

ASSESSMENT OF KNOWLEDGE, ATTITUDE, AND PERCEPTION TOWARD AI-BASED RADIATION DOSE REDUCTION AMONG DIAGNOSTIC AND SURGICAL IMAGING PROFESSIONALS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Artificial intelligence (AI)-based dose-optimization tools, particularly deep learning image reconstruction, are increasingly used to reduce radiation exposure in diagnostic and interventional imaging while preserving image quality. The clinical benefit of these tools depends on the knowledge, attitude, and perception (KAP) of the professionals who apply them, yet comparative KAP data across diagnostic and surgical imaging personnel remain limited. **Aim:** To assess the knowledge, attitude, and perception toward AI-based radiation dose reduction and to determine the factors influencing its acceptance and implementation among diagnostic and surgical imaging professionals. **Methods:** A cross-sectional survey was conducted among 113 diagnostic and surgical imaging professionals using a structured, self-administered questionnaire covering demographics, knowledge/awareness of AI applications, a 10-item Likert-scale attitude/perception module (1 = Strongly Disagree to 5 = Strongly Agree), and perceived barriers to implementation. Descriptive statistics were computed, and chi-square (χ^2) tests of independence examined associations between demographic/professional variables and knowledge/attitude outcomes (significance set at $p < 0.05$). **Results:** Of 113 respondents (100% consent and completion rate), 84.1% had heard of AI applications in radiology and 68.1% were aware that AI could help reduce radiation dose; however, only 25.7% reported that their workplace currently used AI-based imaging software, and only 26.5% had received formal AI training, while 68.1% wanted dose-reduction-specific training. Attitude/perception scores were consistently favourable across all ten Likert items (item means 3.51–3.89 of 5; overall composite mean 3.67, SD 1.11). High installation cost (52.2%), lack of training (42.5%), and lack of institutional support (38.9%) were the most cited barriers. Chi-square testing showed significant associations between gender and awareness of AI-based dose reduction ($\chi^2=5.21$, $p=0.022$), professional role and perceived importance of AI ($\chi^2=7.06$, $p=0.029$), and workplace AI adoption and perceived importance of AI ($\chi^2=10.77$, $p=0.005$); associations with age group, years of experience, workplace setting, and prior formal AI training were not significant ($p > 0.05$). **Conclusion:** Diagnostic and surgical imaging professionals hold generally positive attitudes toward AI-based radiation dose reduction despite limited formal training and low current workplace adoption. Hands-on exposure to AI tools, rather than age or years of experience, appears to be the strongest correlate of positive perception, highlighting structured training and institutional investment as priority levers for safe and effective clinical integration.

Keywords: Artificial Intelligence, Radiation Dose Reduction, Deep Learning Reconstruction, Radiology, Knowledge, Attitude and Perception, Diagnostic Imaging, Surgical Imaging, ALARA, Cross-Sectional Study

How to cite this article: Singh S, Ansari MS, Singhanian DK, Maurya P, Pandey R, Saha S, Khan I., Assessment of Knowledge, Attitude, and Perception Toward AI-Based Radiation Dose Reduction Among Diagnostic and Surgical Imaging Professionals: A Cross-Sectional Study. *Int J Drug Deliv Technol*. 2026;16(81s): 1487-1493; DOI: 10.25258/ijddt.16.81s.182

Source of support: XX

Conflict of interest: XX

INTRODUCTION

Ionizing radiation is fundamental to modern diagnostic and interventional/surgical imaging, yet its cumulative use carries

recognized stochastic and deterministic risks, ranging from an elevated lifetime cancer risk to, at higher cumulative exposures, tissue-specific deterministic effects.[1] This dual reality indispensable diagnostic and procedural benefit set against measurable biological risk has anchored radiation safety practice for decades in the ALARA principle (As Low As Reasonably Achievable), which obligates every professional who orders, performs, or is present during a radiological procedure to justify each exposure and optimize technique so that the dose delivered is the minimum compatible with the required image or procedural quality.[2,3] In diagnostic radiology this responsibility falls primarily on radiologists and radiographers/technologists, while in the operating theatre and catheterization laboratory it extends to surgeons, interventional cardiologists, and surgical staff who work under fluoroscopic guidance and are themselves occupationally exposed alongside the patient.[4,5]

