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Perception of medical imaging educators on the addition of AI education to the medical imaging curriculum: A cross-sectional survey.

Abstract

Introduction

As one of the most technologically advanced fields in healthcare, it is unsurprising that artificial intelligence (AI) is significantly impacting medical imaging. The Health and Care Professions Councils (HCPC) updated Standards of Proficiency (SoP) require clinicians to demonstrate awareness of AI principles and their application in practice. Imaging curricula must be updated to ensure professionals meet these standards. This study explores medical imaging educators' perspectives on AI education, examining their awareness, attitudes, and preparedness to deliver AI content.

Methods

A survey was developed to assess the perceptions of academic educators in European medical imaging programmes. The survey was hosted online via the Joint Information Systems Committee (JISC) platform and included a mix of closed and open-ended questions. Convenience sampling was used to recruit attendees at the European Congress of Radiology (ECR) in Vienna in March 2023.

Results

A total of 33 responses were received from across 14 countries. Respondents were from a diagnostic radiography background ($n=21$) or dual-qualified ($n=12$). Only 15.1% ($n=5$) had completed formal AI training. Self-reported preparedness levels indicated a low to moderate preparedness to deliver AI content. Mean AI awareness was 9.21 (of a possible 12), $SD=2.83$.

Conclusion

While medical imaging educators demonstrate relatively high AI awareness, their preparedness to deliver AI content remains low. Many expressed the need for greater support from higher education institutions (HEIs) to ensure staff are adequately equipped to integrate AI education into medical imaging curricula.

Implications for practice

The gap between AI awareness and preparedness among medical imaging educators underscores the need for institutional support. HEIs should prioritise AI-focused and curriculum resources to better equip educators in integrating AI into medical imaging education, ensuring future radiographers develop essential AI competencies.

Introduction

Artificial intelligence (AI) is becoming more commonplace in healthcare^{1,2}, streamlining processes and improving accuracy. Its integration in radiography and radiology has sparked discussions about workforce impact, with concerns about job security and professional viability³. Studies indicate that resistance to AI often stems from a lack of understanding, and raising awareness is key to improving acceptance³⁻⁸.

Despite AI's growing presence, education on the topic remains scarce^{9,10}. In Autumn 2023, the Health and Care Professions Council (HCPC) updated its Standards of Proficiency for Radiographers¹¹ requiring clinicians to demonstrate competence in AI. This shift underscores the urgent need for AI-focused education in higher education institutions (HEIs).

The College of Radiographers Industry Partnership Scheme (CoRIPS) funded the Radiographer Education and Learning in AI (REAL-AI) project to investigate AI education in medical imaging. This study aimed to:

1. Assess AI understanding in the medical imaging community
2. Investigate current and planned AI education in HEIs
3. Develop and evaluate AI training interventions

This paper presents findings from a survey of medical imaging educators, exploring their awareness, attitudes, and preparedness to integrate AI into curricula.

Methods

The survey, adapted from a previous REAL-AI instrument¹⁵, employed a mixed-methods approach combining closed and open-ended questions. It consisted of three sections:

- 1) Demographics
- 2) Current AI Awareness
- 3) AI Education.

The 17-item survey included checkbox-style questions with free-text options. One additional Likert-scale question assessed educators' self-rated preparedness to deliver AI content (0= not at all prepared, 10= completely prepared). A pilot study with 20 laypersons, students, and imaging professionals ensured validity, leading to minor wording adjustments.

Measuring AI Awareness

AI awareness was assessed using 14 statements about (12 accurate, 2 inaccurate). Participants identified correct statements, with scores ranging from 0-12. Awareness scores were analysed for correlations with demographic variables.

Dissemination

The survey was hosted on JISC Online Surveys and disseminated via QR codes, short URLs, and direct distribution at:

- European Congress of Radiology (ECR) (March 2023, Vienna)
- United Kingdom Imaging and Oncology Congress (UKIO) (June 2023)
- Social media and professional networks

Ethical Considerations

Participation was voluntary with informed consent obtained via an embedded participant information sheet (PIS) and digital consent form. Responses were anonymous, stored securely and processed under GDPR (2018) guidelines. The survey followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).

