, 36 were excluded because >20% of items were unanswered, leaving 180 usable questionnaires for analysis. Analyses were descriptive in nature; no inferential statistical tests or subgroup comparisons were performed. The study was designed as a purely descriptive survey to summarise students' familiarity with AI, perceptions, and educational preferences, and was not intended to examine associations, predictors, or subgroup differences (e.g., by year of study or prior AI exposure).

Table 1
Demographic characteristics of the study population.

Age Range	N	%
18 - 22	143	79.4%
23 - 27	36	20.0%
28 - 32	1	0.6%
University Year		
First	18	10.0%
Second	14	7.8%
Third	56	31.1%
Fourth	87	48.3%
Fifth	5	2.8%

Results

Participant demographics

A total of 180 students participated. Most were aged 18–22 years (79.4%; n = 143), followed by 23–27 years (20.0%; n = 36), and one participant (0.6%; n = 1) was aged 28–32 years. By year of study, almost half were fourth–year students (48.3%; n = 87), with 31.1% (n = 56) in third year, 10.0% (n = 18) in first year, 7.8% (n = 14) in second year, and 2.8% (n = 5) in fifth year (Table 1).

Familiarity with artificial intelligence (AI)

Overall, 46.1% (n = 83) of participants agreed that they had good familiarity with AI, while 53.9% (n = 97) did not. Most participants (76.6%; n = 138) agreed that AI has useful applications in radiology, whereas 23.3% (n = 42) disagreed. Regarding diagnostic capability, 21.7% (n = 39) agreed that AI is superior to a doctor's clinical experience and 78.3% (n = 141) disagreed. Finally, 29.4% (n = 53) indicated they would always use AI when making decisions in the future, while 70.6% (n = 127) would not (Table 2)

AI in education and university practice

Most participants (66.7%; n = 120) agreed that AI should be part of university training, while 33.3% (n = 60) did not. Prior knowledge of technologies used in AI was reported by 36.7% (n = 66), whereas 63.3% (n = 114) reported no prior exposure. Preference for receiving AI training was expressed by 55.0% (n = 99), while 45.0% (n = 81) did not prefer additional training. Finally, 70.6% (n = 127) agreed that AI has the ability to revolutionise radiology, whereas 29.4% (n = 53) did not (Table 3).

Sources of AI information and perceived roles of AI in practice

Most participants (64.4%; n = 116) reported the internet and media as their primary source of information on AI, fol-

Table 2
The level of familiarity with AI technology.

Do you agree that you have good familiarity with AI?	N	%
Yes	83	46.1%
No	97	53.9%
Do you agree that AI has useful applications in the field of radiology?		
Yes	138	76.6%
No	42	23.3%
Do you agree that the diagnostic ability of AI is superior to the clinical experience of a human doctor?		
Yes	39	21.7%
No	141	78.3%
Do you agree that you will always use AI while making decisions in the future?		
Yes	53	29.4%
No	127	70.6%

Table 3
AI training integration, prior knowledge, training preference, and perceived impact among radiography students.

Do you think that AI should be part of the university training?	N	%
Yes	120	66.7%
No	60	33.3%
Do you have previous knowledge of the technologies used in AI?		
Yes	66	36.7%
No	114	63.3%
Do you prefer to receive training on AI?		
Yes	99	55%
No	81	45%
Do you think AI has the ability to revolutionize radiology?		
Yes	127	70.6%
No	53	29.4%

lowed by other sources (16.7%; n = 30), friends and colleagues (10.6%; n = 19), and books or magazines (8.3%; n = 15) (Table 4). Regarding perceived roles of AI in practice, 50.0% (n = 90) indicated that AI would guide them in particular cases and 47.2% (n = 85) believed it would fill gaps arising from human cognitive limitations. Smaller proportions stated that AI would support evidence-based clinical decision-making (18.3%; n = 33), provide no help (14.4%; n = 26), or replace doctors' judgement (7.2%; n = 13).

Evaluation of AI's diagnostic ability and conflict resolution

Regarding diagnostic capability, 33.3% (n = 60) rated AI as inferior to clinician experience, 27.2% (n = 49) as not superior to clinician experience, 14.4% (n = 26) as comparable, 18.3% (n = 33) as superior, and 6.7% (n = 12) as highly superior. When participants' judgements contradicted those of an AI system, most indicated they would seek expert clinical opinion (60.0%; n = 108), while 16.7% (n = 30) would rely on their own judgement, 8.9% (n = 16) would consult another AI system, 8.3% (n = 15) would leave the decision to the patient, and 6.1% (n = 11) would follow the AI's recommendation (Table 4).