Artificial intelligence (AI) has emerged over the last decade as one of the most consequential technical developments for radiation dose optimization. Deep learning-based image reconstruction (DLR) algorithms, trained on convolutional neural network architectures, are now used to denoise and reconstruct diagnostic-quality images from substantially lower-dose raw data than conventional filtered back-projection or iterative reconstruction permit.[6,7] Systematic and scoping reviews report that DLR techniques can reduce computed tomography (CT) radiation dose by a wide margin with some pediatric and organ-specific applications achieving reductions in the range of 36–90% while preserving or even improving image noise characteristics, spatial resolution, and diagnostic confidence.[6,8] Comparable AI-driven approaches, including automatic exposure control, dose-modulation algorithms, and real-time fluoroscopic noise reduction, are increasingly being extended from the CT suite into general radiography, fluoroscopy, and image-guided surgical and interventional settings, where cumulative operator and patient exposure is a longstanding safety concern.[9,10]

However, the clinical benefit of any dose-reduction technology is realized only to the extent that the professionals who select protocols, operate equipment, and interpret AI-reconstructed images understand, trust, and correctly apply it. A substantial body of survey-based literature has documented persistent gaps in radiation-protection knowledge among radiology professionals and trainees, including underestimation of dose and cancer risk from common examinations, incomplete training in optimization principles, and variable adherence to protective practices, particularly among technologists and staff in interventional and catheterization-laboratory settings.[11–15] Parallel to this, a separate and rapidly growing body of “knowledge, attitude, and perception” (KAP) research has examined how radiologists, residents, and to a lesser extent technologists and medical students perceive AI in imaging more broadly. These studies consistently show generally positive attitudes toward AI’s diagnostic potential coexisting with limited formal AI training, variable self-rated knowledge, and residual concern about professional displacement, workflow disruption, and over-reliance on algorithmic output.[16–20] Notably, several of these studies report that respondents with greater AI knowledge and training hold more favourable and more nuanced attitudes toward its adoption, underscoring knowledge as a modifiable determinant of acceptance rather than a fixed trait.[17,20]

Despite this expanding literature, two gaps remain evident. First, most existing KAP surveys address AI in imaging broadly diagnostic accuracy, workflow automation, or fear of replacement rather than isolating the specific, and arguably lower-controversy, application of AI-based radiation dose reduction, which is a distinct construct combining technical understanding of dose-optimization algorithms with attitudes toward patient and occupational safety. Second, the populations sampled are typically confined to radiologists, residents, or radiographers within diagnostic departments; comparatively little is known about how surgical and interventional imaging professionals surgeons, interventional cardiologists, and

operating-theatre staff who rely on fluoroscopy and other AI-assisted modalities perceive and engage with these same technologies, despite their direct occupational exposure and procedural responsibility for dose management.[4,5,9] Understanding both diagnostic and surgical imaging professionals within a single comparative framework is therefore necessary to identify discipline-specific knowledge deficits, attitudinal barriers, and training needs that could inform targeted educational interventions and support safer, more confident clinical integration of AI-based dose-reduction tools.

Against this background, the present study was designed to assess the knowledge, attitude, and perception toward AI-based radiation dose reduction among diagnostic and surgical imaging professionals, and to compare these dimensions across professional groups in order to identify gaps that can guide focused training and policy development.

Aim and Objectives

Aim: To assess the knowledge, attitude, and perception toward Artificial Intelligence (AI)-based radiation dose reduction and to determine the factors influencing its acceptance and implementation among diagnostic and surgical imaging professionals.

Objectives

- To assess the knowledge of diagnostic and surgical imaging professionals regarding the applications of Artificial Intelligence (AI) in radiation dose reduction.
- To evaluate the attitude of diagnostic and surgical imaging professionals toward the adoption of AI-based radiation dose reduction in clinical imaging practice.
- To assess the perception of diagnostic and surgical imaging professionals regarding the benefits, challenges, and future implementation of AI-based radiation dose reduction in medical imaging.

MATERIALS AND METHODS

Study Design and Setting

This was a cross-sectional, questionnaire-based study designed to assess knowledge, attitude, and perception (KAP) toward AI-based radiation dose reduction among diagnostic and surgical imaging professionals. [Insert institution/department name, city, and country] over a study period of [insert duration/dates]. The study was carried out in accordance with the Declaration of Helsinki, and institutional ethical clearance was obtained prior to data collection [insert IRB/Ethics Committee name and approval number].