Data Analysis

Survey data were exported to SPSS (version 29) for statistical analysis. Descriptive and inferential tests included independent t-tests, ANOVA, and Tukey HSD. This group comparison approach was favoured over correlation analysis methods due to the relatively small sample size ($n=33$). Qualitative responses underwent thematic analysis using Braun & Clarke's¹⁸ six-phase framework: 1) Familiarisation, 2) Initial coding, 3) Theme identification, 4) Theme review, 5) Theme definition, 6) Report writing.

Results

33 responses were received from participants across Europe and beyond (Figure 1).

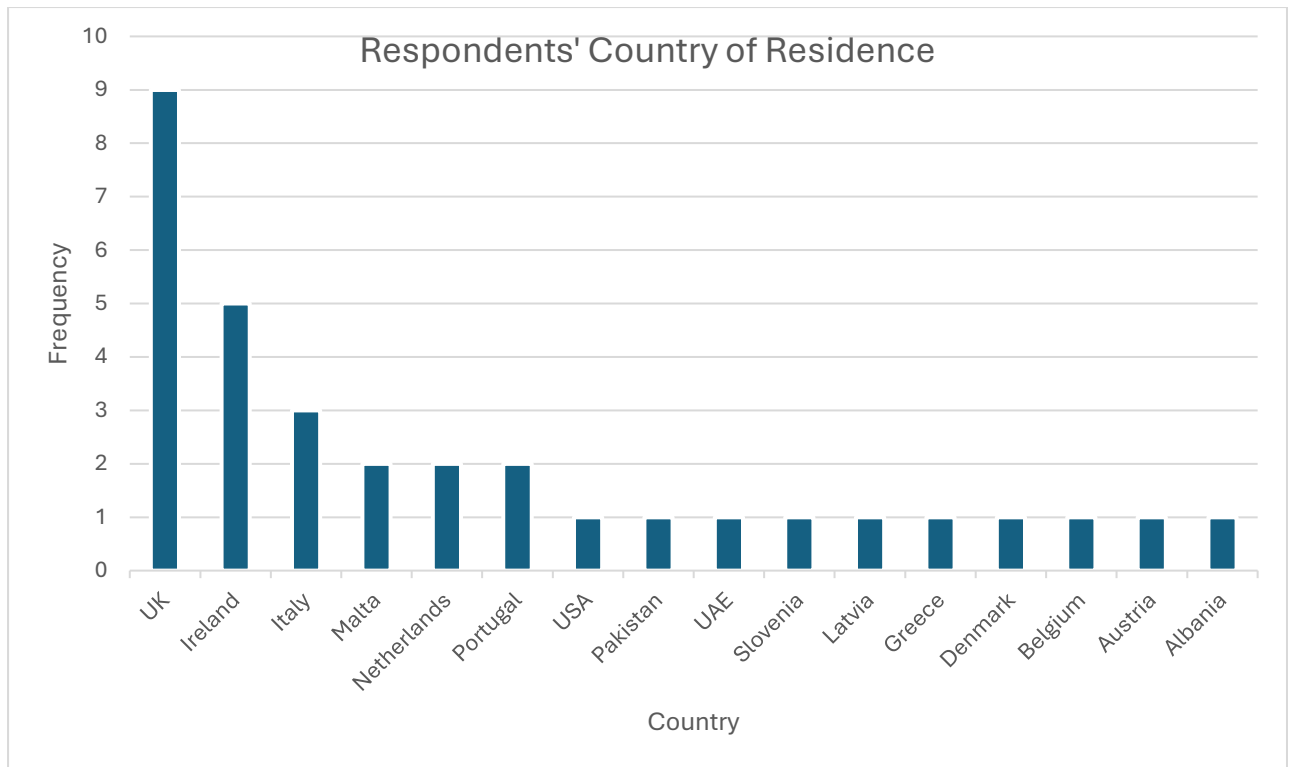


Figure 1: Respondents' Country of Residence

Participants were from a diagnostic radiography background ($n=21$) or dual-qualified in diagnostic and therapeutic radiography ($n=12$). For participants' ages, see Table 1.

15.2% ($n=5$) had completed training on AI. Self-reported levels of preparedness ($M=4.42$) indicate a low to moderate sense of preparedness (see figure 2). Respondents were 60.6% female ($n=20$) and 39.4% ($n=13$) male.

