

THE ROLE OF ARTIFICIAL INTELLIGENCE IN NURSING EDUCATION AND PRACTICE

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Summary

The implementation of artificial intelligence (AI) technologies represents one of the key directions in the digital transformation of healthcare systems. The growing relevance of AI adoption is driven by multiple interrelated factors, including the accumulation of large-scale healthcare data, the widespread use of electronic health records and digital medical imaging archives, advances in machine learning methodologies, and increased availability of high-performance computational infrastructure. Existing evidence from research and applied implementations demonstrates that AI technologies can significantly enhance the efficiency of healthcare organizations, optimize the allocation of financial and human resources, improve healthcare management and service delivery, and enable the development of new patient-centered digital services. This paper analyzes the main domains of AI application, including clinical decision support systems, automated patient monitoring, predictive analytics, personalized care, medication management, and telemedicine. It is established that AI integration contributes to improved quality of healthcare services, increased operational efficiency, and reduced workload on medical personnel. Particular attention is given to the transformation of nursing education, which must adapt to emerging technological paradigms through the integration of digital competencies and innovative pedagogical approaches. The study synthesizes key opportunities and challenges associated with AI adoption, including ethical considerations, data security risks, infrastructural limitations, and the potential reduction of human-centered care elements. The necessity of comprehensive workforce training and the development of adaptive educational frameworks for healthcare professionals is emphasized.

Key words: healthcare, generative artificial intelligence, digital technologies, nursing care, transformation.

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1. Introduction

Artificial intelligence (AI) is rapidly permeating all spheres of life, including healthcare. The use of AI in healthcare is actively expanding across various medical domains, opening new opportunities for improving clinical workflows and patient care. In recent years, its potential has been extensively explored and applied in different areas of healthcare, revealing new horizons for enhancing the quality of medical services. Nursing, as one of the key components of the healthcare system, is also not remaining unaffected by these changes (*Ahmed, 2024*). The application of AI in nursing practice promises significant improvements in diagnostics, treatment, patient monitoring, and resource management. The aim of integrating AI into nursing is to develop tools and solutions that reduce nurses' workload and improve patient care (*He et al., 2019*). These AI-based tools are used across various aspects of nursing practice, including

patient monitoring, chronic disease management, and even assistance during procedures performed under high-risk conditions.

The current policy of the World Health Organization is focused on the responsible and ethical use of AI technologies in healthcare, aimed at protecting human well-being and ensuring the principle of health for all (*World Health Organization, 2021; 2023*). The pursuit of improved patient outcomes at lower costs serves as a catalyst for breakthrough technologies that are gradually transforming existing approaches. Within this transformative wave, nursing has become a critical area for AI integration, given the central role of nurses as frontline healthcare providers (*Clipper et al., 2018*). The significance of AI in nursing extends beyond automation, encompassing the empowerment of nurses through technologies capable of analyzing complex datasets, predicting patient needs, and supporting clinical decision-making. As technological advancements continue to shape nursing practice, their potential impact on patient outcomes is becoming increasingly substantial (*Sun & Hoelscher, 2023*).

The development of AI technologies is likely to influence the clinical practice of future healthcare professionals. Future healthcare specialists view AI as a reliable partner and supportive tool capable of enhancing the efficiency of modern medicine; at the same time, AI should be integrated into educational processes to ensure a smooth transition into future clinical practice (*Chornobryva, 2025*). However, the implementation of new technologies is always accompanied by a range of challenges. Issues of data security, ethical use of AI, and the readiness of healthcare personnel to work with new tools must be carefully considered. In addition, it is important to understand how AI may transform the role of nurses and their interaction with patients. This article examines the prospects and challenges of AI application in nursing and nursing education, analyzing current achievements and discussing possible directions for future development.

2. Main text

One of the earliest applications of artificial intelligence (AI) in nursing was the development of clinical decision support systems. These systems assisted nurses in making informed decisions by analyzing vast amounts of data. As the benefits of AI become increasingly evident, its adoption in nursing practice continues to grow exponentially (*Murdoch, 2021*). AI technologies are being actively integrated into various areas of clinical medicine, research, and healthcare management. However, the diagnostic domain remains a primary focus, as AI algorithms have demonstrated remarkable success in the analysis of medical images. Computer vision systems can identify abnormalities in radiographic images, computed tomography (CT), and magnetic resonance imaging (MRI) scans with levels of accuracy that often exceed those of practicing clinicians.

The most common examples of AI implementation in nursing practice include:

1) *Automated patient monitoring.* AI-enabled monitoring systems allow continuous tracking and analysis of patients' vital signs and overall condition in real time without the need for direct human intervention. Functioning as a form of continuous surveillance, these systems reduce the burden on nurses associated with constant manual monitoring and facilitate the early detection of clinical deterioration (*O'Connor, 2022*);

2) *Predictive analytics.* AI serves as a powerful tool for analyzing historical patient data through advanced algorithms and forecasting future health-related events and trends (*De Gagne, 2023*). For example, predictive analytics can estimate the likelihood of disease development, sudden clinical deterioration, hospital readmission, or the need for specific therapeutic interventions, enabling more proactive and preventive care.

