

EDITORIAL

Artificial Intelligence in Medical Science: Navigating Promise and Peril – an editorial

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H N sarker¹

The accelerating integration of artificial intelligence (AI) into medical science marks a pivotal moment for global health systems. Once considered a speculative tool, AI is rapidly becoming an essential component of diagnostics, therapeutics, and health-care delivery. Yet its future role will be defined not by technological capability alone, but by our collective willingness to govern it responsibly, equitably, and transparently.

In diagnosis, AI has demonstrated clear value. Deep-learning models can detect abnormalities in radiology and digital pathology with a consistency that often narrows inter-observer variation. Early evidence from prospective studies suggests that AI-assisted reporting can reduce time to diagnosis and support overburdened clinical services without compromising safety.^[1] Beyond imaging, predictive analytics drawing on electronic health records, genomic data, and wearable sensors offer the potential for earlier detection of deterioration and more personalised care pathways.^[2]

AI's influence on biomedical science may prove even more transformative. Algorithms capable of modelling protein structures, predicting molecular interactions, and triaging chemical libraries have begun to shorten drug-discovery timelines.^[3] Combined with advances in automated laboratory systems, this shift could accelerate therapeutic development in areas of high unmet need, including antimicrobial resistance and rare diseases.

Yet enthusiasm must be tempered with realism. Major concerns remain about bias embedded within training datasets, with substantial implications for health equity. AI models frequently perform less reliably in populations under-represented in source data — an unacceptable outcome in systems already marked by disparities.^[4] Equally concerning

is the opacity of many AI systems. Black-box models that cannot be interrogated undermine clinical trust and pose a serious barrier to safe deployment.

Regulatory frameworks are evolving but remain fragmented. The increasing prevalence of adaptive algorithms—systems that continue to learn after deployment—raises new questions about accountability, monitoring, and patient consent. Robust post-market surveillance, akin to pharmacovigilance, will be essential.^[5] Meanwhile, emerging studies warn of a more subtle risk: that routine reliance on AI may erode clinical skills, reducing the capacity for independent diagnostic reasoning.^[6]

To chart a safe and effective future, several priorities must guide global action. First, AI models must undergo rigorous, prospective, multi-context validation with transparent reporting standards. Second, developers and regulators must place fairness at the centre of design, ensuring that data pipelines reflect the diversity of real patient populations. Third, explainability should be considered not an optional feature but a core requirement for any clinical decision-support system. Fourth, medical education must evolve, embedding AI literacy within the training of all health professionals. Finally, international collaboration is essential to prevent emerging technologies from deepening global health inequities.

AI will not replace clinicians, nor should it aspire to. Its value lies in augmenting human expertise, broadening access, and enabling more precise and humane care. But if the future of AI in medical science is to be one of progress rather than peril, the global health community must engage with the technology not merely as a tool, but as a shared responsibility. The choices made now will shape the trajectory of medicine for decades to come.

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1. Professor (Ex), Medicine, Sher-E-Bangla Medical College, Barishal, and Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh

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