Table 1: Age range of educators in survey

Age years	n	%
18-25	1	3
26-35	5	15.2
36-45	13	39.4
46-55	11	33.3
56-65	3	9.1

51.5% ($n=17$) were qualified in a medical imaging > 20 years (Table 2). 18.2% ($n=6$) were working as educators for the same length of time (Table 3).

Table 2: Years of experience in medical imaging

	n	%
< 1 year	0	0
>1 year but <6 years	4	12.1

>11 but <20 years	12	36.4
>20 years	17	51.5

Table 3: Years experience in education

	n	%
< 1 year	0	0
> 1 but < 6 years	9	27.3
> 6 but < 11 years	10	30.3
> 11 but < 20 years	8	24.2
> 20 years	6	18.2

51.5% indicated their employing HEI had already introduced AI to its curriculum.

AI Champions & Superusers

Respondents indicated strong support for AI superusers¹ with 72.7% ($n=24$) in favour of such roles. Although a majority appear to support the concept of AI superusers, free-text responses revealed conflicting themes.

1. Need for specialised roles:

“Would make more practical sense to have a small team of experts to provide training and support.” (Participant 29).

Many believe that having specialised roles such as superusers is beneficial for managing advanced applications and research, as well as providing continuous support in the clinical environment.

2. Inclusivity and general training:

“...everyone should be involved in the process. restricting it to one group does not help to involve all staff and appears to be something that can only be used by a few.” (Participant 3).

Several responses highlight the importance of involving all staff in AI education to avoid bottlenecks and ensure widespread understanding and acceptance of AI amongst the entire workforce. There were, however, concerns raised about potential for dilution of knowledge, or skills staying only with dedicated staff, if some staff fail to engage.

3. Feasibility doubts and scepticism:

“AI is likely to become part and parcel of the technologies we use as radiographers so why should that be restricted?” (Participant 9).

There were mixed views on the feasibility of AI superusers, with some participants recognising practical challenges such as workforce shortages, need for continuous

¹ Expert in a system or business process that can help others learn how to use it. In this context, the term refers to a clinical professional who is trained to a higher degree than their colleagues and can cascade knowledge of a system or software.

training, and potential workflow bottlenecks which could arise as a result. A few participants were sceptical of the feasibility of superusers or completely against the concept, stating that “...restricting it to one group does not help to involve all staff and appears to be something that can only be used by a few.” (Participant 4). It was highlighted that superusers as a solution could be more resource efficient in terms of cost and time.

69.7% would like to see AI concepts taught by an expert such as a computer scientist or AI champion. Thematic analysis of free-text responses demonstrated 3 themes:

1. Need for specialised knowledge:

“Non-experts may have a too superficial understanding of AI to teach.” (Participant 7).

Many participants highlighted that teaching AI concepts requires a deep understanding and specialised knowledge that only experts can provide. This will ensure accuracy and comprehensiveness in teaching.

2. Links to professional and clinical practice:

“This could still be a radiographer who is trained to deliver this. Where information or teaching is cascaded it can become diluted or delivered incorrectly.” (Participant 1).

Participants stressed the importance of AI education being directly relatable to professional practice and the clinical setting. This ensures that the learning is relevant and can be effectively utilised in real-world scenarios.

3. Multidisciplinary approach:

“... [experts] are likely to be able to explain what AI is and isn’t capable of in different ways. Radiography specific staff to put it into clinical context.” (Participant 25).

Several responses suggested that a multidisciplinary approach, involving experts in AI and trained radiographers, would provide a more comprehensive education. This approach leverages the strengths of different disciplines to cover both theoretical and practical aspects of AI in medical imaging.

Level of knowledge required and preferred method of delivery

69.7% ($n=23$) indicated preference for AI education delivery at undergraduate level, with 24.2% ($n=8$) preferring postgraduate level. The remaining 2 participants were unsure. Tables 4 and 5 give a breakdown of the methods of delivery respondents found most appropriate. The most popular option for undergraduate education with 54.5% ($n=18$) was a mix of theory and practical learning. The least favoured amongst educators was optional classes.

