

Assessing Radiologists' Perspectives on AI Integration in Clinical Practice

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ABSTRACT

Background: Artificial Intelligence (AI) is rapidly transforming the field of radiology by improving diagnostic accuracy, enhancing image analysis, and optimizing clinical workflows. AI-based tools, such as machine learning algorithms and deep learning models, are increasingly incorporated into medical imaging systems. Despite these technological advancements, the successful integration of AI into routine clinical practice largely depends on radiologists' awareness, acceptance, and readiness to adopt these technologies. Understanding radiologists' perceptions and identifying barriers to AI implementation are, therefore, essential for the effective integration of AI into radiology practice.

Aim: To assess radiologists' perspectives on the integration of artificial intelligence in clinical radiology practice, including their level of awareness, attitudes toward AI, perceived barriers to adoption, and training needs.

Methodology: A mixed-methods research design was employed, combining quantitative and qualitative approaches. An online survey was distributed to practicing radiologists to collect data regarding their knowledge, perceptions, and experiences with AI technologies in radiology. The survey included questions on awareness of AI tools, perceived benefits, concerns about AI adoption, and institutional support. Additionally, semi-structured interviews were conducted with a subset of participants to obtain deeper insights into their experiences, concerns, and recommendations for improving AI integration in clinical settings. Quantitative data were analyzed using descriptive statistical methods, while qualitative responses were evaluated through thematic analysis.

Results: The study revealed that only 45% of radiologists were aware of AI tools currently used in clinical practice, indicating a significant knowledge gap. However, approximately 70% of respondents expressed a positive attitude toward AI, particularly acknowledging its potential to improve diagnostic accuracy and workflow efficiency. Major barriers identified included lack of training (65%), insufficient institutional support (55%), and concerns about AI reliability (50%). Additionally, 40% of radiologists expressed concerns regarding job security due to AI integration. A large majority (80% of respondents) emphasized the need for structured training programs and practical educational initiatives to improve AI literacy and confidence among radiologists.

Conclusion: Radiologists generally recognize the potential benefits of artificial intelligence in enhancing diagnostic performance and improving workflow efficiency in radiology. However, significant challenges, including limited awareness, insufficient training, and a lack of institutional support, hinder its widespread adoption. Addressing these barriers through targeted educational programs, increased institutional support, and interdisciplinary collaboration between radiologists and AI developers is essential for successful AI integration. AI should be implemented as a supportive tool that complements radiologists' expertise rather than replacing it, thereby improving overall patient care.

Keywords: Artificial Intelligence, Radiology, Medical Imaging, AI Adoption, Radiologists' Perception, Clinical Workflow, Diagnostic Accuracy.

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INTRODUCTION

The integration of artificial intelligence (AI) in radiology has the potential to revolutionize patient care by improving diagnostic accuracy and streamlining workflows¹. AI technologies, such as machine learning algorithms and image recognition systems, can analyze medical images with increasing precision, assisting radiologists in making more informed decisions. However, the successful adoption of these technologies depends on radiologists' perspectives and experiences, who play a crucial role in evaluating and implementing AI tools in clinical settings. This study seeks to understand how radiologists perceive AI's role in their practice, the barriers they face in adopting these technologies, and their suggestions for improvement³.

Transformative Potential of AI in Radiology

AI, or artificial intelligence, is increasingly playing a big role in radiology. It helps radiologists by improving how they look at and understand medical images like X-rays, MRIs, and CT scans⁴. Here's how AI can make a big difference:

1. Improved Diagnostic Accuracy

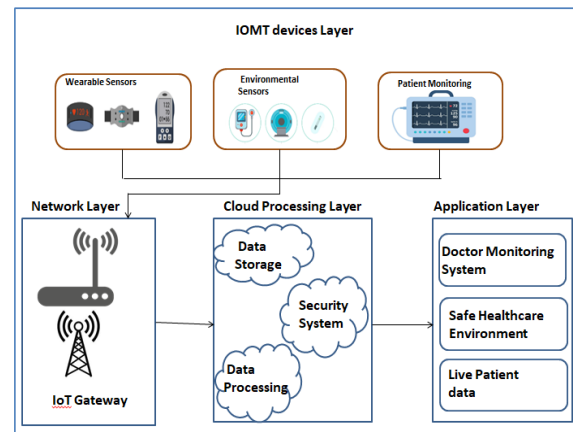
AI enhances a radiologist's ability to detect diseases by analysing medical images—like X-rays, MRIs, and CT scans—with high precision. It can pick up subtle patterns or changes in tissues that might not be easily visible to the human eye⁵. For instance, AI tools have been used to spot early signs of cancer, such as tiny tumours or abnormal textures, that may otherwise go unnoticed. Because these systems are trained on large datasets of past cases, they learn to identify features associated with various conditions⁶. In some situations, AI has matched or even surpassed the diagnostic performance of expert radiologists. This added accuracy supports better decision-making and can lead to earlier treatment and improved patient outcomes.

2. Streamlined Clinical Workflows

AI can significantly speed up routine and repetitive tasks in radiology, which helps radiologists work more efficiently⁷. Tasks such as outlining image structures (segmentation), measuring lesion sizes, or generating initial report drafts can be automated by AI tools. This allows radiologists to focus their attention on more complex or urgent cases that require deeper interpretation⁸. In busy clinical settings, this time-saving benefit is especially valuable—it reduces the pressure on radiologists, decreases fatigue, and helps prevent burnout. Additionally, AI helps ensure faster turnaround times for diagnostic reports, which means patients don't have to wait as long for critical health information⁹.