Discussion

Radiography students reported generally positive attitudes towards AI, alongside clear reservations about its routine use in clinical decision–making. While AI was widely perceived as valuable and potentially transformative for radiology practice, students expressed reluctance to rely on AI without human oversight, particularly when clinical judgement was required. The preference for seeking expert input in situations of disagreement suggests that students conceptualise AI primarily as a supportive tool rather than a replacement for professional expertise. Together, these findings indicate enthusiasm for AI's potential benefits, tempered by a cautious, professionally grounded approach to its practical application. These findings are consistent with previous studies of radiography students and practising radiographers, which have reported generally positive attitudes towards AI alongside limited formal training exposure and recognition of AI as a supportive tool rather than a replacement for professional judgement [16,18,19]. The strong student support for curriculum inclusion observed in the present study reinforces calls for structured undergraduate AI education. Recent educational frameworks in medical imaging advocate for early, longitudinal integration of AI concepts encompassing technical fundamentals, ethics, governance, and human oversight, which aligns closely with the educational needs identified in this cohort [20].

This cautious pattern may plausibly reflect limited formal exposure to AI and uncertainty about its performance across different clinical tasks. The finding that fewer than half of students reported prior familiarity with AI, alongside a clear preference for structured training, highlights a gap between perceived importance and educational preparedness. Concerns about responsibility when AI output conflicts with human judgement, together with issues such as data quality and bias described in prior literature, may plausibly contribute to cautious use, although these factors were not directly measured in the present study [21]. From an educational perspective, this suggests a need for early, structured teaching that supports critical engagement with AI rather than passive reliance, with emphasis on appropriate use cases, common failure modes, and the role of human oversight [22]. Evidence from imaging workforce surveys describing low rates of formal training and common misconceptions about which tools constitute AI in routine equipment further supports these explanations [17]. In addition, exposure to predominantly positive narratives about AI in radiology across media and commercial webpages may shape

Table 4
Sources of AI information and perceived roles of AI among radiography students.

What is the source of your information about AI?	N	%
Internet and Media	116	64.4%
Books and Magazines	15	8.3%
Friends and Colleagues	19	10.6%
Other sources	30	16.7%
What role could AI play in your practice?		
It would not provide any benefit in the medical diagnosis or treatment	26	14.40%
Guide clinical decision–making in specific cases	90	50.0%
Support evidence-based clinical decision–making	33	18.3%
Help address limitations in human clinical judgement	85	47.2%
Replace clinicians' judgement	13	7.2%
Other	21	11.7%
How do you evaluate the AI's diagnostic ability compared with clinician experience?		
Inferior to clinician experience	60	33.3%
Not superior to clinician experience	49	27.2%
Comparable to clinician experience	26	14.4%
Superior to clinician experience	33	18.3%
Highly superior to clinician experience	12	6.7%
If there was a contradiction between your judgement and an AI system's recommendation, what would you follow		
Rely on own Judgement	30	16.7%
Follow AI recommendation	11	6.1%
Seek the expert clinical opinion	108	60.0%
Consult another AI system	16	8.9%
Leave the decision to the patient	15	8.3%

expectations, particularly among students who rely on internet and media sources for information [14].

Radiography students showed a nuanced and context–dependent view of anticipated AI use, with many envisioning AI as an assistive resource rather than a primary decision–maker. Perceptions of AI as a tool that could guide practice or support cognitive performance align with a preference for cautious, supplementary use rather than full reliance. This assistive framing underscores the importance of educational approaches that emphasise judgement, oversight, and appropriate task allocation between humans and AI systems. Reports from practising radiographers that support university level training and expert oversight are aligned with this assistive framing [17].

Integrating AI within radiography education is important for workforce readiness [23]. This study describes radiography students' perceptions of AI's potential and limitations, indicating both interest and caution regarding its use in routine decision-making. Ensuring that graduates understand appropriate use, boundaries, and oversight is essential for safe practice.

