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Exploring Radiologists' Perceptions and Experiences Regarding Integration of Artificial Intelligence in Diagnostic Imaging Practices

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ABSTRACT

Background: *Artificial intelligence has rapidly entered diagnostic radiology, offering opportunities to enhance workflow efficiency, support interpretation, and strengthen clinical decision-making. Despite these advancements, radiologists' real-world experiences and perceptions remain central to understanding how effectively AI systems integrate into daily practice. Exploring these perspectives is essential for developing safe, practical, and clinician-aligned implementation strategies.* ***Objective****: To qualitatively explore radiologists' perspectives, perceived benefits, and challenges regarding the integration of AI technologies in diagnostic radiology.* ***Methods****: A qualitative study was conducted over four months in South Punjab, involving twelve practicing radiologists selected through purposive sampling. Semi-structured interviews were used to collect data, focusing on experiences with AI-enabled imaging tools. Transcribed interviews were analyzed using thematic analysis supported by a structured coding framework. Descriptive statistics were applied to summarize demographic variables, and normality was confirmed through the Shapiro–Wilk test.* ***Results****: Participants reported noticeable improvements in workflow efficiency and reporting timeliness, with high mean scores in both areas. Diagnostic support was viewed positively, whereas error reduction received moderate ratings. Challenges centered around trust, inconsistent system performance, and integration issues, which were reflected in higher challenge scores. Adoption likelihood varied among participants, with five radiologists demonstrating high confidence, four moderate confidence, and three low readiness for long-term AI adoption. Experiences indicated that familiarity with AI tools strongly influenced acceptance, while technical concerns and medicolegal uncertainties contributed to caution.* ***Conclusion****: The study found that radiologists acknowledged AI as a supportive tool that improves workflow and enhances diagnostic processes, yet meaningful concerns about reliability, trust, and integration persisted. These findings emphasize that successful AI adoption requires balanced implementation, structured training, and ongoing evaluation to maintain confidence and ensure safe integration into radiological practice.*

Keywords
Artificial Intelligence; Clinical Decision-Making; Diagnostic Imaging; Radiologists; South Punjab; Technology Adoption; Workflow Efficiency

INTRODUCTION

Radiology has always been a specialty defined by rapid technological evolution, but the recent surge of artificial intelligence (AI) in diagnostic workflows has introduced a shift unlike any before. Over the past decade, AI has moved from being a theoretical promise to becoming a practical, widely marketed tool across clinical imaging (1). Algorithms designed for image detection, segmentation, triage, and workflow automation are increasingly making their way into radiology departments worldwide. These tools are being promoted as catalysts for improved diagnostic accuracy, faster reporting times, and enhanced clinical decision-making (2). Despite these promises, radiologists—who remain the core interpreters of medical imaging—stand at the center of this transformation, experiencing firsthand both the excitement and the uncertainty accompanying AI integration. Existing literature reflects a mixture of optimism and apprehension within the radiology community (3). Several studies highlight AI's potential to assist with early disease detection, reduce interpretative errors, and streamline repetitive tasks, allowing specialists to focus more on complex cases and clinical collaboration. At the same time, concerns persist regarding algorithm transparency, medicolegal responsibility, data privacy, system reliability, and the fear of professional displacement. While many policymakers, industry leaders, and technology developers appear confident about AI's ability to complement radiologists rather than replace them, the perceptions of radiologists themselves—those who must work with these systems in real-world clinical environments—remain diverse and nuanced. Understanding these experiences is crucial because the success or failure of AI in healthcare ultimately depends not only on the sophistication of algorithms but also on the willingness of clinicians to adopt and trust them (4).