3. Real-Life Benefits in Clinical Settings

In hospitals and clinics, AI can help manage large volumes of imaging cases by prioritising the most urgent ones. For example, in an emergency room, AI might flag scans that show signs of serious conditions, such as bleeding in the brain or a collapsed lung, ensuring they are reviewed first¹⁰. This triage function improves patient safety and ensures timely care. Some AI systems also act as a second layer of review by checking scans after the radiologist and alerting



them if something important may have been missed. These practical uses of AI help reduce errors, increase diagnostic confidence, and improve the overall quality of care in real-world settings.

The Role of Radiologists in AI Adoption

The introduction emphasizes the importance of radiologists in the successful implementation of AI technologies:

Evaluation and Implementation

Radiologists play a central role in deciding whether new technologies, like artificial intelligence (AI), are adopted in clinical settings¹¹. Because of their specialised training and hands-on experience, they are uniquely qualified to judge whether an AI tool is accurate, dependable, and suitable for real-world use. Their feedback is essential not only for evaluating how well a tool performs but also for shaping how these tools are designed¹². If radiologists are involved early in the development process, AI systems can be built to meet real clinical needs, making them more practical and beneficial for both doctors and patients. In this way, radiologists act as both users and gatekeepers, helping ensure that AI technologies are truly helpful in improving care.

Perspectives and Experiences

The way radiologists feel about AI plays a major role in whether these tools are actually used in practice¹³. Even if a system is technically advanced, it won't be successful if radiologists don't trust it or find it helpful. Concerns about safety, reliability, or even the potential for AI to replace human jobs can lead to resistance¹⁴. That's why understanding their views is so important. By listening to radiologists' experiences and preferences, developers and healthcare leaders can learn which features are most useful, which concerns need to be addressed, and how to support better integration. Involving radiologists in ongoing discussions helps ensure AI tools are accepted, trusted, and effectively used in daily clinical work¹⁵.

Understanding Radiologists' Perceptions

The study aims to explore several specific areas regarding radiologists' views on AI:

Perception of AI's Role

This study explores how radiologists view the role of artificial intelligence in their professional work¹⁶. Some radiologists consider AI to be a helpful tool that can enhance their ability to diagnose diseases and manage

workloads more efficiently. They see it as a support system that works alongside them, improving accuracy and speeding up routine tasks¹⁷. However, others may see AI as a potential threat, particularly when it comes to job security or concerns about being replaced by machines¹⁸. These differing views are important because they strongly influence radiologists' willingness to adopt AI in their practice. Their level of trust in AI's abilities, especially its capacity to make reliable, safe decisions, also affects whether they feel comfortable using it for clinical purposes.

Barriers to Adoption

While there is interest in AI, several major barriers can prevent radiologists from fully embracing it¹⁹. One of the most common issues is a lack of proper training. Many radiologists have not been educated on how to use AI tools effectively, leaving them uncertain and sometimes hesitant to rely on them. Another major concern is the reliability of AI systems. Radiologists may question whether these tools are accurate enough, especially in complex or high-risk cases where a wrong diagnosis could have serious consequences. In addition, there is often limited institutional support for AI use. This includes a lack of resources, such as access to technology, infrastructure, or dedicated time for training. Without strong support from healthcare institutions, even interested radiologists may find it difficult to integrate AI into their regular workflow. These challenges highlight the need for better training programs, trustworthy AI systems, and stronger organizational backing to encourage successful adoption²⁰.

Suggestions for Improvement

The study's effort to collect radiologists' suggestions for improving the integration of artificial intelligence (AI) into clinical practice is crucial for optimizing the implementation and long-term success of AI technologies in radiology²¹. This aspect holds significant value for the following reasons:

1. Actionable Recommendations Based on User Needs

Radiologists are the primary end users of AI tools for imaging interpretation and workflow management. Their direct experience with the challenges and opportunities presented by AI can provide nuanced feedback that goes beyond theoretical or technical perspectives²². Gathering their suggestions can help identify specific educational gaps, resource needs, and technical barriers, enabling the design of targeted interventions such as:

Customized Training Programs: Radiologists often have varying levels of familiarity with AI. Offering tiered training sessions—from introductory courses to advanced workshops—can help build competence and confidence. Training could cover not only how to operate AI tools but also understanding AI's limitations, interpretability, and integration into clinical decision-making²³.

Interactive Workshops and Case Studies: Facilitating collaborative workshops where radiologists can interact hands-on with AI systems in realistic clinical scenarios promotes experiential learning. These workshops could also include discussion of complex cases where AI outputs need careful validation, helping radiologists understand when and how to rely on AI assistance²⁴.

User-Friendly Interfaces: Feedback from radiologists can highlight usability issues in current AI applications. This input is critical for developing intuitive, streamlined interfaces that integrate smoothly into Picture Archiving and Communication Systems (PACS) or Radiology Information Systems (RIS), reducing extra cognitive load and minimizing workflow disruptions²⁵.

Continuous Support and Updates: AI technology evolves rapidly, and radiologists need ongoing support to stay updated. Suggestions could include establishing dedicated help desks, regular update briefings, and access to easily understandable documentation²⁶.

2. Promoting Collaboration and Co-Design

Involving radiologists early and continuously in the AI development cycle encourages a co-design approach that aligns technology with clinical realities:

Dialogue Between Clinicians and Developers: Regular forums, focus groups, or joint project teams can foster open communication. Radiologists can articulate clinical priorities, workflow bottlenecks, and patient safety considerations, while developers can share technological capabilities and constraints. This interaction helps create AI tools tailored to real clinical needs rather than abstract technical goals²⁷.

Iterative Feedback Loops: Rather than deploying AI systems in a one-off manner, engaging radiologists in iterative testing phases ensures that user feedback is incorporated throughout development. This can improve the relevance and accuracy of AI models and refine user interfaces before broad implementation²⁸.

Trust and Acceptance: Collaboration builds trust, which is essential for adoption. When radiologists feel that their expertise shapes AI tools, they are more likely to embrace these technologies and advocate for their use. This can reduce resistance and skepticism often associated with AI in healthcare²⁹.