Study Population and Sampling

The study population comprised diagnostic and surgical imaging professionals, including radiologists, radiologic technologists/radiographers, CT and MRI technicians, faculty/academic professionals, and undergraduate/postgraduate students or interns in radiology and medical imaging technology. Participants were recruited using a convenience (non-probability) sampling technique, and the survey link/form was distributed through [insert distribution channel e.g., institutional email, professional networks, or social media]. A total of 113 respondents completed the questionnaire; all 113 provided informed consent prior to participation, yielding a 100% consent and completion rate among those who opened the form.

Inclusion and Exclusion Criteria

Inclusion criteria: currently practising or in training as a diagnostic or surgical imaging professional (radiologist, radiographer/technologist, CT/MRI technician, interventional/surgical imaging staff, or radiology student/intern); willingness to provide informed consent; and completion of the full questionnaire. Exclusion criteria: professionals outside the field of diagnostic/interventional imaging, incomplete questionnaire responses, and non-consenting individuals.

Data Collection Tool

Data were collected using a structured, self-administered questionnaire comprising four sections: (1) demographic and professional characteristics (age, gender, professional qualification, current role, years of experience, and workplace setting); (2) knowledge and awareness of AI applications in radiology, including awareness that AI can reduce radiation dose, current workplace adoption of AI-based imaging software, prior formal AI training, and interest in future training; (3) a 10-item attitude/perception module rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) addressing image quality, protocol optimization, patient safety, workflow, trust in AI recommendations, and concerns about job impact; and (4) a multiple-response item on perceived barriers to AI implementation in radiology practice.

Statistical Analysis

Data were analysed using Python (pandas and SciPy libraries). Descriptive statistics frequencies and percentages for categorical variables, and mean, median, mode, and standard deviation (SD) for the Likert-scale attitude/perception items were computed. The chi-square (χ^2) test of independence was used to examine associations between categorical demographic/professional variables (gender, age group, years of

experience, professional role, and workplace setting/AI exposure) and key knowledge/attitude outcomes (awareness of AI-based dose reduction, having heard of AI in radiology, perceived importance of AI, and desire for training). A p-value < 0.05 was considered statistically significant. As several cross-tabulations involved sparse cells (expected counts < 5), these specific comparisons should be interpreted with appropriate caution; Fisher's exact test is noted as a preferable alternative for such small subgroups and can be substituted in sensitivity analyses.

RESULTS

Demographic Characteristics

A total of 113 diagnostic and surgical imaging professionals participated in the study. The majority of respondents were in the 20–25-year age group (91.2%), male (63.7%), held a B.Sc. in Radiology/Medical Imaging Technology (85.8%), were students/interns (70.8%), had less than one year of professional experience (62.8%), and worked in private hospital settings (61.9%). The complete demographic profile is presented in Table 1 and Figure 1.

Table 1. Demographic Characteristics of Respondents (N = 113)

Variable	Category	n	%
Age Group	20–25 years	103	91.2%
	26–30 years	5	4.4%
	31–35 years	3	2.7%
	Above 40 years	2	1.8%
Gender	Male	72	63.7%
	Female	41	36.3%
Professional Qualification	B.Sc. Radiology/Medical Imaging Technology	97	85.8%
	M.Sc. Radiology/Medical Imaging Technology	11	9.7%
	Other	3	2.7%
	MD Radiodiagnosis	2	1.8%
Current Professional Role	Student/Intern	80	70.8%
	Radiologic Technologist	14	12.4%
	Faculty/Academic Professional	6	5.3%
	Radiographer	6	5.3%
	CT Technician	2	1.8%
	Radiologist	2	1.8%
	Other	2	1.8%
	MRI Technician	1	0.9%
Years of Professional Experience	Less than 1 year	71	62.8%
	1–3 years	29	25.7%
	4–6 years	6	5.3%
	7–10 years	5	4.4%
	More than 10 years	2	1.8%
Workplace Setting	Private Hospital	70	61.9%
	Other	14	12.4%
	Teaching Institution	11	9.7%
	Government Hospital	10	8.8%
	Diagnostic Center	8	7.1%

Knowledge and Awareness of AI in Radiology

Most respondents (84.1%) had heard of AI applications in radiology, and 68.1% were aware that AI can help reduce radiation dose. However, only 25.7% reported that their workplace currently used AI-based imaging software, and only 26.5% had received formal training regarding AI applications in

radiology. A large majority (68.1%) expressed a desire for training specifically on AI-based dose reduction, and 45.1% rated AI as “Very Important” for the future of radiation dose reduction (a further 26.5% rated it “Important”). Full results are shown in Table 2 and Figures 2–3.