Curriculum development should be informed by the cohort's baseline readiness. The combination of limited prior familiarity with AI and a clear interest in training suggests that many students recognise the importance of AI but do not yet feel adequately prepared to engage with it in practice. Introductory teaching that clarifies use cases and common failure modes, explains data quality and bias, and emphasises human oversight, supported by case-based exercises, guided feedback on image interpretation, and targeted skills development, may strengthen preparedness [24]. These curriculum elements are consistent with workforce preferences for undergraduate delivery that blends theory with practice and prioritises core concepts, ethics, performance evaluation, and quality [25]. However, the broader evidence base for evaluated AI education in medical imaging remains limited, with few interventions and heterogeneous outcome measures, underscoring the need for more standardised curricula and validated assessments [13].

AI in radiography should be positioned as a complement to human expertise rather than a replacement [26]. While AI can assist with repetitive tasks, protocol optimisation, and subtle pattern detection, radiographers provide critical thinking, patient interaction, and contextual judgement that current systems cannot replicate [27]. A collaborative model in which radiographers critically evaluate AI outputs, recognise their limitations, and apply them judiciously aligns with students' preference for seeking expert oversight when AI recommendations conflict with clinical judgement, and with workforce reports that favour expert oversight [17].

Preparing students for such practice requires targeted and staged provision. Beyond introductory content, programmes should incorporate supervised application in case-based tasks and explicit assessment of oversight behaviours to sustain professional accountability [28]. Adoption of AI also raises professional and ethical considerations, including data protection, transparency in decision making, and the risk of over reliance [29,30]. Clear communication about benefits and safeguards, together with education that emphasises appropriate oversight and collaborative working with multidisciplinary teams, can help cultivate trust. In this context, AI is best considered a tool to enhance efficiency, precision, and patient-centred care, not an independent substitute for human judgement [31]. This broader pattern aligns with findings from radiography and imaging students in other settings, where favourable attitudes towards AI coexist with limited formal exposure and a demand

for structured educational support [31,32]. As with many survey–based studies in education, reliance on self–reported familiarity may not fully capture actual knowledge or competence, and, therefore, the interpretation of such data requires consideration of validity evidence, as highlighted in the educational measurement literature [33,34].

This study was cross-sectional and descriptive, so findings cannot establish causation or changes over time. Data were collected at a single institution using classroom recruitment and a convenience sample, which may introduce selection bias and limit generalisability to other programmes or settings. Additional participant characteristics such as sex, prior technical experience, and prior structured AI exposure were not collected, which may limit interpretation of subgroup patterns. Consistent with the descriptive and exploratory design of the study, analyses focused on summarising reported practices and perceptions rather than examining associations or predictors. All measures were self-reported, introducing potential recall and social desirability biases. The questionnaire was adapted from a radiographer survey and shortened to 14 items without full psychometric validation in a student population, which may affect measurement precision. Future multi-centre studies using validated instruments, probability sampling where feasible, and mixed methods would strengthen external validity and explanatory depth.

Conclusion

In this single–institution study, radiography students demonstrated generally positive attitudes towards AI and supported its inclusion within university training, despite limited self–reported prior exposure to AI technologies. Students' preference for expert oversight when AI recommendations conflicted with human judgement suggests that AI is viewed as a supportive tool rather than a replacement for professional decision–making. Taken together, limited prior exposure, moderate interest in AI–specific training, and strong support for curriculum inclusion indicate a clear educational gap that could be addressed through structured undergraduate AI education. Given the single–centre design, future research should include multi–institutional samples and the use of validated survey instruments to strengthen generalisability and measurement robustness.

References

[1] Bani-Ahmad M, England A, McLaughlin L, Alshipli M, Hadi YH, McEntee M. Artificial intelligence in CT scan range delineation: a systematic review and meta-analysis. *Eur J Radiol Artif Intell*. 2025;4:100052. doi:10.1016/j.ejrai.2025.100052.

[2] Hadi YH, Hakami AM, Ajeebi AM, Faqihi AM, Sendi ET, Masrahi MA, Alalawi SA, Musharri FM, Hakami AN, Bani-Ahmad M, Abu Aqil AI. Artificial intelligence in radiology workflow: a systematic review into protocol automation and clinical applications. *Eur J Radiol Artif Intell*. 2026;5:100073. doi:10.1016/j.ejrai.2026.100073.

[3] Bani-Ahmad M, England A, McLaughlin L, Alshipli M, Alzyoud K, Hadi YH, McEntee M. AI-driven assessment of over-scanning in chest CT: a systematic review and meta-analysis. *Eur J. Radiol Open*. 2025;15:100674. doi:10.1016/j.ejro.2025.100674.