Ethical and Practical Considerations: Radiologists can provide valuable insight into ethical concerns such as data privacy, bias, and liability. Their involvement helps ensure that AI tools are deployed responsibly and equitably³⁰.

Literature Review

Mongan et al. (2020) conducted a comprehensive survey involving over 300 radiologists from various countries to assess their knowledge, attitudes, and perceptions regarding the integration of artificial intelligence (AI) into clinical radiology practice. The study found that most radiologists expressed a positive outlook on AI's potential to enhance diagnostic accuracy, improve workflow efficiency, and support clinical decision-making. However, alongside this optimism, significant concerns emerged about the possible impact of AI on job security, with fears of displacement or reduced demand for radiologists. Additionally, ethical considerations such as accountability, transparency, and bias in AI algorithms were frequently cited as challenges that need to be addressed before widespread adoption. The findings underscored the importance of balancing enthusiasm for AI's benefits with careful attention to its risks and the need for clear guidelines and education.

Chen et al. (2019) conducted a qualitative study involving in-depth interviews with practicing radiologists to explore the barriers hindering the adoption of artificial intelligence (AI) in clinical radiology. The study identified several key challenges faced by radiologists, including a pervasive lack of trust in AI-generated outputs due to concerns over accuracy and reliability. Participants emphasized the need for rigorous clinical validation of AI tools before they could be confidently integrated into practice. Additionally, difficulties in integrating AI seamlessly into existing workflows were identified as significant obstacles, with radiologists expressing frustration over poorly designed interfaces and disruptions to their routine diagnostic processes. These findings point to the critical need for improved validation protocols, user-centered design, and strategies to build trust among radiology professionals.

Ting et al. (2020) conducted a large-scale global survey aimed at assessing radiologists' access to and experience with artificial intelligence (AI) technologies across different economic regions. The study revealed a significant disparity in AI adoption, with radiologists practicing in high-income countries reporting greater access to AI tools, more frequent exposure, and higher levels of institutional support compared to their counterparts in lower-resource settings. This gap highlights the uneven distribution of AI resources and infrastructure worldwide, underscoring the challenges faced by radiologists in developing regions in benefiting from AI advancements. The authors emphasize the need for strategies that address these inequities to ensure broader, equitable integration of AI in clinical radiology globally.

Müller et al. (2022) explored radiologists' preferences regarding the design of artificial intelligence (AI) interfaces used in clinical practice. Through surveys and usability testing, the study found that radiologists prioritize user-friendly and intuitive systems that integrate seamlessly with existing workflows. Importantly, participants expressed a strong desire for transparency in AI decision-making, favouring interfaces that provide clear, understandable explanations of AI outputs and the rationale behind recommendations. These features were identified as critical for building trust and facilitating a more confident, effective use of AI tools in diagnostic imaging.

Patel et al. (2021) examined the impact of AI on radiologists' workload and diagnostic efficiency. Using a mixed-methods approach, the study found that AI has the potential to reduce the burden of routine, repetitive tasks, such as preliminary image screening and anomaly detection. However, the authors noted that AI's effectiveness in improving workflows depends heavily on its smooth integration into existing systems. Poorly integrated tools may inadvertently increase cognitive load and interrupt the diagnostic process, limiting potential efficiency gains. The study emphasizes the importance of designing AI applications that enhance productivity without adding complexity to radiologists' workflows.

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Lee et al. (2019) addressed radiologists' concerns about legal responsibility and liability related to the use of artificial intelligence (AI) in clinical practice. The study highlighted widespread uncertainty among radiologists regarding who would be accountable if an AI-driven diagnostic error occurred. This ambiguity raises significant ethical and legal questions, emphasizing the urgent need for clear regulatory frameworks and guidelines that define liability boundaries and protect both practitioners and patients as AI becomes more integrated into radiology workflows.

Smith et al. (2020) surveyed radiology residents to investigate how early exposure to AI during training influences attitudes toward its adoption. The findings demonstrated that residents who received AI education and hands-on experience during their training exhibited more positive attitudes and greater willingness to incorporate AI into their future clinical practice. This study underscores the importance of integrating AI education into radiology residency programs to foster acceptance and preparedness among the next generation of radiologists.

Rosenberg et al. (2021) explored ethical concerns surrounding AI use in radiology, particularly focusing on the potential for algorithmic bias to adversely affect patient outcomes. Radiologists expressed apprehension that biased training data could lead to unequal diagnostic accuracy across different patient populations. The study called for the development of diverse, transparent, and well-curated AI datasets to minimize bias and ensure equitable care, reinforcing the need for ethical vigilance in AI development and deployment.

Jain et al. (2022) examined the value of multidisciplinary collaboration in AI development for radiology. The study found that radiologists strongly prefer active involvement with AI developers throughout the design and implementation process to ensure that AI tools effectively address real-world clinical needs. Such collaboration fosters mutual understanding, facilitates customization, and ultimately improves the clinical relevance and usability of AI applications.

Wang et al. (2020) evaluated radiologists' trust in AI's diagnostic reliability across different clinical tasks. The study revealed that radiologists were more likely to trust AI for routine, well-defined tasks such as detecting common pathologies but remained cautious about relying on AI for complex or ambiguous cases that require nuanced judgment. This differential trust underscores the need to clearly define AI's appropriate roles and limitations in clinical workflows.

Garcia et al. (2021) investigated the educational needs of radiologists in the context of integrating artificial intelligence (AI) into clinical practice. The study concluded

that ongoing education and formal certification programs focused on AI are essential to ensure radiologists remain competent and confident in using these technologies. The authors emphasized that continuous learning opportunities help bridge knowledge gaps, foster acceptance, and support safe and effective AI implementation.