Table 2. Knowledge, Awareness, and Training-Related Responses

Item	Response	n	%
Heard of AI in radiology	Yes	95	84.1%
	Maybe	10	8.8%
	No	8	7.1%
Aware AI can reduce radiation dose	Yes	77	68.1%
	Maybe	25	22.1%
	No	11	9.7%
Workplace uses AI-based imaging software	No	75	66.4%
	Yes	29	25.7%
	Maybe	9	8.0%
Received formal AI training	No	77	68.1%
	Yes	30	26.5%
	Maybe	6	5.3%
Wants training on AI dose reduction	Yes	77	68.1%
	No	23	20.4%
	Maybe	13	11.5%
Perceived importance of AI	Very Important	51	45.1%
	Important	30	26.5%

Item	Response	n	%
	Neutral	26	23.0%
	Not Important	4	3.5%
	Less Important	2	1.8%

Attitude and Perception Toward AI-Based Radiation Dose Reduction

Attitude and perception were measured using ten statements rated on a 5-point Likert scale. All items showed a generally positive orientation toward AI-based radiation dose reduction, with individual item means ranging from 3.51 to 3.89 and an overall composite mean of 3.67 (median 3.89, SD 1.11). The statement

“AI reduces unnecessary repeat imaging examinations” received the highest mean agreement (3.89), while “I trust AI-generated recommendations related to radiation dose optimization” received the lowest (3.51), suggesting that although professionals recognize AI’s practical benefits, a degree of caution persists regarding full reliance on AI-generated outputs. Full descriptive statistics are presented in Table 3 and Figure 4.

Table 3. Descriptive Statistics for Attitude/Perception Likert Items (1–5 scale)

Statement	Mean	Median	Mode	SD
AI can improve image quality while reducing radiation dose.	3.71	4.00	5	1.32
AI-based technologies can help optimize CT scan protocols.	3.57	4.00	4	1.28
AI can improve patient safety in medical imaging.	3.62	4.00	5	1.43
AI reduces unnecessary repeat imaging examinations.	3.89	4.00	5	1.30
AI can assist radiology professionals in maintaining radiation safety standards.	3.64	4.00	5	1.30
AI will become an essential part of future radiology practice.	3.78	4.00	5	1.26
AI implementation can reduce workload and improve efficiency.	3.71	4.00	5	1.29
I trust AI-generated recommendations related to radiation dose optimization.	3.51	4.00	4	1.26
AI can reduce human errors in radiology practice.	3.58	4.00	5	1.34
AI may negatively affect job opportunities in radiology.	3.55	4.00	5	1.43

Perceived Barriers to AI Implementation

Respondents could select multiple barriers to AI implementation in radiology practice. High installation cost (52.2%), lack of training (42.5%), and lack of institutional support (38.9%) were the most frequently cited barriers, followed by additional concerns detailed in Figure 5.

Associations Between Demographic/Professional Variables and Knowledge/Attitude Outcomes

Chi-square (χ^2) tests of independence were conducted to examine associations between demographic/professional characteristics and key knowledge/attitude outcomes (Table 4, Figure 6). Three associations reached statistical significance ($p < 0.05$): (1) gender and awareness that AI can reduce radiation dose ($\chi^2 = 5.21$, $df = 1$, $p = 0.022$), with a higher proportion of male respondents

reporting awareness compared to female respondents; (2) professional role and perceived importance of AI ($\chi^2 = 7.06$, $df = 2$, $p = 0.029$), which varied across student/intern, radiologic technologist, and other professional-role groupings; and (3) workplace AI software use and perceived importance of AI ($\chi^2 = 10.77$, $df = 2$, $p = 0.005$), with respondents whose workplace already used AI-based imaging software more likely to rate AI as important or very important for future radiation dose reduction. All other tested associations including age group, years of experience, workplace setting, and prior formal AI training versus awareness/attitude outcomes were not statistically significant ($p > 0.05$), suggesting that direct workplace exposure to AI, rather than age or years of experience alone, is more strongly linked to positive perception.