Table 4: Respondent’s Preferred Method of Delivery for Undergraduate AI Education

Method of Delivery	Number of Respondents (n)	%
Mix of theory and practical learning	18	54.5

Aspects of AI incorporated throughout existing modules	14	42.4
Clinical demonstrations	10	30.3
Standalone AI module	7	21.2
Online webinars	7	21.2
Asynchronous learning materials	5	15.2
All practical i.e. developing and testing an algorithm	3	9.1
Standalone module with reference to existing topics	3	9.1
Purely theoretical i.e. lectures/seminars	2	6.1
Optional classes	1	3
Other (<i>Technician demonstrations</i>) Participant 14	1	3

Table 5: Preferred Method of Delivery for Postgraduate AI Education

Method of Delivery	Number of Respondents (n)	% of Respondents
Online short courses/CPD	3	9.1
In-person short courses CPD	2	6.1
Aspects incorporated throughout existing PG offerings	2	6.1
Master's level	1	3
Diploma	1	3
Clinical demonstrations	1	3

Current awareness

AI awareness was generally good with 69.7% ($n=23$) scoring 9 (of a possible 12) or more on the awareness scale. Mean awareness score was 9.21, ($SD=2.83$). Table 6 provides a breakdown of the figures per statement. Those with an asterisk (*) are incorrect.

Table 6: Statements on AI in clinical imaging and representative figures.

Q10 Statements on AI	% Correct	% Unsure
The AED in standard x-ray equipment is a form of AI. *	24.2	36.4
X-ray equipment with an auto-positioning function to move the tube and/or detector is powered by AI. *	42.4	24.2
AI algorithms can 'triage' a large volume of imaging examinations and prioritise those which need to be attended to more urgently.	87.9	9.1
AI can reduce CT and MRI scan times in a number of ways, one of which is by reconstructing data from shorter scans whilst maintaining diagnostic accuracy.	84.8	12.1
AI is being used to predict the likelihood of developing certain illnesses in later life.	78.8	15.2

AI algorithms can predict optimal positioning to spare organs at risk during certain radiotherapy treatments.	78.8	12.1
Referral vetting and protocol selection are tasks AI can complete.	75.8	15.2
AI can detect fractures on images of the appendicular skeleton.	84.8	9.1
AI can be used to organise patient lists and clinician's schedules.	78.8	12.1
Quantitative data can be extracted from medical images to predict treatment toxicity and patient outcomes.	75.8	18.2
Algorithms have been developed to detect a range of pathologies, including tuberculosis and Covid-19, on chest x-rays.	93.9	3.0
Quality assurance processes in radiotherapy can be managed by AI.	48.5	45.5
The need for implanted fiducials in prostate cancer patients has been reduced by developments in AI localisation.	51.5	39.4
Algorithms can perform multi-modal image registration using geometric, statistical and physical properties to precisely match features of a patient's various scans.	81.8	15.2

Comparison of mean AI awareness in different groups

Gender and mean AI awareness

The mean score in female participants ($M=9.50$, $SD = 2.74$) was higher than that of male participants ($M=8.77$, $SD = 3$), however this was not statistically significant.

Age and mean AI awareness

There was no notable variation in mean AI awareness by age. Table 7 provides full detail on the mean AI awareness score by age group.

Table 7: Mean AI Awareness Score by Age Group

Years of age	N	Mean	Standard deviation
18-25	1	9.00	.
26-35	5	9.00	2.739
36-45	13	9.15	3.236
46-55	11	9.09	3.081
56-65	3	10.33	0.577

Level of experience, time as educator and mean AI awareness

Neither experience level nor time as an educator had any significant relationship with AI awareness (Table 9).

Table 8: Mean AI Awareness Score by Level of Experience

Years of Experience	N	Mean	SD
>1 year but <6 years	4	9.00	2.160
> 6 but < 11 years	0	-	-
>11 but <20 years	12	8.67	3.367

>20 years	17	9.65	2.621
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Table 9: Mean AI Awareness Score by Years as Educator

Years as Educator	N	Mean	SD
> 1 but < 6 years	9	9.11	2.261
> 6 but < 11 years	10	7.80	4.237
> 11 but < 20 years	8	10.25	1.282
> 20 years	6	10.33	1.033

There was no significant difference between scores for those who had and had not completed AI training (Table 10).