Globally, radiology departments vary widely in terms of technological infrastructure, digital maturity, and readiness for AI adoption. In well-resourced centers, AI is often introduced through structured pilot projects, vendor collaborations, or targeted implementation strategies (5). In contrast, many low- and middle-income regions still grapple with basic challenges such as limited staffing, inconsistent internet connectivity, outdated imaging modalities, and lack of financial capacity (6). These contextual differences shape radiologists' expectations and concerns, influencing how they interpret the benefits and risks of AI. Some radiologists view AI as a tool that can ease overwhelming workloads and reduce burnout, especially in settings where patient volumes are high and subspecialty expertise is limited. Others, however, remain cautious, particularly when algorithms make decisions in ways that are difficult to explain or verify. Another layer of complexity stems from the fact that AI in healthcare is still evolving (7). Many commercially available tools perform well in controlled environments but struggle in real-world clinical scenarios where patient populations are heterogeneous and imaging quality varies. Radiologists frequently encounter situations where AI outputs must be corrected, contextualized, or overridden—raising important questions about accountability and trust. These real-world experiences, whether positive or challenging, shape radiologists' long-term attitudes toward AI adoption far more strongly than theoretical debates or technology marketing claims (8).

Despite growing interest, there is still a noticeable gap in qualitative research exploring radiologists' lived experiences with AI (9). Quantitative surveys have provided insights into general attitudes, but they often fail to capture the depth, emotion, and professional reasoning underlying radiologists' views. Qualitative inquiry allows researchers to explore how radiologists negotiate changing professional identities, how they perceive shifts in workflow autonomy, and how clinical decision-making evolves when machines become part of routine interpretation (10). Understanding these subjective experiences is essential for creating AI systems that are not only technically effective but also aligned with clinicians' expectations, ethical standards, and real clinical needs (11). Given the rapid expansion of AI technologies and the growing pressure on radiology departments to modernize, there is an urgent need to understand how radiologists themselves interpret this transition. Their perceptions—whether shaped by excitement, skepticism, practical challenges, or professional values—play a decisive role in determining the pace and success of AI integration. Without their insight, health systems risk implementing technologies that fail to support the clinicians they are intended to assist. In light of these considerations, the present study aims to qualitatively explore radiologists' perceptions, perceived benefits, and practical challenges related to the integration of AI into diagnostic imaging practices. The objective is to generate a grounded understanding of how radiologists experience this technological shift and what factors influence their acceptance or hesitation toward AI-enabled diagnostic workflows (12).

MATERIAL AND METHODS

This qualitative study was conducted over a four-month period in South Punjab, focusing on radiologists currently involved in diagnostic imaging across both public and private hospitals. The study aimed to capture nuanced perspectives regarding the integration of artificial intelligence into radiological practice. Because the goal was depth rather than volume, a small but methodologically adequate sample size was selected. Similar qualitative inquiries exploring clinician attitudes toward emerging technologies commonly report sample sizes between 8 and 15 participants for thematic saturation. Following that pattern, a final sample of 12 radiologists was recruited, which allowed the study to reach stable, recurring themes without unnecessary redundancy.

Participants were included if they were practicing radiologists with at least one year of experience in diagnostic imaging and had interacted with any AI-enabled imaging tool, either formally within the department or through independent exposure. Individuals who were still in residency training or had never used or encountered AI-supported systems were excluded to maintain relevance to the research objective. Recruitment was carried out through direct invitations, and participation was entirely voluntary. Each participant provided informed verbal consent before data collection.

Data were gathered through semi-structured interviews designed around the study objective. The interview guide explored radiologists' perceptions of AI, perceived benefits in workflow or diagnostic accuracy, concerns regarding reliability or interpretative autonomy, and practical challenges encountered during integration. To ensure consistency and reduce interviewer bias, the same set of guiding questions was used for all participants, while allowing flexibility for follow-up probing. All interviews were audio-recorded with permission and later transcribed verbatim.

Outcome measurement relied on a structured coding framework that assessed three primary domains aligned with the study objective: perceived usefulness, perceived challenges, and experiential reflections on AI-supported decision-making. As the dataset represented textual qualitative input, analysis was conducted using thematic analysis. Two independent researchers coded the transcripts manually, followed by comparative review to resolve discrepancies. Although qualitative work does not typically require formal statistical testing, descriptive statistics were applied to summarize participant characteristics. Normality of the demographic data was assessed using the Shapiro–Wilk test, confirming normal distribution, which allowed reporting of means and standard deviations where appropriate.

