REIMAGINING UNDERGRADUATE MEDICAL EDUCATION IN BANGLADESH IN THE AGE OF ARTIFICIAL INTELLIGENCE: AN EVIDENCE-INFORMED COMPETENCY INTEGRATION FRAMEWORK

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Artificial intelligence (AI) is rapidly transforming global healthcare through applications in diagnostic imaging, clinical decision support systems, predictive analytics, and personalized medicine. As these technologies become increasingly embedded in routine clinical workflows, medical education must evolve to ensure that future physicians are competent to work safely and effectively in AI-augmented healthcare systems. However, evidence shows that undergraduate medical education (UGME) has not kept pace with technological advancement, particularly in low- and middle-income countries (LMICs) such as Bangladesh, where structured AI education remains largely absent[1,2].

Globally, multiple systematic reviews confirm that AI integration into medical curricula is still fragmented, inconsistent, and often elective rather than core[2,3]. Although medical students demonstrate strong enthusiasm toward AI learning, they report limited formal exposure to structured competencies, highlighting a critical gap between educational needs and curriculum design[3]. Recent evidence further emphasizes that most existing programs focus on theoretical awareness rather than practical, clinically integrated competency development[4].

High-income countries have begun addressing this gap through structured curriculum reforms. In the United Kingdom, the General Medical Council emphasizes digital professionalism, data interpretation, and the responsible use of emerging technologies within its *Outcomes for Graduates*, embedding digital competencies into core medical training outcomes[5]. In the United States, institutions such as Stanford University and Harvard Medical School have developed longitudinal AI and data science pathways integrated within clinical reasoning and evidence-based medicine teaching, ensuring progressive competency development rather than isolated instruction[6]. Similarly, Switzerland has adopted interdisciplinary education models integrating medicine, biomedical informatics, and engineering, enabling students to engage with AI systems through problem-based and simulation-based learning approaches[7]. In China, national-level policy support has accelerated the integration of AI education into medical training, driven by rapid digital health expansion and government-backed innovation strategies[8]. Across these contexts, a consistent principle emerges: effective AI education requires longitudinal, competency-based, and clinically contextualized integration rather than standalone modules.

Evidence from Cochrane-aligned and systematic reviews reinforce the importance of clinician understanding in AI adoption. While AI systems improve diagnostic accuracy and workflow efficiency, safe implementation depends on clinicians' ability to critically appraise algorithmic outputs, understand model limitations, and recognize biases in training datasets[9]. Without these competencies, there is a risk of overreliance on automated systems, potentially

compromising clinical judgment and patient safety. Recent synthesis of AI education frameworks identifies four core competency domains essential for UGME integration: foundational AI literacy, clinical application of AI tools, ethical and legal governance, and critical appraisal of AI-based evidence[2,4]. These domains align closely with evidence-based medicine principles and support the development of clinicians capable of responsible AI use in clinical decision-making.

In Bangladesh, UGME remains largely traditional, with limited incorporation of digital health or AI-related competencies. While the healthcare system is increasingly adopting telemedicine, electronic health records, and early-stage AI diagnostic tools, medical curricula have not been updated to reflect this transformation. These disconnect risks producing graduates who are underprepared for contemporary clinical environments and may hinder safe adoption of emerging technologies in healthcare delivery.

To address this gap, this editorial proposes an evidence-informed competency integration framework tailored for Bangladesh. The framework is adapted from global best practices and consists of four progressive domains. First, foundational AI and digital health literacy introduces core concepts such as machine learning, data science, and health informatics. Second, clinical application of AI focuses on interpreting AI-generated outputs in diagnostics, imaging, and risk prediction within clinical reasoning. Third, ethical, legal, and governance competencies emphasize algorithmic bias, patient privacy, accountability, and informed consent in AI-assisted care. Fourth, critical appraisal competencies equip students to evaluate AI tools using principles of validity, reliability, sensitivity, and clinical utility grounded in evidence-based medicine.

Implementation of this framework should prioritize integration rather than addition, embedding AI competencies across existing disciplines such as community medicine, pathology, pharmacology, and internal medicine. This longitudinal approach mirrors successful international models and ensures progressive skill development throughout undergraduate training. Faculty development, institutional collaboration, and use of open-access AI learning platforms will be essential to overcome resource constraints in Bangladesh. Simulation-based learning, case-based discussions, and digital health laboratories may provide feasible and scalable implementation pathways.

In inference, AI is no longer a future consideration but a present reality reshaping healthcare systems globally. Evidence from the United Kingdom, United States, Switzerland, and China demonstrates that structured, competency-based integration is the most effective approach to preparing future physicians. For Bangladesh, adopting an evidence-informed AI competency framework offers a pragmatic and urgent pathway to align medical education with evolving clinical practice. Without such reform, the gap between medical education and healthcare delivery will continue to widen in the era of artificial intelligence.

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