Completed AI training and mean AI awareness

Table 10: Mean AI Awareness Score by Formal AI Training

Have you completed any formal training or qualifications in AI?	Mean	N	SD
Yes	7.80	5	4.919
No	9.46	28	2.333

Comparison of educator and clinical staff AI awareness

An independent samples t-test was compared educators' AI awareness scores with that of clinical staff surveyed in an earlier REAL-AI study¹⁵. The analysis revealed a significant difference in AI awareness scores between clinical staff (M = 8.13, SD = 2.906) and educators (M = 9.21, SD = 2.804); $t(192) = -2.840$, $p = 0.014$. The mean difference in AI awareness scores was -1.079, with a 95% confidence interval ranging from -1.938 to -0.221.

Job role

No statistically significant difference was found.

Preparedness to deliver AI education

Participants ranked their preparedness to deliver AI content on a scale from 0-10 (0=not at all prepared, 10=completely prepared). Mean preparedness was 4.39, SD=2.27. There was no significant difference between genders and preparedness. The 10-point Likert scale for preparedness (Figure 2) was further condensed into 3 categories: unprepared, somewhat prepared, and completely prepared (Figure 3).

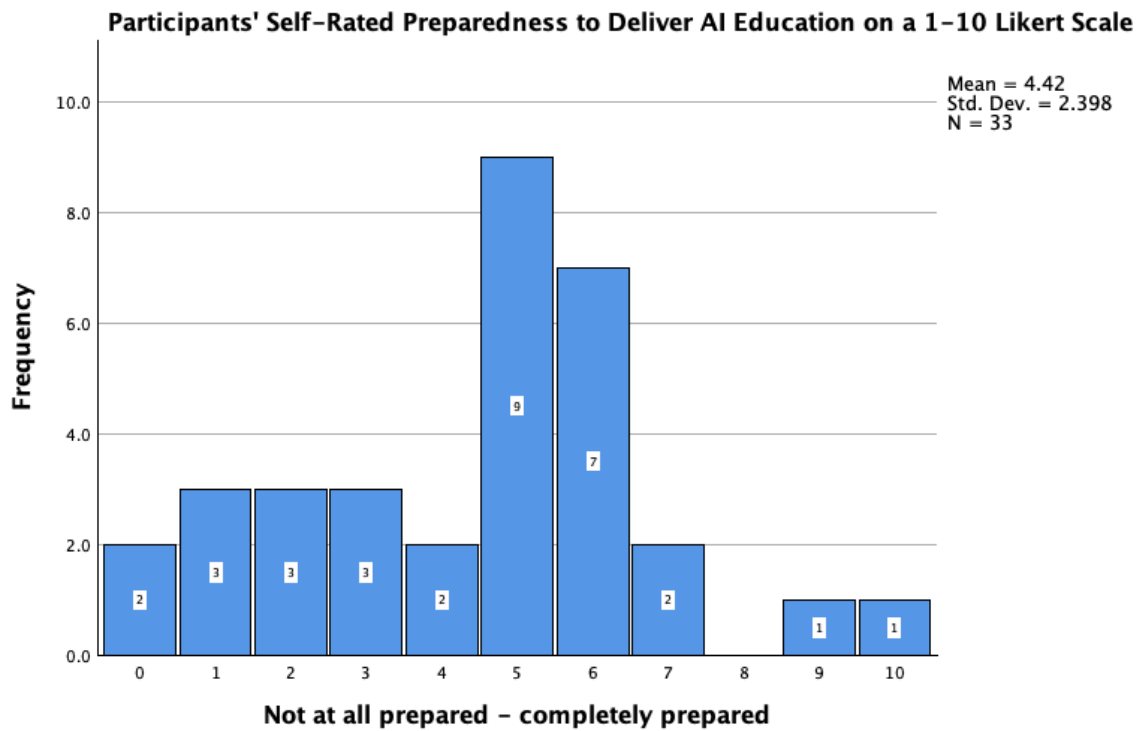


Figure 2: Likert Scale of Self-rated Preparedness

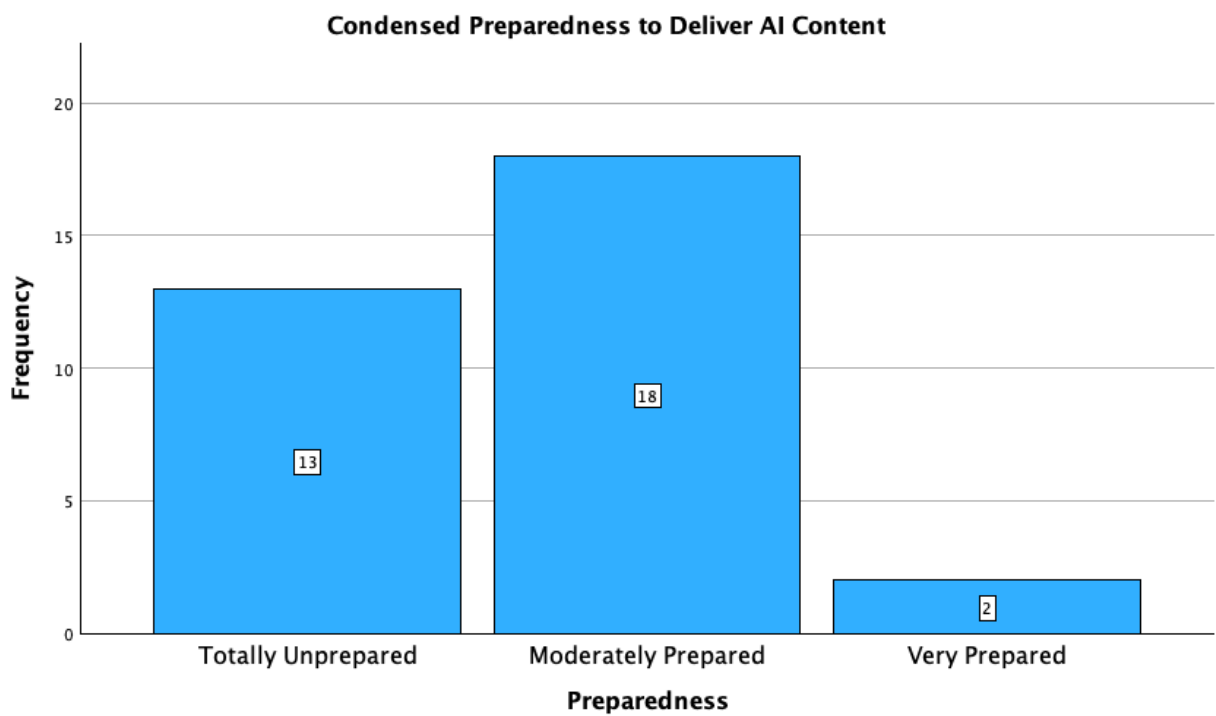


Figure 3. Condensed Self-rated preparedness to deliver AI education

Table 11: Mean AI Awareness and Preparedness to Deliver AI Education

	N	Mean	SD
Totally Unprepared	13	8.85	3.051
Moderately Prepared	18	9.22	2.777
Very Prepared	2	11.50	0.707

No significant interaction with condensed preparedness & AI awareness was found (see Table 11).

Future Role Development with AI

The range of responses to this question demonstrate hope for the growth of medical imaging professions aligned with AI, both clinically and beyond. One participant stated their belief that AI will replace radiographers, indicating no future roles, whilst another stressed the importance of proper radiographic technique to ensure that images used to train AI are of high quality; otherwise, the AI will be suboptimal.