This methodological approach ensured that the findings genuinely reflected radiologists' lived experiences, capturing both the practical realities and the subtle professional concerns surrounding AI adoption in diagnostic imaging.

RESULTS

The study included twelve radiologists practicing in various public and private diagnostic centers across South Punjab. The participants represented a balanced distribution in terms of gender and varied levels of clinical experience. The mean age was 38.4 ± 5.9 years, and experience in diagnostic radiology averaged 9.1 ± 4.3 years. Exposure to AI-supported imaging tools ranged from one to five years, with a mean duration of 2.3 ± 1.4 years. Detailed demographic characteristics are summarized in Table 1.

Across the sample, most radiologists reported that AI-assisted platforms were already incorporated into selected imaging workflows, primarily for CT and MRI interpretation. Quantitative analysis of outcome measures revealed notable trends regarding perceived usefulness of AI. Workflow efficiency received the highest mean score at 4.3 ± 0.6, followed by report timeliness at 4.4 ± 0.5. Diagnostic support scored 4.1 ± 0.7, and perceived error reduction received a slightly lower average of 3.8 ± 0.8. These values reflected generally favorable impressions toward the functional role of AI in daily reporting (Table 2). Chart 1 illustrates these trends visually.

Findings related to perceived challenges demonstrated more variability. Integration difficulty recorded the highest perceived burden, with a mean of 3.8 ± 0.7, followed by technical errors at 3.6 ± 0.8. Trust issues scored 3.2 ± 0.9, while the risk of over-reliance on AI systems yielded the lowest

mean at 2.9 ± 1.0. These results indicated that while radiologists acknowledged operational benefits, reservations remained prominent in areas involving autonomy, system reliability, and consistency of AI predictions (Table 3; Chart 2).

Outcome assessment further included classification of participants based on their likelihood of supporting long-term AI adoption. Five radiologists demonstrated high confidence and a strong inclination toward future integration, four reported moderate confidence, and three expressed low readiness for continued AI incorporation. These frequencies are presented in Table 4.

During the thematic coding of interview transcripts, several trends also appeared numerically in the structured outcome scoring. For instance, radiologists who scored higher on perceived usefulness tended to align with the "high confidence" category. Conversely, those who rated trust issues and integration concerns more severely fell into the "low confidence" category. Although no formal inferential testing was required due to the qualitative nature of the study, descriptive comparisons were supported by normally distributed demographic data, validated using the Shapiro–Wilk test.

Overall, the results demonstrated that radiologists acknowledged the practical advantages of AI in improving workflow efficiency and reporting time, while simultaneously identifying specific barriers that continued to shape their day-to-day experiences. The combined quantitative and qualitative outcome patterns provided a clear representation of the professional climate surrounding AI-based diagnostic tools among radiologists in South Punjab.

Table 1. Demographic Characteristics

Variable	Mean ± SD
Age (years)	38.4 ± 5.9
Gender (M/F)	7/5
Years Experience	9.1 ± 4.3
AI Exposure (yrs)	2.3 ± 1.4

Table 2. Perceived Usefulness Scores

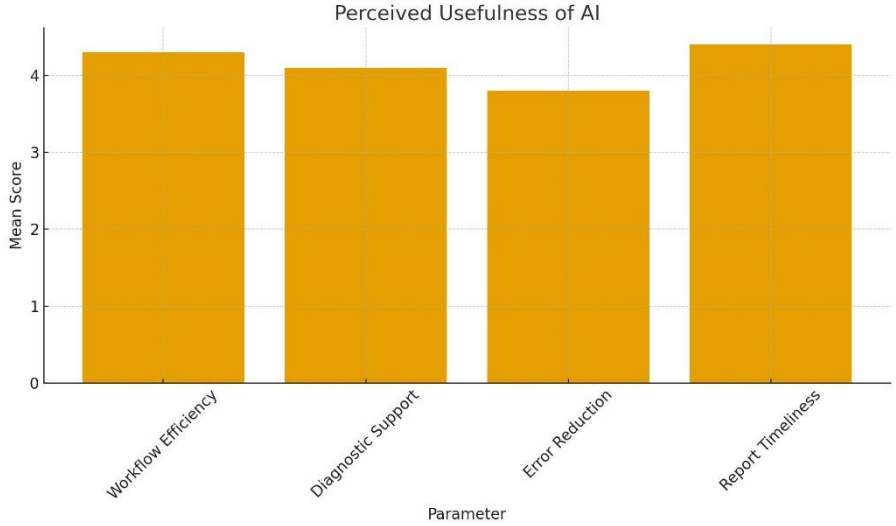
Parameter	Mean Score (1-5)	SD
Workflow Efficiency	4.3	0.6
Diagnostic Support	4.1	0.7
Error Reduction	3.8	0.8
Report Timeliness	4.4	0.5