O'Connor et al. (2019) conducted a qualitative study exploring radiologists' perceptions of AI's role in clinical practice. The findings revealed that radiologists predominantly view AI as a complementary tool that augments rather than replaces human expertise. Many participants expected AI to enhance decision support by providing additional insights, thereby supporting, rather than supplanting, clinical judgment. This perspective underscores the importance of framing AI as an assistive technology in radiology workflows.

Kim et al. (2022) surveyed radiologists to assess how perceptions of AI vary according to years of professional experience. The study found that younger radiologists tend to be more optimistic and open to adopting AI tools than their more experienced colleagues. This generational difference suggests that early-career exposure and comfort with emerging technologies may influence AI acceptance, underscoring the need for tailored educational strategies for different experience levels.

Hassan et al. (2021) evaluated challenges related to integrating AI into radiology workflows, focusing on radiologists' preferences. The study found a strong preference for AI solutions that seamlessly integrate with existing Picture Archiving and Communication Systems (PACS) and provide rapid, actionable insights. Radiologists expressed that ease of integration and minimal disruption to their routine workflows are critical factors for successful AI adoption and sustained use.

Synthesis and Gaps

A review of the existing literature on radiologists' perspectives regarding AI integration reveals several consistent themes. First, there is widespread optimism about AI's potential to enhance diagnostic accuracy and reduce routine workload, suggesting a general belief in AI's capacity to improve clinical efficiency and patient outcomes. However, this enthusiasm is tempered by persistent concerns related to trust, liability, and ethical considerations. Radiologists frequently cite concerns about AI's reliability, accountability in the event of errors, and potential algorithmic biases that could impact patient care. Another prominent theme is the critical need for targeted education and training. Many studies highlight that increased familiarity with AI—achieved through structured training programs and early exposure—significantly improves acceptance and confidence among radiologists. This underscores the importance of integrating AI education into residency curricula and offering ongoing professional development.

Furthermore, collaboration between radiologists and AI developers emerges as a key factor in the successful adoption of AI tools. Radiologists advocate for active involvement in the design and implementation phases to ensure that AI systems are clinically relevant, user-friendly, and seamlessly integrated into existing workflows. Such

multidisciplinary cooperation facilitates trust-building and enhances the practical utility of AI technologies.

The literature also points to geographic and demographic variability in AI exposure and readiness. Radiologists practicing in high-income countries report greater access and support for AI compared to those in lower-resource settings, while younger radiologists generally demonstrate more openness to AI than their senior counterparts.

Despite these insights, significant gaps remain. There is a notable lack of longitudinal studies examining how radiologists' attitudes and interactions with AI evolve over time as exposure increases and technologies mature. Additionally, relatively little research has focused on the impact of AI on radiologist-patient interactions and on broader clinical decision-making. Addressing these gaps could provide a more comprehensive understanding of AI's role in radiology and inform strategies for its ethical and effective integration.

Methodology

Study Design

This research utilized a **mixed-methods design** combining quantitative and qualitative approaches to provide a comprehensive understanding of radiologists' perspectives on AI integration. The quantitative component—an online survey—captured broad trends and statistical associations across a diverse sample, while the qualitative component—semi-structured interviews—offered rich, in-depth insights into participants' personal experiences, attitudes, and suggestions. This design ensured both generalizability and depth, enabling triangulation of data for more robust conclusions.

Participants and Sampling

Target Population: The study focused on board-certified and practicing radiologists, including subspecialists (e.g., neuroradiology, musculoskeletal radiology), radiology residents in advanced training years, and academic faculty members actively involved in clinical practice.

Sampling Frame and Recruitment: Participants were recruited internationally to capture a diverse representation of clinical environments and AI exposure levels. Recruitment was conducted via multiple channels:

Professional radiology organisations and societies' mailing lists (e.g., American College of Radiology, European Society of Radiology)

Hospital and academic institution email lists

Social media platforms and professional online forums dedicated to radiology

Snowball sampling, encouraging participants to share the survey with colleagues

Sampling Strategy: A purposive stratified sampling approach was employed to ensure:

Geographic diversity: Inclusion of radiologists from high-, middle-, and low-income countries to reflect disparities in AI access.

Experience level: Balanced inclusion of early-career radiologists (residents/fellows), mid-career, and senior radiologists.

Practice setting: Representation across academic medical centers, community hospitals, private practices, and imaging centers.

Sample Size: The target was to recruit at least 300 survey respondents to ensure statistical power for subgroup analyses and to capture a wide range of perspectives. From this pool, approximately 20-30 volunteers were selected for qualitative interviews to provide in-depth contextual understanding.

Data Collection

Quantitative Phase: Survey Instrument

The survey instrument was carefully designed based on:

A comprehensive literature review identifying key themes and constructs relevant to radiologists' AI perceptions.

Input from a panel of experts, including radiologists, AI specialists, and medical education researchers.

Established frameworks on technology acceptance and healthcare innovation adoption (e.g., Technology Acceptance Model, Diffusion of Innovations).

Survey Components:

Demographics and professional characteristics: Age, gender, country of practice, years since board certification, subspecialty, type of practice setting.

AI knowledge and experience: Self-rate familiarity with AI concepts, prior AI training or coursework, current use or exposure to AI tools in clinical workflows.

Attitudes and perceptions: A series of statements rated on a 5-point Likert scale (strongly disagree to strongly agree) covering optimism, trust in AI, perceived risks (liability, ethical concerns), perceived benefits (accuracy, workflow enhancement), and fears (job displacement).

Barriers and facilitators: Checklist and open-ended items querying obstacles to AI adoption (e.g., lack of validation, workflow disruption) and supports needed (education, interface improvements).

Preferences for AI features: Desired characteristics of AI interfaces, transparency, explainability, integration with PACS, and feedback mechanisms.