1. Clinical AI role: Several participants expressed thoughts that AI specialist roles in the clinical environment such as adaptive radiotherapists, advanced reporting radiographers, consultant radiographers, AI practice educators, and procurement, auditing and governance.
2. Patient-centred AI: It was highlighted that patient care should remain at the core with AI-assisted working.
3. Industry roles: Some participants envisaged future roles where imaging staff could work as consultants or advisors to industry partners to validate new AI tools, or to equipment manufacturers and software designers.

Discussion

These findings provide insight into AI education for academic staff. Several themes emerged from the data.

Demographic analysis revealed a notable age difference between educators (83% >36 years old) and clinical staff in the earlier REAL-AI survey (57% 18-35 years old)¹⁵. This generational gap presents both challenges and opportunities. Younger clinical staff may bring fresh perspectives and greater AI familiarity, having grown up alongside its development. While older educators are not inherently less AI-savvy, younger staff may have had more exposure, leading to a different baseline comfort level. To ensure AI integration benefits all professionals, assumptions about adaptability must be avoided, with education tailored across all age groups. Targeted professional development can enhance AI knowledge among current educators, whose extensive experience contextualises AI in medical imaging. As senior educators near retirement, supporting younger clinical staff in transitioning to

academic roles can help bridge generational gaps in education. However, clinical expertise alone does not equate to teach proficiency, emphasising the need for pedagogical training.