Table 4. Chi-Square Test Results for Selected Associations

Association	χ^2	df	p-value	Interpretation
Gender × Awareness of AI dose reduction	5.214	1	0.0224	Significant
Gender × Heard of AI in radiology	0.304	1	0.5815	Not significant
Gender × Perceived importance	2.853	1	0.0912	Not significant
Age group × Awareness of AI dose reduction	0.000	1	1.0000	Not significant
Age group × Perceived importance	0.959	1	0.3275	Not significant
Experience × Awareness of AI dose reduction	1.073	2	0.5847	Not significant
Experience × Perceived importance	0.047	2	0.9768	Not significant
Professional role × Awareness of AI dose reduction	0.110	2	0.9464	Not significant
Professional role × Heard of AI in radiology	1.843	2	0.3980	Not significant
Professional role × Perceived importance	7.062	2	0.0293	Significant
Professional role × Wants training	3.158	2	0.2062	Not significant
Workplace setting × Awareness of AI dose reduction	1.658	4	0.7984	Not significant
Heard of AI × Perceived importance	0.116	1	0.7332	Not significant
Awareness of AI dose reduction × Wants training	0.000	1	0.9893	Not significant
Workplace AI software use × Perceived importance	10.774	2	0.0046	Significant
Received formal AI training × Awareness of AI dose reduction	5.421	2	0.0665	Not significant

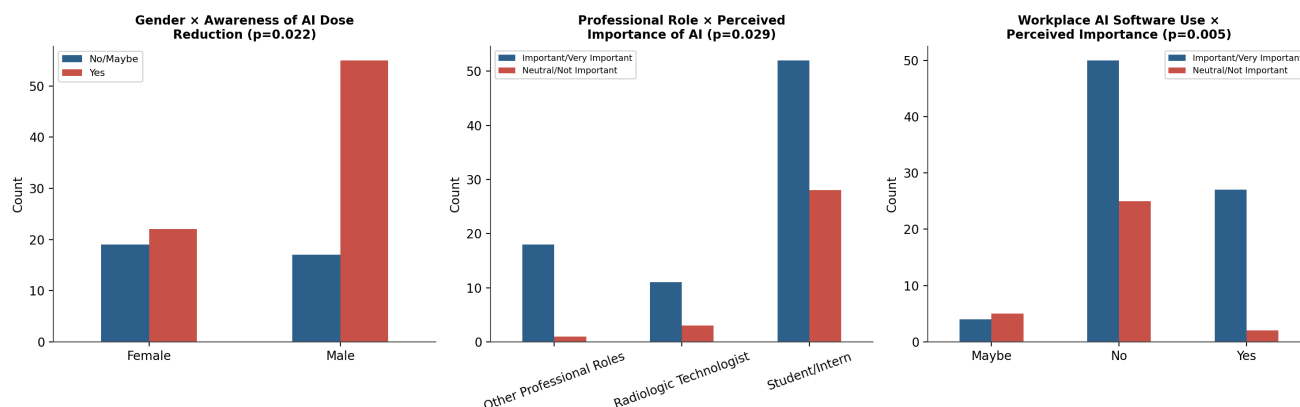


Figure 1. Significant associations identified by chi-square testing ($p < 0.05$).

DISCUSSION

This cross-sectional survey of 113 diagnostic and surgical imaging professionals found a pattern that closely mirrors the broader AI-in-radiology KAP literature: high general awareness of AI, generally favourable attitudes, but a persistent gap between awareness and both formal training and workplace implementation. The proportion of respondents who had heard of AI in radiology (84.1%) and who were specifically aware that AI can reduce radiation dose (68.1%) is broadly consistent with, and in the case of general AI awareness somewhat higher than, findings from international radiologist and resident surveys, where awareness of AI is typically high but detailed, curriculum-based knowledge remains limited.[16,17] This gap between broad awareness and applied knowledge was evident in the present sample as well: despite high awareness, only 26.5% had received formal AI training and only 25.7% worked in a department currently using AI-based imaging software, echoing reports that formal AI education in radiology curricula remains inconsistent even as clinical AI tools proliferate.[17,18,20]

The attitude/perception findings were consistently positive across all ten Likert items (means 3.51–3.89 of 5), with the strongest agreement on AI's ability to reduce unnecessary repeat imaging and the weakest though still net-positive agreement on trusting AI-generated dose-optimization recommendations outright. This pattern, in which functional/practical benefits are endorsed more readily than unconditional trust in autonomous AI output, has been reported in prior AI-in-radiology attitude surveys and is consistent with the broader finding that comfort with AI recommendations tends to lag behind recognition of AI's technical benefits.[16,19] Similarly, the item addressing potential negative impact on job opportunities (mean 3.55) reflects the residual concern about professional displacement that has been documented across multiple radiologist, resident, and medical-student AI surveys, even in populations that are otherwise strongly positive about AI adoption.[16,17,20]