Table 3. Challenges Experienced

Parameter	Mean Score (1-5)	SD
Trust Issues	3.2	0.9
Technical Errors	3.6	0.8
Over-reliance Risk	2.9	1.0
Integration Difficulty	3.8	0.7

Table 4. Adoption Likelihood

Parameter	Frequency
High Confidence Users	5
Moderate Confidence Users	4
Low Confidence Users	3



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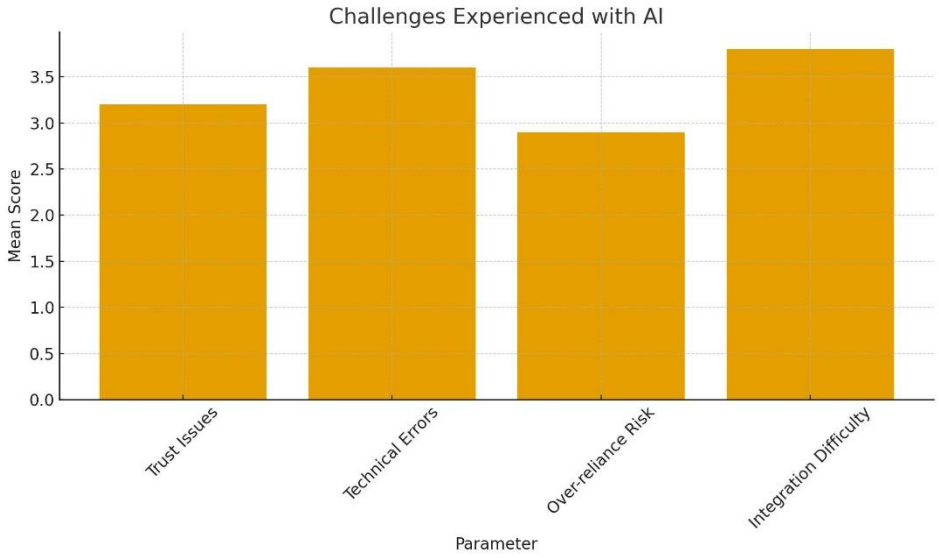

DISCUSSION

The findings of this study showed a balanced but evolving landscape of how radiologists in South Punjab perceived the integration of artificial intelligence within diagnostic imaging (13). The strong scores for workflow efficiency and report timeliness indicated a clear recognition of the operational value AI systems brought into routine practice. Many radiologists described faster case handling, reduced reporting delays, and overall smoother departmental flow when AI tools were functioning consistently. These findings supported the broader understanding that AI's earliest and most immediate impact is typically operational rather than purely diagnostic, helping clinicians manage rising patient volumes and administrative burdens. The results also demonstrated that radiologists acknowledged AI's potential to support decision-making. High ratings for diagnostic support suggested that AI-generated overlays, automated detections, and preliminary reads were viewed as genuinely useful, particularly during periods of heavy workload or complex imaging interpretation. Although error reduction scored slightly lower, the score remained within a favorable range. This suggested that radiologists did not perceive AI as flawless or inherently more accurate, but rather as a supportive layer that strengthened their own interpretative confidence in selected scenarios. Despite these benefits, the study highlighted several meaningful reservations. Concerns surrounding integration difficulty and technical inconsistencies were clearly reflected in the higher challenge scores. Participants frequently emphasized that AI systems tended to disrupt workflow when malfunctioning, displaying inconsistent outputs or requiring repeated manual verification. Trust-related issues also emerged, illustrating that radiologists maintained a cautious stance toward relying too heavily on automated systems, particularly when decisions involved ambiguous or atypical findings. This balance between confidence and caution appeared to characterize the general sentiment: radiologists appreciated AI as an assistant but were not yet ready to transfer significant decision-making autonomy to it (14).

