

Artificial intelligence in radiology: Transforming the future of medical imaging in low and middle-income countries

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Artificial intelligence (AI) is transforming radiology, creating new possibilities to boost diagnostic accuracy, speed up workflows, and enhance patient care. As imaging practice advances, AI is becoming an essential aid for radiologists, helping them manage complex imaging tasks more efficiently and precisely. Below, I outline the ways AI can support radiology services in low and middle-income (LMICs) countries such as Nepal.

Applications of AI in Radiology

1. Image Analysis i.e Interpretative role: AI systems are highly effective at identifying abnormalities like tumors or fractures with impressive precision, often drawing attention to faint signs that could be missed by clinicians and supporting earlier detection. They can also prioritize emergency cases by triaging scans, so care teams are alerted to critical patients sooner and can respond more effectively

2. Non-interpretative role

1. Workflow Optimization

By automating repetitive tasks such as image segmentation and drafting screening reports, AI frees radiologists to concentrate on more complex cases, increasing efficiency and throughput.

2. Improving image quality

AI techniques can enhance image clarity and consistency by reducing noise, improving reconstruction, and optimizing acquisition parameters, which can lower the need for repeat scans and improve diagnostic utility.

3. Decision Support

AI systems offer evidence-based suggestions, quantitative measurements, and second-opinion insights that bolster diagnostic confidence and help reduce variability across readers.

Challenges and Ethical Considerations

The integration of AI into diagnostic radiology offers unprecedented opportunities for efficiency and accuracy, yet it simultaneously introduces profound ethical and operational challenges. As AI tools transition from research validation to clinical deployment, radiologists must navigate a complex landscape defined by algorithmic bias, liability ambiguities, and the risk of automation bias.

A major ethical issue is **algorithmic bias**. Many AI models are trained on datasets that do not reflect diverse populations, often over representing some groups while underrepresenting others. When a model is developed mainly from data in one region or ethnic group, its performance can drop when used on different patient populations. Mazurowski et al. (2025) warn that neglecting these biases

can worsen existing health inequities and urge that AI tools undergo thorough fairness testing across varied subgroups before being put into clinical practice.^{1,2}

Furthermore, the **“Black Box” problem** - the lack of interpretability in deep learning models complicates the principle of informed consent. When an AI system flags a pathology without providing a transparent rationale (such as a saliency map), clinicians may struggle to explain the diagnosis to patients. This opacity directly impacts **legal liability**. If a radiologist relies on an incorrect AI suggestion, or conversely, overrides a correct one, the allocation of malpractice liability remains legally murky. Recent experimental data suggest that disclosing AI error rates to juries can mitigate perceived radiologist liability, but the fear of litigation continues to drive “defensive” behaviors.^{1,2}

Automation bias presents a serious risk to clinical skills. Radiologists-especially trainees-may place excessive trust in AI outputs, treating them as definitive rather than probabilistic guidance. To mitigate this, the field is increasingly endorsing a Human-in-the-Loop model (HITL), where AI functions only as a triage or decision support aid and never as an autonomous decision maker. Robust governance and oversight are essential to ensure AI amplifies human judgment and safeguards patient safety, rather than replacing clinicians or prioritizing speed over care.¹

Need for local models in low- and middle-income countries

Adaptive learning is also one of the most upcoming challenges for AI in healthcare. FDA clearance does not mean it can be easily applied in the medical field all over the world. The reliance on “globally” trained AI models in LMICs presents a significant risk of clinical failure due to the “generalization gap.” Algorithms trained primarily on Western populations often struggle to identify pathologies that are prevalent in LMICs but rare in high-income datasets, such as advanced Tuberculosis or specific tropical diseases. A model optimized for detecting early-stage lung cancer in a US population may completely miss the cavitary lesions of TB common in South Asia or Sub-Saharan Africa.³

In low and middle-income settings, the infrastructure realities favor compact, locally run AI models rather than large, cloud-dependent systems. Where internet access is intermittent and power supplies are unreliable, AI should be capable of operating offline on on-site servers or portable devices. Beyond technical needs, building local models protects data sovereignty and prevents the extraction of patient data to train commercial systems abroad. Local development empowers regional researchers to create sustainable, culturally relevant tools that remain under national control and governance.

The Future of AI in Radiology

The trajectory of AI in radiology within LMICs is not merely a technological evolution; it is a potential humanitarian revolution. For regions burdened by chronic shortages of specialists, AI offers a vital “force multiplier,” promising to democratize diagnostic excellence and bridge the chasm between scarcity and sufficiency.

However, the future cannot be built on the passive importation of tools designed for high-resource settings. True progress demands indigenous innovation: the development and validation of “frugal AI” models trained on local demographic data and optimized for regional pathologies like tuberculosis or neglected tropical diseases.

Ultimately, the goal is not to replace the radiologist but to elevate them. By automating routine detection, AI allows the limited workforce to focus on complex decision-making and patient advocacy. We must move forward with “cautious optimism”, prioritizing equity over novelty and sustainability over speed. If steered by robust ethical frameworks and local data sovereignty, AI will cease to be a luxury of the elite and become a fundamental pillar of global health equity.

In conclusion, AI is not just a technological innovation; it is a transformative force that has the potential to redefine the practice of radiology. By embracing AI, radiologists can unlock new possibilities that can augment human intelligence, ultimately leading to better care for patients worldwide.

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