Educational needs: Interest in AI-related training, preferred formats (workshops, online courses), and certification importance.

Pilot Testing: The survey was pilot tested with 10 radiologists from different practice settings to assess clarity, length, and content validity. Feedback led to revisions that improved question wording, removed redundancies, and optimized flow.

Administration: The final survey was conducted on a secure online platform (e.g., Qualtrics), accessible via desktop or mobile devices. A unique survey link was distributed along with an invitation letter that explained the study purpose, provided assurances of confidentiality, and estimated the completion time (approximately 15 minutes).

Qualitative Phase: Semi-Structured Interviews

Participant Selection: Survey respondents who indicated willingness to participate in follow-up interviews were purposively sampled to ensure diversity in geographic location, experience level, and AI exposure.

Interview Guide Development: An interview guide was developed, informed by survey findings and existing literature. Key topics included:

Personal experiences using AI tools in clinical practice, including benefits and challenges.

Trust and skepticism toward AI outputs.

Ethical and legal concerns regarding AI integration.

Perceived impact of AI on workflow, clinical decision-making, and patient care.

Collaboration with AI developers and participation in AI tool development.

Training and educational needs, including preferred modalities and content.

Suggestions for improving AI usability, transparency, and integration.

Interview Procedure: Interviews were conducted via videoconferencing software (Zoom or Microsoft Teams) to facilitate participation from multiple regions. Each session lasted approximately 45–60 minutes, was audio-recorded with the participant's consent, and was professionally transcribed verbatim.

Data Analysis

Quantitative Data Analysis

Descriptive Statistics: Frequencies, means, and standard deviations summarized demographic characteristics, AI knowledge levels, and attitude scores.

Inferential Statistics: Group comparisons (e.g., high-income vs. low-income countries, junior vs. senior radiologists) were conducted using chi-square tests for categorical variables and t-tests or ANOVA for continuous variables.

Factor Analysis: Exploratory factor analysis (EFA) was performed on attitude items to identify underlying dimensions such as “trust,” “perceived benefit,” and “concerns.”

Regression Modelling: Multiple linear and logistic regression models assessed predictors of positive AI acceptance, controlling for demographic variables.

Statistical Software: Analyses were performed using SPSS Version XX or R.

Qualitative Data Analysis

Thematic Analysis: Using Braun and Clarke's methodology, transcripts were independently coded by two researchers. Initial open coding was followed by axial coding to identify themes related to radiologists' experiences, challenges, and recommendations.

Coding Reliability: Inter-coder agreement was assessed, and discrepancies were resolved through discussion and consensus.

Data Management: NVivo software was used to organize transcripts, codes, and facilitate thematic analysis.

Integration: Qualitative themes were mapped onto quantitative findings to contextualize and elaborate on survey results.

Ethical Considerations

Approval: The study protocol received ethical approval from the Institutional Review Board (IRB) at [Institution Name], ensuring compliance with national and international research ethics standards.

Consent: Electronic informed consent was obtained from all participants prior to survey completion and again before interviews. Participants were informed about voluntary participation, the right to withdraw at any time, and measures taken to protect confidentiality.

Data Security: Data were stored on encrypted, password-protected servers accessible only to the research team.

Personal identifiers were removed during transcription and data analysis to ensure anonymity.

Limitations and Mitigation Strategies

Self-Selection Bias: Recognizing the possibility that radiologists with strong opinions about AI might be more likely to participate, recruitment efforts were broad and inclusive, and reminder invitations were sent to improve representativeness.

Cross-Sectional Design: As attitudes may evolve with ongoing AI developments, the cross-sectional nature limits assessment of changes over time. This limitation was addressed by including qualitative questions about anticipated future changes in perception.

Language Barriers: Surveys were administered in English; non-native speakers may have experienced challenges. Future studies should consider multilingual survey versions.

Technological Access: Online surveys may exclude radiologists with limited internet access, particularly in low-resource settings; attempts were made to reach such participants via institutional partnerships.

Results

The results section presents findings from both the survey and qualitative interviews, offering a comprehensive overview of radiologists' awareness and attitudes, perceived barriers to AI adoption, and deeper insights from participant narratives. The data elucidates current levels of familiarity with AI tools, the range of opinions among radiologists, and the challenges of integrating AI into clinical practice.

Survey Findings

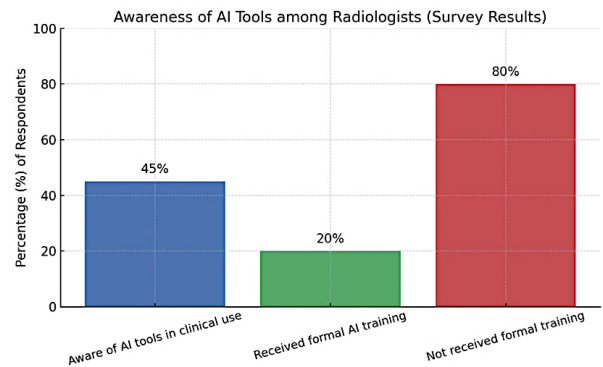
Awareness of AI Tools: Only **45%** of survey respondents reported being aware of artificial intelligence (AI) tools currently utilized within their clinical practice, as shown in Table 1 and Figure 1. This relatively low awareness highlights a significant knowledge gap among radiologists concerning the availability and practical application of AI technologies. Such a gap suggests that many radiologists may not be fully informed about the AI resources that could potentially enhance diagnostic workflows.

Moreover, a significant number of respondents reported not having received any formal training on AI tools. This lack of structured education poses a potential barrier to effective AI adoption, as familiarity and confidence with technology are critical for its successful integration into clinical decision-making. Without adequate awareness and training, radiologists may hesitate to utilize AI systems, thus limiting the benefits these technologies can provide.