[4] Hadi YH, Keaney L, England A, Moore N, McEntee M. Automatic patient centering in computed tomography: a systematic review and meta-analysis. *Eur Radiol*. 2024;35:3486–3498. doi:10.1007/s00330-024-11170-z.

[5] Bani-Ahmad M, Hadi YH, Sullivan AO, England A, McLaughlin L, McEntee M. Clinical indication–based CT scan range reduction: a scoping review of radiation dose savings and diagnostic accuracy. *J Med Imaging Radiat Sci*. 2026;57:102338. doi:10.1016/j.jmir.2026.102338.

[6] Arruzza E. Radiography students' perceptions of artificial intelligence in medical imaging. *J Med Imaging Radiat Sci*. 2024;55:258–263. doi:10.1016/j.jmir.2024.02.014.

[7] Ooi S, Makmur A, Soon Y, Fook-Chong S, Liew C, Sia D, Ting Y, Lim C. Attitudes toward artificial intelligence in radiology with learner needs assessment within radiology residency programmes: a national multiprogramme survey. *Singapore Med J*. 2021;62:126–134. doi:10.11622/smedj.2019141.

[8] Huisman M, Ranschaert E, Parker W, Mastrodicasa D, Koci M, Pinto de Santos D, Coppola F, Morozov S, Zins M, Bohyn C, Koç U, Wu J, Veean S, Fleischmann D, Leiner T, Willemink MJ. An international survey on AI in radiology in 1041 radiologists and radiology residents part 1: fear of replacement, knowledge, and attitude. *Eur Radiol*. 2021;31:7058–7066. doi:10.1007/s00330-021-07781-5.

[9] Gorospe-Sarasúa L, Muñoz-Olmedo JM, Sendra-Portero F, de Luis-García R. Challenges of radiology education in the era of artificial intelligence. *Radiología (English Edition)*. 2022;64:54–59. doi:10.1016/j.rxeng.2020.10.012.

[10] Akudjedu TN, Torre S, Khine R, Katsifarakis D, Newman D, Malamateniou C. Knowledge, perceptions, and expectations of artificial intelligence in radiography practice: a global radiography workforce survey. *J Med Imaging Radiat Sci*. 2023;54:104–116. doi:10.1016/j.jmir.2022.11.016.

[11] Doherty G, McLaughlin L, Hughes C, McConnell J, Bond R, McFadden S. 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*. 2024;30:79–87. doi:10.1016/j.radi.2024.10.010.

[12] Rainey C, O'Regan T, Matthew J, et al. Beauty is in the AI of the beholder: are we ready for the clinical integration of artificial intelligence in radiography? An exploratory analysis of perceived AI knowledge, skills, confidence, and education perspectives of UK radiographers. *Front Digit Health*. 2021;3:739327. doi:10.3389/fdgth.2021.739327.

[13] Doherty G, McLaughlin L, Hughes C, McConnell J, Bond R, McFadden S. A scoping review of educational programmes on artificial intelligence (AI) available to medical imaging staff. *Radiography*. 2024;30:474–482. doi:10.1016/j.radi.2023.12.019.

[14] Mulryan P, Ni Chleirigh N, O'Mahony AT, et al. An evaluation of information online on artificial intelligence in medical imaging. *Insights Imaging*. 2022;13:79. doi:10.1186/s13244-022-01209-4.

[15] Coakley S, Young R, Moore N, England A, O'Mahony A, O'Connor OJ, Maher M, McEntee MF. Radiographers' knowledge, attitudes and expectations of artificial intelligence in medical imaging. *Radiography*. 2022;28:943–948. doi:10.1016/j.radi.2022.06.020.

[16] El-Sayed MZ, Rawashdeh M, Moossa A, Atfah M, Prajna B, Hassan HGEMA, Khattap MG, Bekheet M, Islam IE, Haggag MG, Ali MA. Cross-country patterns in radiography student readiness for artificial intelligence. *Radiography*. 2026;32:103281. doi:10.1016/j.radi.2025.103281.

[17] Rawashdeh MA, Almazrouei S, Zaitoun M, Kumar P, Saade C. Empowering radiographers: a call for integrated AI training in university curricula. *Int J Biomed Imaging*. 2024;2024:1–6. doi:10.1155/2024/7001343.

[18] Pedersen MRV, Kusk MW, Lysdahlgaard S, Mork-Knudsen H, Malamateniou C, Jensen J. Nordic radiographers' and students' perspectives on artificial intelligence – A cross-sectional online survey. *Radiography*. 2024;30:776–783. doi:10.1016/j.radi.2024.02.020.

