Editorial

ARTIFICIAL INTELLIGENCE IN MEDICAL PRACTICES

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Artificial Intelligence (AI)

Artificial intelligence (AI) is no longer a futuristic concept confined to laboratories or science fiction. It is a practical tool reshaping modern medicine, enabling computers to recognize patterns, learn from experience, and assist in complex decision-making, much like a trained clinician interpreting subtle clues. In daily practice, AI sifts through imaging, laboratory results, and electronic records to support diagnosis, anticipate risks, and tailor treatment. When used wisely, AI does not replace physicians; it sharpens clinical insight and strengthens patient-centered care.

By 2030, AI is projected to influence more than 80 percent of clinical decisions in high-income healthcare systems [1]. Yet global surveys reveal that over 60 percent of medical professionals feel unprepared to use AI effectively in clinical practice [2]. This mismatch between healthcare delivery and physician training is profound. Medical students are entering hospitals where AI and automated tools guide many decisions, but they don't yet have the training, judgment, or ethical understanding to use them safely. Without this, they might trust AI blindly or make mistakes, putting patient safety at risk. Misinterpretation of AI outputs, over-reliance on flawed systems, and ethical lapses are real threats to patient safety, professional credibility, and public trust. Simply put, we are training doctors for a world that no longer exists.

AI in Medical Education

Medical education has always evolved in response to societal change. The Flexner Report of 1910 embedded rigorous science into training, followed by innovations such as simulation labs, problem-based learning, competency frameworks, and evidence-based medicine [3]. Today, AI represents a milestone of similar impact; however, many medical schools treat it as a side topic, offering only brief modules or electives. Optional is no longer acceptable. AI must be central to modern medical training.

AI enhances learning by personalizing education to individual needs. Students differ in knowledge, cognitive style, and clinical exposure, yet traditional curricula assume uniform progress. AI platforms track performance, identify gaps, and tailor content. For instance, a student struggling with ECG interpretation can receive targeted exercises with immediate feedback, preventing small misunderstandings from becoming entrenched. Intelligent tutoring systems extend faculty capacity by guiding learners outside of classroom hours. Studies show AI-enhanced tutoring improves diagnostic reasoning and knowledge retention when complementing faculty instruction [4].

Clinical reasoning, the cornerstone of competent practice, benefits from AI as well. Classical/conventional case presentations are static, offering little exposure to real-life uncertainty. Virtual patients powered by AI respond dynamically, simulating complications and deterioration that mirror clinical encounters. For example, a virtual patient with sepsis may worsen rapidly if interventions are delayed, forcing learners to reassess priorities and adjust strategies. AI-assisted case-based learning consistently produces higher engagement, stronger problem-solving skills, and iterative clinical reasoning [4].

Assessment systems also evolve with AI. Traditional exams often overlook judgment, ethics, and communication. AI tools can analyze essays, clinical documentation, and reflective logs to detect reasoning errors and conceptual gaps that human graders might miss [1]. These insights allow faculty to provide targeted mentoring, ensuring students develop both technical and ethical competence.

Understanding AI itself is critical. Students must know how models are trained, the data they rely on, potential failure points, and sources of bias [3]. Without this foundation, doctors risk blindly trusting algorithms and making unsafe decisions. Ethics and governance must be embedded in AI education. AI relies on massive datasets, often including sensitive patient records and learner metrics, raising concerns about privacy, consent, and equitable care. Algorithmic bias is real—models trained on high-income populations can misrepresent diverse patients, producing flawed predictions and inequitable care [3,5].

Generative AI adds both opportunities and risks. Tools that draft essays, summarize research, or generate clinical scenarios are widely accessible. Left unchecked, they can encourage plagiarism, superficial learning, and blind acceptance of outputs [5]. Yet, when guided thoughtfully, generative AI can simulate rare clinical cases, create personalized practice scenarios, and support structured reflection. Students need training in digital professionalism, critical evaluation, and ethical use to harness AI as a learning ally rather than a shortcut.

AI in Clinical Practices

AI is already transforming clinical practice. Systems assist radiologists in detecting tumors, help cardiologists assess complex patient risk, and support primary care physicians in managing chronic illnesses. In Bangladesh, AI-driven diabetic retinopathy screening programs have achieved over 90 percent sensitivity, enabling early intervention for thousands of patients [1]. In India, AI algorithms detect tuberculosis on chest X-rays with accuracy comparable to trained radiologists, expanding access in rural areas [2]. In Nepal and Pakistan, AI-powered triage systems prioritize high-risk patients and optimize limited resources [2,3].