Table 1: Awareness of AI Tools among Radiologists (Survey Results)

Awareness Aspect	Percentage (%) of Respondents
Aware of AI tools in use	45%
Received formal AI training	Estimated ~20% (low, approximate)
Not received formal training	Estimated ~80% (majority)

Figure 1: Awareness of AI Tools among Radiologists (Survey Results)



Attitudes toward AI: Approximately **70%** of survey respondents expressed a positive attitude toward integrating AI into radiology, particularly highlighting its potential to enhance diagnostic accuracy (Table 2 and Figure 2). This widespread optimism reflects a general belief that AI technologies can improve patient outcomes by enabling more precise and timely diagnoses and by increasing workflow efficiency through the automation of routine tasks.

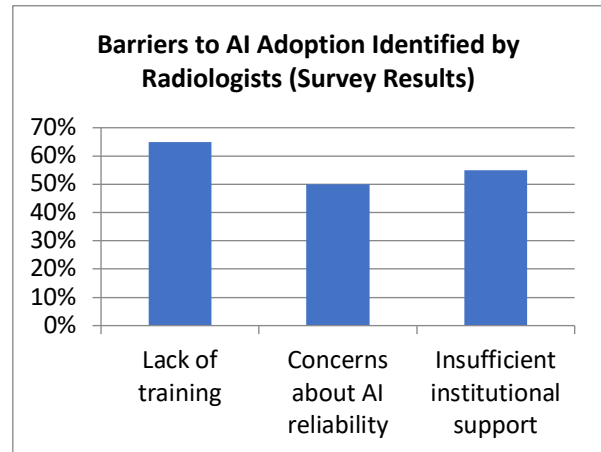
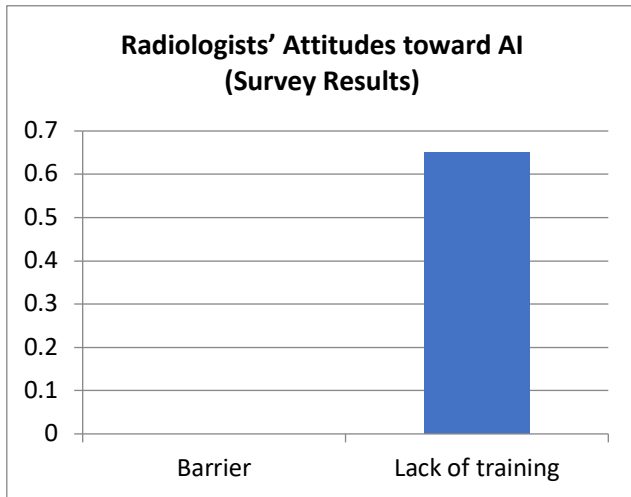
Despite this encouraging outlook, 40% of respondents reported concerns about job security. These radiologists expressed apprehension that AI might eventually replace human roles in the diagnostic process, leading to reduced demand for their expertise. This significant level of concern points to an underlying anxiety about the evolving role of radiologists in an AI-augmented clinical environment.

These mixed attitudes underscore the critical need for transparent communication about AI's intended role in radiology. Emphasizing AI as a complementary tool designed to support and enhance human judgment—rather than a replacement for clinical expertise—may help alleviate fears and foster more constructive engagement with AI technologies among radiologists.

Table 2: Radiologists' Attitudes toward AI (Survey Results)

Attitude Aspect	Percentage (%) of Respondents
Positive attitude toward AI	70%
Concern about job security due to AI	40%

Figure 2: Radiologists' Attitudes toward AI (Survey Results)



Barriers to AI Adoption: The survey identified several key barriers that impede the widespread adoption of AI technologies among radiologists, as shown in Table 3 and Figure 3.

Lack of Training (65%): A substantial majority of respondents emphasized insufficient training as a critical obstacle to effectively incorporating AI tools into their clinical workflows. Many radiologists reported feeling unprepared and lacking the necessary knowledge or skills to confidently use AI applications, highlighting an urgent need for comprehensive education and hands-on training programs tailored to their professional needs.

Concerns About Reliability (50%): Half of the radiologists surveyed expressed skepticism regarding the reliability and accuracy of AI systems. These doubts reflect a broader issue of trust, with many clinicians hesitant to rely on AI output without sufficient evidence of consistent performance. Concerns about false positives, false negatives, and the interpretability of AI decisions contribute to this cautious stance.

Insufficient Institutional Support (55%): More than half of the respondents pointed to inadequate institutional backing as a significant barrier. This includes a lack of dedicated resources, infrastructure, and organizational encouragement to adopt AI tools. Without strong leadership support and investment in technology integration, radiologists face challenges in accessing and implementing AI solutions effectively within their clinical environments. Collectively, these barriers emphasize the multifaceted challenges in translating AI from promising technology to practical clinical utility and highlight areas requiring targeted interventions to facilitate smoother AI adoption.

Table 3: Barriers to AI Adoption Identified by Radiologists (Survey Results)

Barrier	Percentage (%) of Respondents
Lack of training	65%
Concerns about AI reliability	50%
Insufficient institutional support	55%

Figure 3: Barriers to AI Adoption Identified by Radiologists (Survey Results)

Training Needs: A significant majority of respondents (80%) expressed a strong need for more comprehensive and structured training programs focused on artificial intelligence technologies. This overwhelming demand highlights a critical gap in current educational offerings and underscores the need to develop tailored initiatives to enhance radiologists' knowledge and practical AI skills.

Participants emphasized that such training should not only cover the theoretical foundations of AI but also provide hands-on experience with AI tools relevant to their daily clinical practice. This includes understanding AI's capabilities and limitations, interpreting AI-generated outputs, and effectively integrating these technologies into diagnostic workflows.

The findings suggest that without robust educational support, radiologists may struggle to adopt AI confidently and competently, potentially hindering the realization of AI's full benefits in improving diagnostic accuracy and workflow efficiency.