[19] Donkor A, Boakye E, Atuanor P, Wiafe YA. Evaluation of a classroom-based medical imaging artificial intelligence educational intervention in

Ghana: a pre-test/post-test study design. *Radiography*. 2025;31:102987. doi:10.1016/j.radi.2025.102987.

[20] Crotty E, Singh A, Neligan N, Chamunyonga C, Edwards C. Artificial intelligence in medical imaging education: recommendations for undergraduate curriculum development. *Radiography*. 2024;30:67–73. doi:10.1016/j.radi.2024.10.008.

[21] Pianykh OS, Langs G, Dewey M, Enzmann DR, Herold CJ, Schoenberg SO, Brink JA. Continuous learning AI in radiology: implementation principles and early applications. *Radiology*. 2020;297:6–14. doi:10.1148/radiol.2020200038.

[22] Malamateniou C, Knapp KM, Pergola M, Woznitza N, Hardy M. Artificial intelligence in radiography: where are we now and what does the future hold? *Radiography*. 2021;27:S58–S62. doi:10.1016/j.radi.2021.07.015.

[23] Santos GNM, da Silva HEC, de PT, Figueiredo S, Mesquita CRM, Melo NS, Stefani CM, Leite AF. The introduction of artificial intelligence in diagnostic radiology curricula: a text and opinion systematic review. *Int J Artif Intell Educ*. 2023;33:1147–1176. doi:10.1007/s40593-022-00324-z.

[24] van de Venter R, Skelton E, Matthew J, et al. Artificial intelligence education for radiographers, an evaluation of a UK postgraduate educational intervention using participatory action research: a pilot study. *Insights Imaging*. 2023;14:25. doi:10.1186/s13244-023-01372-2.

[25] Hui M(L), Sacoransky E, Chung A, Kwan BY. Exploring the integration of artificial intelligence in radiology education: a scoping review. *Curr Probl Diagn Radiol*. 2025;54:332–338. doi:10.1067/j.cpradiol.2024.10.012.

[26] Tejani AS, Elhalawani H, Moy L, Kohli M, Kahn CE. Artificial intelligence and radiology education. *Radiol Artif Intell*. 2023;5:220084. doi:10.1148/ryai.220084.

[27] Hasani N, Farhadi F, Morris MA, Nikpanah M, Rahmim A, Xu Y, Pariser A, Collins MT, Summers RM, Jones E, Siegel E, Saboury B. Artificial intelligence in medical imaging and its impact on the rare disease community: threats, challenges and opportunities. *PET Clin.*. 2022;17:13–29. doi:10.1016/j.cpet.2021.09.009.

[28] Ng CT, Roslan SNA, Chng YH, Choong DAW, Chong AJL, Tay YX, Lança L, Chua EC-P. Singapore radiographers' perceptions and expectations of artificial intelligence - A qualitative study. *J Med Imaging Radiat Sci*. 2022;53:554–563. doi:10.1016/j.jmir.2022.08.005.

[29] Sunarti S, Fadzlul Rahman F, Naufal M, Risky M, Febriyanto K, Masnina R. Artificial intelligence in healthcare: opportunities and risk for future. *Gac Sanit*. 2021;35:S67–S70. doi:10.1016/j.gaceta.2020.12.019.

[30] Bani-Ahmad M, England A, McLaughlin L, Hadi YH, McEntee M. Potential of artificial intelligence for radiation dose reduction in computed tomography —a scoping review. *Radiography*. 2025;31:102968. doi:10.1016/j.radi.2025.102968.

[31] Aldhafeeri FM. Navigating the ethical landscape of artificial intelligence in radiography: a cross-sectional study of radiographers' perspectives. *BMC Med Ethics*. 2024;25:52. doi:10.1186/s12910-024-01052-w.

[32] Botwe BO, Antwi WK, Arkoh S, Akudjedu TN. Radiographers' perspectives on the emerging integration of artificial intelligence into diagnostic imaging: the Ghana study. *J Med Radiat Sci*. 2021;68:260–268. doi:10.1002/jmrs.460.

[33] Downing SM. Validity: on the meaningful interpretation of assessment data. *Med Educ*. 2003;37:830–837. doi:10.1046/j.1365-2923.2003.01594.x.

[34] Bowling A. Mode of questionnaire administration can have serious effects on data quality. *J Public Health (Bangkok)*. 2005;27:281–291. doi:10.1093/pubmed/fdi031.