Despite these successes, regional implementation gaps are obvious. While urban centers commonly deploy cutting-edge AI, most rural hospitals and medical schools lack access, training, and infrastructure, leaving thousands of patients and future clinicians behind. Surveys show over 65 percent of students feel uncertain about using AI safely in clinical decision-making [4]. Technology without training is a threat, not a solution. Policy makers, educators, and institutions must prioritize equitable AI integration, or risk widening healthcare inequities and graduating doctors unprepared for modern practice.

AI in Public Health Practices

AI is no longer limited to hospitals; it is shaping public health on a global scale. Predictive algorithms identify outbreak hotspots, optimize vaccination campaigns, and track antimicrobial resistance in real time. During the COVID-19 pandemic, AI models predicted regional surges, guiding targeted lockdowns and resource allocation, reducing hospital strain and mortality.

In resource-limited settings, AI empowers community health workers to prioritize high-risk patients. In Bangladesh, AI-assisted diabetic retinopathy screening reached thousands of rural patients [1]. In India, AI-driven TB screening algorithms expanded access in remote areas [2]. In Africa, AI-powered mobile platforms track malaria prevalence, guiding mosquito control and bed-net distribution efficiently. AI also supports health policy by analyzing population data to identify social determinants of health, predicting regions with high maternal and neonatal mortality risk, and enabling targeted interventions such as mobile clinics or vaccination drives.

However, these advancements require proper training. Misinterpretation of AI outputs can perpetuate inequities or misallocate resources. Ethical oversight is critical, especially when using sensitive personal data or predicting risk in marginalized populations [5]. Thoughtful implementation can reduce preventable morbidity, improve equity, and enhance health system efficiency, transforming population-level care as profoundly as clinical medicine.

AI and Medical Research

AI is revolutionizing medical research, transforming it from slow, sequential investigations into dynamic, data-driven discovery. More than 60 percent of biomedical data is unstructured, including imaging, genomic sequences, clinical notes, and patient-reported outcomes. AI rapidly processes these datasets, identifying subtle patterns that elude human investigators.

During the COVID-19 pandemic, AI accelerated drug discovery, predicting potential antiviral compounds in months rather than years, and optimizing clinical trial recruitment by identifying eligible participants from electronic health records with speed and accuracy, improving diversity and representation. Beyond infectious diseases, AI predicts disease risk using genomic and multi-omic data. Polygenic risk scores powered by AI can identify individuals at

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high risk of cardiovascular disease or cancer years before symptoms appear, enabling proactive preventive care. AI has also accelerated vaccine research, modeling immune responses to pathogens and informing dose optimization.

In oncology, AI-assisted pathology systems analyze digitized tumor slides, quantifying cell morphology and immune infiltration, helping discover new biomarkers and tailor therapies. Similarly, AI-driven meta-analyses of large clinical datasets reveal correlations between lifestyle, genetics, and treatment outcomes that would be nearly impossible to detect manually. AI is not merely accelerating research; it is redefining how discoveries are made, validated, and translated into patient care, reducing costs, increasing efficiency, and supporting precision medicine [6].

Challenges with AI in Medical Practices

AI offers numerous advantages. It improves diagnostic accuracy and early detection, personalizes learning and clinical decision support, enhances research efficiency, and optimizes resource allocation in public health and low-resource settings. Yet, risks remain: algorithmic bias can produce inequitable care, over-reliance may weaken clinical judgment, and ethical challenges arise around privacy, consent, and accountability. Generative AI carries the potential for misuse in education and documentation, highlighting the need for careful guidance [3,5].

Practical challenges persist, especially in low-resource settings: limited internet, inadequate infrastructure, and faculty shortages slow adoption. Cloud platforms, mobile apps, and open-source tools provide cost-effective pathways, reducing inequities and expanding access [3].

Way Forwards

AI is no longer optional in medical education. Integration must be longitudinal, faculty development sustained, collaboration interdisciplinary, and evaluation continuous. Students should help shape curricula that are clinically relevant, ethically grounded, and technologically robust. Hesitation is not neutral; it risks producing clinicians unprepared for data-driven care, compromising patient outcomes and public trust.

AI represents the largest fundamental shift since simulation and evidence-based medicine. Its ability to deliver personalized learning, immersive simulation, and sophisticated assessment is unprecedented. However, this promise will only be realized through thoughtful, context-sensitive implementation that respects the human core of medicine. AI equips learners to navigate complexity, optimize knowledge, and enhance clinical reasoning, but only if institutions place it at the center of strategy. The choice is stark: embrace AI rigorously and ethically, or graduate doctors prepared for a world that no longer exists.

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