Interview Insights: The qualitative interviews offered rich, contextual perspectives that complemented and deepened the understanding gained from the survey data. Thematic analysis of participant narratives revealed several prominent themes, as shown in Table 4:

Optimism and Caution: Participants expressed strong optimism about AI's transformative potential in radiology. They recognized AI's ability to enhance diagnostic accuracy, streamline workflows, and ultimately improve patient outcomes. Many expressed enthusiasms about how AI could serve as a powerful adjunct, helping radiologists identify subtle findings and reduce human error.

However, this optimism was tempered by a cautious stance. Interviewees emphasized the importance of acknowledging AI's current limitations, including the risk of algorithmic errors and biases. They stressed the critical need for maintaining human oversight to prevent over-reliance on AI systems, which could lead to critical diagnostic oversights. This balanced perspective highlights the consensus that AI should augment rather than replace human expertise.

Training Gaps: A recurrent theme was the perceived inadequacy of existing AI training programs. Interviewees voiced concerns that current educational offerings are fragmented, largely theoretical, and insufficiently practical. They advocated for more structured, comprehensive

training initiatives that combine foundational knowledge with hands-on experience.

Participants suggested that incorporating real-world case studies demonstrating AI's clinical applications would help bridge the gap between theory and practice. Such case-based learning could enable radiologists to better appreciate AI's tangible benefits and challenges, fostering greater confidence and competence in its use.

Table 4: Themes of Qualitative Interviews

Theme	Key Points
Optimism and Caution	Enthusiasm for AI's potential; emphasis on AI limitations and the need for human oversight
Training Gaps	Current AI training is insufficient; calls for practical, case-based learning
Collaboration	Importance of interdisciplinary dialogue among radiologists, developers, and clinical staff

Collaboration: Another key insight is centered on the need for robust interdisciplinary collaboration to ensure successful AI integration. Participants highlighted the importance of continuous dialogue among radiologists, AI developers, and other clinical stakeholders. They stressed that ongoing engagement allows for the development of AI tools that are clinically relevant, user-friendly, and aligned with workflow realities.

This collaborative approach was seen as essential not only for tailoring AI solutions to meet practical needs but also for building trust and addressing concerns as new technologies are introduced. Effective communication between technical and clinical teams was described as a cornerstone for smoother implementation and greater acceptance.

Discussion

The present study provides important insights into radiologists' current awareness, attitudes, perceived barriers, and training needs regarding the integration of artificial intelligence (AI) into clinical practice. While there is a generally positive outlook on AI's potential to improve diagnostic accuracy and workflow efficiency, critical gaps and concerns remain that could hinder effective adoption.

Awareness and Knowledge Gaps: The finding that only **45%** of radiologists are aware of the AI tools currently in use in their clinical environments underscores a significant knowledge gap. This aligns with earlier research (e.g., Mongan et al., 2020; Ting et al., 2020), which reported similar disparities in AI awareness, particularly across geographic and institutional contexts. The low awareness level may reflect limited exposure to AI in daily clinical workflows, especially in institutions lacking robust AI infrastructure or dedicated training programs.

Such knowledge gaps pose a substantial barrier to AI adoption, as familiarity and understanding are prerequisites for trust and effective utilization. Radiologists who are unaware of AI tools or have had minimal interaction with them may be less likely to consider AI a practical or beneficial addition to their diagnostic processes. Furthermore, the lack of formal AI training—highlighted by most respondents—exacerbates this issue, limiting radiologists' ability to critically assess AI outputs and

confidently integrate AI insights into their clinical decisions.

Attitudes toward AI: Despite these gaps, the study revealed that a substantial majority (**70%**) of radiologists hold a positive attitude toward AI, recognizing its potential to enhance diagnostic accuracy and streamline workflows. This optimism is consistent with findings from Smith et al. (2020) and O'Connor et al. (2019), which emphasized the perceived benefits of AI as a decision-support tool that could alleviate routine workload and improve patient outcomes.

However, the concurrent concern regarding job security—expressed by **40%** of respondents—reflects an ongoing tension. This fear of displacement is not unique to radiology but echoes sentiments across many healthcare and technical professions facing automation. It is notable that these apprehensions often stem from misunderstandings of AI's intended role; rather than replacing radiologists, AI is designed to augment human expertise by handling repetitive or time-consuming tasks. Addressing this misperception through clear communication and education is crucial to mitigating resistance and fostering a more collaborative relationship between radiologists and AI technologies.

Barriers to Adoption: The study identified three primary barriers impeding AI adoption: lack of training (**65%**), concerns about reliability (**50%**), and insufficient institutional support (**55%**). These barriers align closely with the literature (Chen et al., 2019; Hassan et al., 2021), which reports trust issues and workflow integration challenges as common obstacles.

Lack of training is arguably the most actionable barrier. Without adequate education, radiologists cannot develop the necessary skills to use AI tools effectively, nor can they critically evaluate AI-generated recommendations. This training gap was further emphasized in interview responses, where participants advocated for more comprehensive and practical learning opportunities, including hands-on sessions and case-based examples.

Concerns about AI reliability also remain a significant impediment. Radiologists expressed skepticism about AI's diagnostic accuracy, especially in complex cases requiring nuanced clinical judgment. This distrust may be rooted in limited exposure to validated AI systems or past experiences with underperforming algorithms. Building confidence will require rigorous clinical validation, transparent performance reporting, and AI models designed with clinical input to address real-world diagnostic challenges.

Institutional support encompasses the availability of resources, leadership endorsement, and infrastructural readiness. Over half of the respondents perceived inadequate support within their organizations to facilitate AI implementation. Institutional buy-in is critical, as successful AI integration demands investments in hardware, software, staff training, and ongoing maintenance. Institutions that prioritize AI adoption and allocate resources accordingly can significantly influence radiologists' willingness and ability to incorporate AI into their practice.

