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Beyond the Algorithm: Quick review of Real-World Hurdles for Radiology AI

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Abbreviations: AI: Artificial Intelligence; LLMs: Large Language Models

Introduction

The integration of artificial intelligence (AI) in radiology represents a transformative shift in the field, enhancing diagnostic accuracy, workflow efficiency, and overall patient care. AI technologies, particularly deep learning (DL) algorithms and use of large language models (LLMs), have been developed to optimize workflow, enhancing image quality, reducing radiation dose, analyzing medical images, assisting radiologists in detecting emergency findings, early-stage cancers, fractures, and other abnormalities that may otherwise go unnoticed as well as prediction of outcome. As these systems become increasingly embedded in clinical practice, their potential to improve healthcare delivery has garnered significant attention within the medical community and beyond [1,2].

However, the application of AI in radiology is not without challenges and controversies. Issues related to data quality and standardization, algorithmic bias, and ethical considerations such as patient privacy and informed consent pose substantial hurdles to widespread adoption. Moreover, the integration of AI tools into existing clinical workflows often requires overcoming operational barriers, including the need for robust governance frameworks and the financial implications of implementing these technologies. These challenges underscore the necessity for ongoing research, regulation, and education to ensure that AI is utilized safely and effectively in medical settings [3].

Challenges and Limitations

The integration of artificial intelligence (AI) in radiology presents a myriad of challenges that can impede its effectiveness and widespread adoption. These challenges can be broadly categorized as follows;

Technical Challenges

Data Quality and Standardization

The efficacy of AI algorithms relies heavily on the data used for training and validation. Issues such as data quality, standardization, and interoperability can significantly impact the performance of AI systems. For instance, discrepancies in imaging modalities and the diverse software platforms used by different diagnostic systems can complicate the development and deployment of AI algorithms, limiting their applicability across various medical environments [4,5].

Algorithm Generalizability & Interpretability/explainability

Generalizability is a major limitation of AI as applications are mostly unable to perform in similar patten across different platforms, devices and mostly patients' population. The complexity of AI models, particularly deep learning systems, can obscure their interpretability and many models are chosen without appropriate relevant clinical explanation, a matter named black-box bias [6].

Ethical Considerations

Algorithmic Bias

AI systems tend to perpetuate existing disparities in healthcare. Lack of diversity in training models creates a simple bias that is accentuated with each epoch/level during building of the AI model and furthermore during each application of the model afterwards. These biases not only jeopardize patient care but also perpetuate existing inequalities within healthcare systems. Addressing algorithmic fairness is vital to ensure that AI technologies do not exacerbate healthcare disparities [4,6].

Data Privacy and HIPPA Compliance

Patient data are sacred during medical practice and their privacy before, during and after image acquisition in compliance with HIPPA rules is nonnegotiable. However, this is still a gray zone. Whether patients need to be informed of the use of AI is not well an established practice [7,8].

Regulatory and Governance Issues

Deployers of AI systems must ensure adherence to guidelines concerning high-risk systems, including supervision of AI applications and maintain monitoring systems for input data. These regulatory requirements necessitate a high level of diligence from radiology departments, creating additional administrative burdens. Effective governance frameworks are essential for the responsible deployment of AI in radiology. These frameworks should prioritize transparency, rigorous evaluation, and the ethical use of AI technologies to mitigate risks associated with patient safety and data privacy. Collaborative efforts among regulatory bodies, healthcare providers, and technology developers are crucial to navigating the complexities of AI integration [7-9].

Operational Challenges

Integration into Clinical Workflows

Many radiology departments face difficulties in modifying their established processes to accommodate AI tools effectively. This requires not only technical adjustments but also changes in the culture and practices of healthcare teams to embrace AI-driven decision support systems [10].

Cost Implications

The financial implications of implementing AI in radiology cannot be overlooked and it creates potential disparities in access to innovative diagnostic tools [9,10].

Role of Radiologists in AI Integration

Despite these difficulties, the potential of AI to enhance imaging interpretation, automate workflow processes, and predict disease risk marks it as a critical partner in modern radiology. Radiologists' involvement in development and implementation of AI technologies into clinical practice is crucial to ensuring that these technologies augment rather than undermine the quality, safety, and equity of patient care. Radiologists must advocate for and contribute to the development of ethical frameworks that guide technological innovation and its application in clinical settings [11-13].

References

1. Najjar R (2023) Redefining Radiology: A Review of Artificial Intelligence Integration in Medical Imaging. Diagnostics (Basel) 13(17).
2. Lu Zhang, Mingqian Liu, Lingyun Wang, Yaping Zhang, Xiangjun Xu, et al. (2024) Constructing a Large Language Model to Generate Impressions from Findings in Radiology Reports. Radiology 312(3): e240885.
3. Michelle I Knopp, Eric J Warm, Danielle Weber, Matthew Kelleher, Benjamin Kinnear, et al. (2023) AI-Enabled Medical Education: Threads of Change, Promising Futures, and Risky Realities Across Four Potential Future Worlds. JMIR Med Educ 9: e50373.
4. Bernardo C Bizzo, Giridhar Dasegowda, Christopher Bridge, Benjamin Miller, James M Hillis, et al. (2023) Addressing the Challenges of Implementing Artificial Intelligence Tools in Clinical Practice: Principles from Experience. J Am Coll Radiol 20(3): 352-360.
5. Bizzo BC, RR Almeida, TK Alkasab (2021) Data Management in Artificial Intelligence-Assisted Radiology Reporting. J Am Coll Radiol 18(11): 1485-1488.
6. Kocak B, I Mese (2025) AI agents in radiology: toward autonomous and adaptive intelligence. Diagn Interv Radiol.
7. Elmar Kotter, Tugba Akinci D'Antonoli, Renato Cuocolo, Monika Hierath, Merel Huisman, et al. (2025) Guiding AI in radiology: ESR's recommendations for effective implementation of the European AI Act. Insights Imaging 16(1): 33.
8. Goisauf M, M Cano Abadia (2022) Ethics of AI in Radiology: A Review of Ethical and Societal Implications. Front Big Data 5: 850383.
9. Masooma Hassan, Andre Kushniruk, Elizabeth Borycki (2024) Barriers to and Facilitators of Artificial Intelligence Adoption in Health Care: Scoping Review. JMIR Hum Factors 11: e48633.
10. Tugba Akinci D'Antonoli, Christian Bluethgen, Renato Cuocolo, Michail E Klontzas, Andrea Ponsiglione, et al. (2025) Foundation models for radiology: fundamentals, applications, opportunities, challenges, risks, and prospects. Diagn Interv Radiol.
11. Schlemmer HP (2025) Navigating the AI revolution: will radiology sink or soar? Jpn J Radiol 43(10): 1628-1633.
12. Rohan Krishna Nk, Anupama RS, Shivaraj K (2025) Artificial Intelligence in Radiology: Augmentation, Not Replacement. Cureus 17(6): e86247.
13. Rafał Obuchowicz, Julia Lasek, Marek Wodziński, Adam Piórkowski, Michał Strzelecki, et al. (2025) Artificial Intelligence-Empowered Radiology-Current Status and Critical Review. Diagnostics (Basel) 15(3): 282.

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