Another point of note in demographic analysis of the educators' responses was that whilst most educators have been working in the medical imaging field for more than 20 years, only 20% have taught for that long. This disparity could present challenges but also demonstrates the deep clinical expertise of current educators, which could be leveraged to enhance AI education and potentially lead to innovation in education practices.

Current Awareness

As in the previous REAL-AI study, there is no universally accepted definition of awareness¹⁵. Scaled responses are commonly used, as certainty is often cited as a key factor¹⁹. However, this study adopted a different approach due to well-documented issues with Likert scale responses^{20,21}.

The data suggest that although few educators have formal AI training, they demonstrate greater conceptual understanding than clinical staff. AI awareness in educators (M = 9.21) was statistically higher than in clinical staff from the earlier REAL-AI study (M = 8.13)¹⁵. This highlights a need for targeted AI training tailored to both groups. Higher awareness among may stem from their role in curriculum development and AI integration in teaching. Alternatively, they may have a greater aptitude for acquiring and retaining knowledge. Clinical staff, however, may benefit more from practical, hands-on AI training relevant to their clinical practice. Further research should explore factors contributing to educators' higher awareness and identify strategies to enhance AI training for clinical staff. Integrating AI education into curricula and expanding professional development align with the Society of Radiographers AI Advisory Group Work Plan¹².

Some educators incorrectly identified inaccurate statements in the awareness section as correct. Whilst these errors were excluded from AI awareness scores, they highlight the need for AI training across all levels. Misconceptions centred on standard imaging equipment, which does not use AI for the specified functions. Notably, 24.2% of educators misclassified '*the AED in standard x-ray equipment is a form of AI*' as AI, and 42.4% believed '*x-ray equipment with an auto-positioning function to move the tube and/or detector is powered by AI*' used AI. Such misconceptions could impact students, leading to overestimations of AI's capabilities in clinical practice. A key risk is unrealistic expectations of AI's role in healthcare. Additionally, passing down inaccurate knowledge to students may contribute to misunderstandings of AI's true potential in medical imaging¹⁵.

Preparedness

The Covid-19 pandemic underscored the importance of an adaptive faculty for patient care²². Post-pandemic research identified lack of preparedness as a significant barrier²³. Respondents in this study reported a low mean preparedness score of 4.39 (out of 10), indicating educators feel unready to teach AI content. This highlights a gap in readiness for integrating AI into medical imaging curricula. The absence of a significant difference in preparedness by gender is encouraging, suggesting equal uptake of teaching initiatives.

However, the lack of correlation between correlation between AI awareness and preparedness implies that even knowledgeable educators feel unprepared, pointing to the need for practical, pedagogical AI training. The combination of low preparedness and limited institutional support presents a major barrier to effective AI integration. Supporting staff to achieve the confidence needed to deliver AI content is imperative for successful curriculum implementation.

Education and training preferences

As in the earlier REAL-AI clinical survey¹⁵, clinical staff demonstrated a preference for AI education to be delivered at undergraduate level, with a blend of theory and practical learning. Educators also expressed a desire for AI content to be added to existing modules. These findings reinforce the notion that foundational AI knowledge should be embedded early in a clinician's professional training to prepare them to engage with AI from the earliest stage of their career. Efforts to build a comprehensive AI curricula will uphold the guidance laid out by both the HCPC in their updated Standards of Proficiency¹⁴, and the SoR AI recommendations¹². Some respondents indicated a preference for postgraduate AI education, favouring online or in-person short courses. This could be due to concerns over adding to an already full undergraduate curriculum, or because of a belief that not all imaging staff need to understand AI concepts to function in their role.

AI Champions & Superusers

69.7% ($n=23$) of participants believe that AI concepts should be taught by an expert. The sentiments expressed indicate a belief that AI concepts may be too complex for a non-specialist to teach initially, but there was also expression of hope that eventually, imaging staff would be able to instruct on it as well as an expert. Others opined that cascading complex teaching comes with a risk of dilution of key concepts. Those who disagreed with the need for 'expert' tutelage argue that the feasibility of that approach is unlikely, and that experienced medical imaging educators would be more appropriate due to their ability to relate the concepts back to clinical imaging applications.

