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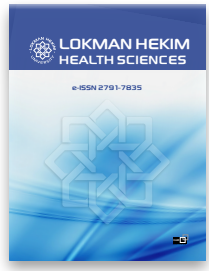

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EDITORIAL COMMENT

The Artificial Intelligence Revolution in Medicine and Health Sciences – From Historical Roots to Future Therapeutics

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This special issue brings together research at the intersection of artificial intelligence and the health sciences. Our focus spans artificial intelligence's (AI's) historical roots in medicine, its growing role in diagnosis and clinical practice, and the questions it raises for the future of patient care. Throughout, we aim to engage with these developments critically and responsibly – drawing on recent literature while keeping ethical considerations at the center of the discussion.

A Historical Perspective: From Rule-Based Systems to Deep Learning

AI's place in medicine was not built overnight. The groundwork was laid decades ago, beginning in the 1970s with early expert systems such as MYCIN – a program developed to identify bacterial infections and suggest appropriate antibiotic treatments.[1] These rule-based tools were designed to support clinical decision-making, but their limited computing power and scarce data kept them largely within research settings. Even so, they introduced a foundational idea: that algorithms could play a meaningful role in medical reasoning. That idea has since grown considerably. With the rise of big data and modern computing, machine learning and deep learning have moved from the laboratory into everyday clinical practice.

Transformation in Screening and Diagnostic Processes

Among AI's most consequential contributions to medicine are its abilities to process images and recognize complex patterns with remarkable consistency. In fields such as radiology, pathology, and emergency medicine, where data volumes are high and the margin for error is low, AI systems have demonstrated a reliable capacity to detect subtle findings that might otherwise be missed. A recent review from Türkiye reports that AI-based imaging tools reach accuracy rates of 85–90% in identifying conditions through X-rays and computed tomography scans, and show comparable performance in emergency triage.[2]

Yet the value of these tools extends beyond patients who are already symptomatic. Population-level screening – identifying individuals at risk before disease becomes clinically apparent – represents one of the most promising applications of predictive AI. By drawing on electronic health records and genetic data, these models can flag risk factors early, supporting the kind of preventive approach that has long been central to public health. Embedding such tools within national health systems could meaningfully strengthen early detection and reduce the long-term burden on healthcare infrastructure.

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AI in Treatment: Personalized Medicine and Preventive Care

AI has also begun to reshape how treatment itself is delivered. The standardized, population-wide approach to care is increasingly being supplemented – and in some areas replaced – by personalized strategies tailored to the individual. Deep learning models can integrate a patient's biomarkers, genetic profile, and environmental context to support more targeted treatment decisions.[3] In parallel, AI-driven health platforms are being developed to support continuous monitoring, stress management, and proactive intervention, with particular attention to underserved areas such as elder care and social isolation.[4] In oncology and surgery, algorithms are contributing to immunotherapy response prediction and the optimization of robotic procedures, offering more precise and safer pathways for patients.

Future Projections: Multimodal AI and Educational Readiness

Looking further ahead, AI is poised to accelerate medical research in ways that were until recently impractical. Drug discovery, historically a process of years and substantial investment, is being compressed through AI systems capable of modeling protein structures and running molecular simulations at speed.[5] The next step will likely be the widespread adoption of multimodal models – systems that can simultaneously interpret genetic data, laboratory results, imaging, and clinical history to produce a more complete picture of the patient.[6]

These advances, however, come with responsibilities that the field cannot afford to overlook. Questions of algorithmic bias, data governance, and clinical accountability require clear regulatory responses and sustained institutional attention. Equally important is the preparation of the next generation of healthcare professionals. Research suggests that medical and nursing students' engagement with AI is closely tied to their broader orientation toward innovation, underscoring the need to incorporate AI literacy into healthcare education as a matter of priority.[7]

The studies gathered in this special issue reflect this breadth – spanning diagnostic innovation, therapeutic application, ethical inquiry, and educational readiness. We hope they contribute meaningfully to the ongoing conversation about how AI can be integrated into medicine in a way that is evidence-based, ethically grounded, and genuinely centered on patient care.

We wish you an enlightening and thought-provoking reading experience.

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