EDITORIAL

INTEGRATING ARTIFICIAL INTELLIGENCE INTO MEDICAL EDUCATION IN PAKISTAN: AN URGENT REFORM AGENDA

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Although Artificial Intelligence (AI) has become integral to medical training internationally, its uptake within Pakistan's medical education system remains limited. At present, structured exposure to AI is offered by only a small number of institutions which leaves many graduates insufficiently prepared for data driven clinical practice. This gap is becoming increasingly evident as clinical decision-making relies more heavily on digital tools and large datasets. Integrating AI literacy alongside ethical principles and appropriate regulatory oversight into undergraduate curricula would support safer clinical practice and help align medical training in Pakistan with international standards.

Keywords: Artificial Intelligence; Medical Education; Ethics; Pakistan

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Artificial intelligence (AI) is transforming medical education worldwide, yet many institutions in Pakistan remain slow to adapt. A recent national survey found that approximately one quarter of health sciences institutions in Pakistan currently use structured digital learning systems.[1] In comparison, medical schools elsewhere have begun to integrate AI into core areas of teaching such as interpretations of clinical investigations to guiding treatment decisions.[2] Graduates trained without such exposure will enter a profession increasingly defined by data driven decision-making, yet remain ill-equipped to engage critically or responsibly with its tools. Integrating AI literacy across undergraduate training is therefore not a novelty but a professional obligation fundamental to competent, ethical and safe clinical practice in contemporary medicine.[1]

AI-based systems are now present in several areas of clinical care. In diagnostic practice, machine-learning models now detect radiological and pathological abnormalities with accuracy comparable to, and in some contexts exceeding, expert interpretation.[3] AI-enabled decision-support systems now contribute to treatment planning, earlier recognition of disease, and more reliable risk assessment, helping to improve both clinical efficiency and patient safety.[3,4] Recent reviews describe the pace of AI adoption across hospitals as rapid and transformative.[4] As a result, these shifts have altered what is expected of medical competence. Clinicians are now required to understand, assess, and apply algorithm-generated information responsibly in day-to-day practice.[2,3] Keeping pace with this transformation is therefore no longer optional for medical education. Without targeted national investment, Pakistan risks becoming a passive consumer of imported technologies rather than building the capacity to evaluate or adapt them for local clinical use.[1,3]

Artificial intelligence is likewise influencing mental-health research and practice. According to a recent BMC Psychiatry review, models using speech and text features can detect depressive and anxiety disorders with accuracies of roughly 80–90%, while related techniques are being applied to relapse prediction and medication optimisation.[4] Evidence from this and related studies demonstrates that such tools are broadening access to psychiatric care through digital therapeutics and AI-assisted counselling platforms that support continuous, data-driven monitoring of patient progress.[4,5] However, the introduction of these tools brings important ethical concerns, particularly around privacy, consent, and the handling of sensitive mental-health data in low-resource settings. The World Health Organization (WHO) has noted that AI tools in healthcare raises ongoing questions around transparency, accountability and the responsible use of data for both clinicians and developers.[5] In Pakistan, exposure to AI within medical training remains limited. National data indicates that relatively few clinicians have received structured exposure to digital health or AI based systems due to

limited institutional support, financial constraints and a shortage of trained faculty.[6] Medical colleges face practical barriers such as weak infrastructure, poor internet access and limited awareness of how AI can be used in teaching. Although some private universities have greater access to resources, they often depend on imported systems that are poorly aligned with the local clinical context.[1,6] Public institutions, by contrast, continue to struggle with the provision of even basic e-learning platforms.[6] Faculty readiness remains a further constraint, with few educators reporting confidence in teaching digital health skills.[6,7] Without comparable reforms, graduates in Pakistan are likely to remain underprepared for the digital transformation as its role progresses in clinical practice.

Reform in Pakistan should begin with curriculum redesign and faculty preparation. Evidence from international settings suggests that introducing AI-related teaching across the undergraduate years can strengthen core clinical skills as well as improve abilities of students with emerging technologies.[8] Pakistan can adapt these approaches by integrating AI content into existing clinical and research modules, supported by appropriate faculty development.[8] Ethical considerations should be addressed alongside technical instructions during training in line with WHO guidance.[5] Including these principles in the curriculum could help graduates evaluate algorithmic tools more confidently. This would facilitate appropriate application in patient care and allow graduates to take an informed role in the technologies influencing medical practice.[8,9]

The growing use of AI in clinical prediction, imaging and targeted treatment has set new expectations for professional competence.[10] Pakistan cannot remain on the margins of this shift. Without structured training in AI, many medical graduates are likely to lack skills required for data centred decision making and contemporary model of care.[1,6] Strengthening AI literacy at the undergraduate level is therefore essential. Recent analysis suggests that the pace of technological changes is likely to accelerate further. This makes it increasingly important for clinicians to engage with these systems critically and ethically.[5,10]

This transformation rests on a strong ethical foundation. Principles of transparency, accountability and fair data use should be central to how AI education is approached.[5] With these safeguards in place, Pakistan can train clinicians who are technologically capable. These clinicians would also remain committed to the values that define high-quality medical care. Ultimately, the integration of AI into medical education reflects wider changes in contemporary medical practice. Ensuring that this shift is guided by clear educational priorities will be central to maintaining professional standards in an increasingly digital clinical environment.

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