72.7% ($n=24$) supported the advent of 'AI Superusers', who would act in a similar capacity to PACS superusers for AI technology. Justifications centred around the practicality of training key staff as superusers, especially given current workforce shortages. Others highlighted potential dilution of knowledge, workflow bottlenecks, failure to engage by some staff, and resource constraints in developing the initiative.

Role Development

Responses to this question were varied, reflecting a significant shift from the fears and apprehensions highlighted in earlier research. The most prominent theme among the responses was the emergence of specialist clinical AI roles, indicating a desire for new pathways beyond traditional modalities. This suggests educators and professionals envision a future where AI expertise could lead to advanced imaging positions. Additionally, potential industry roles were noted, emphasising how AI proficiency could drive the profession's growth beyond the clinical environment. Such roles could be crucial for the successful

implementation of AI in medical imaging, as radiographers with AI knowledge could contribute to the design and testing of the technologies, thus ensuring they are fit for purpose. Despite these evolving roles, respondents highlighted the importance of maintaining a focus on patient-centred care, underscoring that it should remain the primary motivation for medical imaging professionals.

Whilst most respondents indicated optimism for the future of the medical imaging professions, one voiced concern that AI implementation could herald trouble for professional practice. Their worry centred around the potential for loss of staffs' ability to use proper radiographic technique, through over-use of and over-reliance on AI. This is a valid concern, one which must be a factor when curricula are being redesigned to accommodate AI learning. De-skilling through the implementation of a novel technology is a phenomenon reported when the transition to digital radiography occurred²⁴. Despite these fears, this transition ultimately led to increased efficiency and the potential for enhanced image quality, which in turn improved patient care with enhanced outcomes²⁵.

Since the rapid growth of AI in recent years, fears for job replacement have abounded. These fears have yet to come to fruition and likely never will. However, it has been widely stated that whilst AI will not replace medical imaging staff, those staff who are knowledgeable about AI will replace those who are not.

Implications for Practice and Policy

The main implication of these findings for practice and policy is that those tasked with the delivery of a novel curricula encompassing AI concepts feel ill-prepared to undertake the role.

Limitations

The authors acknowledge the small sample size in the survey. Attempts were made to maximise participation in the survey including a short promotional article published in the Society of Radiographers member magazine Synergy, as well as promotion on multiple social media platforms including LinkedIn. The survey was also promoted at two of the most notable imaging conferences in Europe, namely the United Kingdom Imaging and Oncology conference (UKIO) and ECR. Despite this large-scale promotion, only 33 responses were received. Participating educators were from a diagnostic radiography background or were dual-qualified in diagnostic and therapeutic radiography. The aim was to gather the individual views of educators, outside of the scope of their employing institution. This unique perspective of educators has not, to this author's knowledge, been explored in this context before. This perspective is invaluable, these are the people tasked with teaching the next generation of radiographers and radiotherapists. If they have not received appropriate instruction on AI, or have issues with an aspect, it is crucial to understand their point of view. The authors hope that despite the small sample, this unique element has provided some valuable insight. The types of analyses that could be performed was limited by the categorical nature of some variables. Future research might seek to conduct interviews with participants to allow for probing and potential greater insight.

Conclusion

This study highlights a critical gap between AI awareness and preparedness among medical imaging educators, underscoring the need for institutional support to equip faculty with the skills required to integrate AI into curricula. While educators demonstrated higher AI awareness than clinical staff from the earlier REAL_AI study, their self-reported preparedness to teach AI remained low. This suggests that awareness alone is insufficient, and structured, pedagogically informed training is essential.

Educators expressed a preference for AI education to begin at the undergraduate level, favouring a blended learning approach that integrates both theoretical and practical components. While some supported embedding AI within existing modules, others saw value in standalone courses or postgraduate learning. The role of AI champions and superusers was debated, with mixed views on their necessity and feasibility. Additionally, respondents envisioned new specialist roles in AI within medical imaging, indicating a shift towards evolving career pathways.

These findings emphasise the need for targeted faculty development initiatives, including AI-focused training and interdisciplinary collaboration, to bridge the gap between knowledge and teaching capability. Institutions should consider prioritising structured AI education within medical imaging programmes to ensure future radiographers develop essential AI competencies. As AI adoption in healthcare continues to grow, proactive curriculum development will be key to preparing both educators and students for the future of medical imaging.

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