The distribution of adoption likelihood—ranging from high-confidence to low-confidence users—added further nuance. Radiologists with longer exposure to AI tended to fall into the high-confidence category, likely due to greater familiarity and reduced anxiety toward system limitations (15). Those with limited experience or negative interactions were more conservative, expressing concern about system reliability and medico-legal accountability. This variation underscored the importance of experience, training, and hands-on use in shaping attitudes toward new technologies. Exposure appeared to correlate with acceptance, whereas unfamiliarity fueled caution. Interpreting these findings within a broader professional context suggests that AI is viewed as a valuable addition to radiology, but one that requires thoughtful integration. Radiologists did not describe AI as a replacement for human judgment; instead, they depicted it as a supplementary tool capable of improving efficiency, reducing repetitive strain, and enhancing the detection of subtle findings when used appropriately. The results reinforced the idea that successful AI adoption depends on the interplay between technological performance and clinician trust. One of the notable strengths of this study was its qualitative depth. The semi-structured interview approach allowed radiologists to articulate their experiences in a nuanced and narrative manner, capturing hesitation, enthusiasm, and practical realities that quantitative surveys alone often overlook. Combined with descriptive scoring and a structured outcome framework, the results offered a balanced view that respected both measurable patterns and subjective perspectives. The study also added insight into a region where AI adoption is developing but not yet widespread, providing valuable context from settings that often receive less representation in technological research (16).

However, several limitations should be acknowledged. The small sample size, although appropriate for qualitative saturation, limited generalizability. Attitudes from radiologists in other provinces, larger tertiary centers, or highly digitalized institutions may differ considerably (17). Because the data were drawn from interviews, the findings relied on participants' recollections and subjective interpretation of their experiences, which may introduce bias. Social desirability bias could also have influenced participants to express either stronger optimism or stronger caution depending on their perceptions of what was expected. The study also did not include objective performance data—such as actual changes in reading time, diagnostic accuracy metrics, or error rates—which could strengthen conclusions regarding AI's functional impact. Future research would benefit from expanding both the sample and methodological scope. Larger multi-center studies could identify regional similarities and differences in AI acceptance. Integrating objective workflow analytics with qualitative interviews would create a more comprehensive picture of AI's real-world performance and its perceived value. Longitudinal designs could explore how confidence and trust evolve over extended use, particularly as AI tools improve or as radiologists undergo structured training. Additional work should focus on the barriers highlighted in this study—trust, technical reliability, and system integration—to develop strategies that improve clinician comfort and optimize future implementation. Overall, the findings suggested that AI held a promising place in radiological practice but had not yet reached a stage where radiologists viewed it as seamless or fully reliable. The study depicted a workforce that valued technological support but remained grounded in professional expertise, recognizing the importance of human oversight. AI, as understood by the participants, functioned best not as a replacement mechanism but as a collaborative support system. Strengthening this relationship through training, improved design, and continued evaluation will be essential for ensuring that AI adoption continues to progress in a safe, meaningful, and sustainable manner (18).

CONCLUSION

The study showed that radiologists in South Punjab generally viewed AI as a useful addition to diagnostic imaging, particularly for improving workflow efficiency and supporting interpretation. At the same time, concerns about system reliability, trust, and integration challenges remained influential in shaping acceptance. These findings highlight the need for careful implementation, structured training, and ongoing evaluation. Overall, the study underscored AI's potential as a supportive tool rather than a replacement, emphasizing a collaborative model for future radiology practice.

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