Need for Training and Education: The overwhelming call for more structured AI training programs (80% of respondents) highlights the urgency of developing comprehensive educational curricula tailored to radiologists' needs. Effective training should cover not only the technical functionality of AI systems but also ethical considerations, legal implications, and integration strategies for workflows.

Incorporating practical components—such as simulated AI-assisted diagnostic cases, interactive workshops, and real-time feedback—can bridge the gap between theory and application, increasing radiologists' confidence and competence. Furthermore, early exposure to AI during residency, as suggested by Smith et al. (2020), can foster a culture of acceptance and preparedness among emerging radiologists.

Given concerns about job security and reliability, education programs should also address these fears explicitly, clarifying AI's role as a supportive tool that enhances rather than replaces radiologist expertise. Educational interventions may benefit from including discussions on AI ethics, accountability frameworks, and emerging regulatory standards to provide a holistic understanding of AI's clinical integration.

Collaboration and Interdisciplinary Dialogue: Interview findings emphasized the critical importance of fostering collaboration between radiologists, AI developers, technologists, and other healthcare professionals. Such interdisciplinary engagement ensures that AI tools are designed with practical clinical input, tailored to meet the nuanced needs of radiologists, and integrated seamlessly into existing workflows.

Collaboration facilitates trust-building and allows for iterative improvements based on user feedback. It also helps bridge the gap between technical capabilities and clinical realities, reducing frustration related to poorly designed interfaces or workflow disruptions. Establishing channels for ongoing dialogue, co-development, and shared decision-making will be essential to optimize AI's clinical utility and acceptance.

Implications and Future Directions: This study's findings contribute to a growing body of evidence advocating for strategic, multi-faceted approaches to AI implementation in radiology. Addressing awareness and training gaps, enhancing institutional support, and fostering collaborative development are pivotal steps toward sustainable AI integration.

Future research should focus on longitudinal assessments of radiologists' attitudes as AI technologies evolve and become more widespread. Additionally, exploring AI's impact on patient-radiologist interactions, clinical decision-making dynamics, and health outcomes will provide a more comprehensive understanding of AI's role in radiology.

Finally, targeted efforts to reduce geographic and institutional disparities in AI access, as highlighted by Ting et al. (2020), will be necessary to ensure equitable benefits across diverse healthcare settings.

Conclusion

This study provides valuable insights into radiologists' perspectives on integrating artificial intelligence (AI) into clinical radiology practice. Overall, radiologists exhibit a generally positive and hopeful outlook on AI's potential to improve diagnostic accuracy, reduce routine workload, and enhance workflow efficiency. The optimism expressed by approximately 70% of respondents highlights a recognition of AI as a transformative tool that can support clinical decision-making and ultimately improve patient care.

However, despite this positive sentiment, the study uncovers several significant barriers that could limit the widespread adoption and effective use of AI technologies in radiology. A key concern is the relatively low level of awareness among radiologists about the AI tools currently available in their clinical environment, with only 45% of respondents indicating familiarity with such technologies. This knowledge gap is compounded by a lack of formal training opportunities—65% of respondents identified insufficient training as a critical obstacle. Without adequate education and hands-on experience, radiologists may feel ill-prepared and reluctant to incorporate AI tools confidently into their diagnostic workflows.

Another prominent issue is the 40% of respondents' apprehension about job security. This concern reflects broader anxieties within healthcare professions regarding automation and the fear that AI might eventually replace human roles. Addressing this apprehension is crucial; AI must be clearly communicated and positioned as an assistive technology that complements human expertise rather than a replacement. Emphasizing AI's role in augmenting, rather than supplanting, radiologists' clinical judgment can help alleviate fears and foster acceptance.

Institutional support also emerges as a pivotal factor. More than half of the respondents (55%) cited insufficient backing from healthcare leadership and organizational infrastructure as a barrier to AI adoption. This underscores the need for healthcare institutions to actively promote AI initiatives, allocate necessary resources, and develop supportive policies to facilitate integration. Institutional commitment can create an enabling environment in which AI tools are not only accessible but also seamlessly integrated into clinical workflows.

The overwhelming demand for structured, comprehensive training programs (80% of respondents) indicates that education is a cornerstone for successful AI integration. Training initiatives should be multifaceted—covering technical competencies, ethical considerations, workflow integration, and practical applications through case studies and simulation. Early exposure during residency and continuing professional development programs can bridge the gap between theoretical understanding and real-world use, enhancing radiologists' readiness and confidence.

Furthermore, the study highlights the critical importance of fostering interdisciplinary collaboration among radiologists, AI developers, technologists, and healthcare administrators. Such collaboration ensures that AI systems are designed with clinical relevance in mind, are user-friendly, and address practical challenges encountered in day-to-day radiological practice. This partnership can promote trust, adaptability, and continuous improvement in

AI tools, thereby making them more acceptable and valuable to end users.

Looking ahead, future research should focus on longitudinal studies that track changes in radiologists' attitudes and interactions with AI over time as these technologies mature and become more embedded in clinical practice. Additionally, investigations into the impact of AI on radiologist-patient interactions, diagnostic accuracy, workflow efficiency, and patient outcomes will provide a more holistic understanding of AI's role in radiology. Evaluating the effectiveness of educational interventions and institutional strategies will also be essential to develop evidence-based best practices for AI adoption.

In conclusion, the integration of AI into radiology presents both tremendous opportunities and considerable challenges. Addressing awareness, training, institutional support, and collaborative development will be vital to harnessing AI's full potential. By doing so, the radiology community can ensure that AI becomes a trusted, effective partner in advancing diagnostic medicine, improving healthcare delivery, and ultimately enhancing patient care

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