The barrier profile identified here—high installation cost, lack of training, and lack of institutional support—aligns closely with radiation-protection and AI-adoption literature describing infrastructure and training deficits, rather than professional resistance, as the principal obstacles to safer and more effective dose-optimization practice.[11–15] This reinforces the interpretation that the knowledge-practice gap observed in this study is structural (driven by training and resource availability) rather than attitudinal.

The chi-square analysis offers a further, arguably more actionable, insight: neither age nor years of professional experience was significantly associated with awareness or perceived importance of AI, whereas direct workplace exposure to AI-based imaging software was strongly associated with rating AI as important for future dose reduction ($p = 0.005$). This suggests that positive perception is shaped more by hands-on exposure than by seniority or tenure—a pattern consistent with prior work showing that AI-specific training and experience, rather than general clinical experience, predict more favourable

attitudes toward AI adoption.[17,20] The significant association between gender and awareness of AI-based dose reduction ($p = 0.022$), with higher awareness among male respondents, warrants cautious interpretation given the sample's demographic skew (63.7% male, 91.2% aged 20–25 years, 70.8% students/interns) and should be examined in future, more demographically balanced studies rather than over-generalized. Likewise, the significant association between professional role and perceived importance of AI ($p = 0.029$) is consistent with reports that attitudes toward AI vary meaningfully across professional strata (e.g., students versus practising technologists versus radiologists), reflecting differences in exposure, responsibility, and stake in the technology's clinical and economic impact.[16,17]

Taken together, these findings support a specific and practical interpretation: the professionals surveyed are not resistant to AI-based radiation dose reduction—on the contrary, they are broadly favourable toward it—but they are currently under-trained and under-exposed relative to their own expressed interest (68.1% wanted dose-reduction-specific training). This is consistent with calls elsewhere in the literature for structured, curriculum-embedded AI education in diagnostic and interventional imaging training programs, rather than reliance on incidental workplace exposure alone.[17,18]

LIMITATIONS

Several limitations should be considered when interpreting these findings. First, the sample was heavily weighted toward early-career respondents (91.2% aged 20–25 years; 70.8% students/interns), which limits generalizability to senior or more experienced diagnostic and surgical imaging professionals and may partly explain the low reported rates of workplace AI adoption and formal training. Second, convenience sampling and a single-timepoint, self-reported questionnaire design introduces the possibility of selection and social-desirability bias. Third, several chi-square comparisons involved sparse cells (expected counts < 5 in some cross-tabulations); results for these specific tests should be interpreted with caution, and Fisher's exact test may be a more appropriate alternative for these small subgroups in future analyses. Fourth, the 'source of knowledge' and 'barriers' items were multiple-response questions analysed by tallying individual selections rather than as mutually exclusive categorical variables, which precludes chi-square testing on those items. Finally, as a single-institution/network survey [adjust based on actual recruitment scope], the findings may not be generalizable to diagnostic and surgical imaging professionals in other institutional, regional, or healthcare-system contexts, and multi-centre studies with more balanced representation across seniority levels and professional roles are recommended to validate and extend these findings.

CONCLUSION

This study demonstrates that diagnostic and surgical imaging professionals hold generally positive knowledge, attitude, and perception toward AI-based radiation dose reduction, with strong recognition of its potential to reduce unnecessary repeat imaging,

improve image quality, and support radiation safety standards. However, this favourable disposition coexists with a marked gap between awareness and applied knowledge: current formal AI training and workplace implementation remain low relative to the high level of interest expressed by respondents. Hands-on workplace exposure to AI-based imaging software, rather than age or years of professional experience, emerged as the strongest correlate of perceiving AI as important for the future of radiation dose reduction. High installation cost, lack of training, and insufficient institutional support were identified as the principal barriers to adoption. These findings support the prioritization of structured, curriculum-integrated AI education and institutional investment in AI-based dose-optimization infrastructure as practical, high-yield strategies to translate the existing positive attitude of diagnostic and surgical imaging professionals into safer, more confident, and more consistent clinical practice.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

None.

Ethical Approval: Informed consent was obtained from all participants prior to enrolment.

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