3) *Personalized patient care.* AI algorithms can analyze patients' electronic health records and generate comprehensive health profiles. This analysis may include information on previous treatments, laboratory results, imaging findings, and genetic data. Based on these insights, AI systems can recommend highly individualized care plans tailored to each patient's unique clinical needs and risk factors (Figure 1).

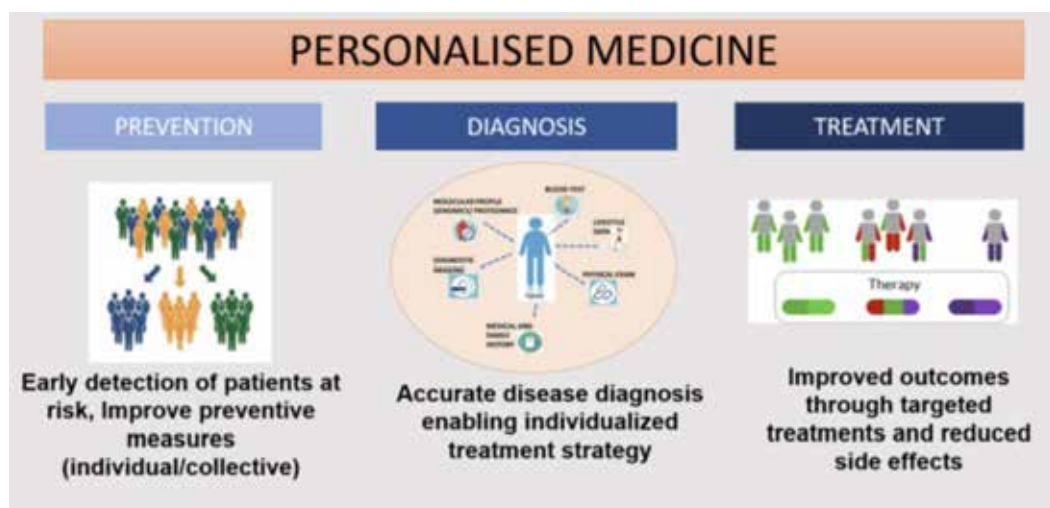


Figure 1. Key Benefits of Personalized Medicine

4) *AI-assisted medication management.* Artificial intelligence can help ensure that patients receive the correct medications, in the appropriate dosages, and at the prescribed times. Medication management encompasses a range of tasks, including prescribing, dispensing, administration, and monitoring adherence to treatment regimens. By streamlining these processes, AI reduces the likelihood of human error and enhances patient safety.

5) *Telemedicine and remote patient care.* Telemedicine, enabled by digital technologies, allows patients to receive healthcare services without the need for in-person visits. Remote Patient Monitoring (RPM) represents a core component of telemedicine, enabling healthcare professionals to continuously track patients' health status and intervene promptly when necessary.

It is evident that AI has a profound impact on healthcare and nursing practice. From enhancing patient monitoring to personalizing care approaches, AI supports nurses in delivering higher-quality and more efficient care. This demonstrates that AI is more than a technological trend; it is becoming an essential tool in contemporary healthcare. Consequently, there is a growing need to advance nursing education, which serves as the foundation for preparing future nursing professionals.

The principal drivers for developing new approaches to nursing education include: societal demands reflected in regulatory frameworks that call for the improvement and modernization of nursing education systems; both international and domestic experience in competency-based training of healthcare professionals through the integration of humanities, social sciences, and medical disciplines; the evolving requirements for professional competence and mobility among nursing specialists; and emerging expectations for future

nurses, who must not only provide competent patient care but also continuously enhance their professional expertise in response to rapid changes in healthcare systems and technological innovation.

The emergence of new medical specialties, advances in healthcare technologies and clinical practice, and the introduction of innovative medical devices, tools, and materials have created a need for the timely adaptation of nursing education. Future nurses must be prepared to assume new professional roles, perform diverse functions, and effectively utilize knowledge-intensive technologies. Therefore, alongside traditional educational approaches, nursing education systems should incorporate contemporary methodologies that reflect the ongoing transformation of healthcare.

In modern society, a nursing professional is expected to be capable of addressing complex medical and social challenges while possessing both clinical and research competencies. Given society's interest in ensuring high-quality preparation of future nurses capable of practicing at an advanced professional level and in accordance with current developments in medicine, educational institutions are actively seeking the most effective strategies and approaches to achieve this objective.

With the advancement of digital technologies, the integration of AI into nursing education has expanded rapidly and is generally viewed positively by both students and educators. However, several significant barriers remain to its successful implementation within educational environments. According to J. Ventura-Silva et al., AI fundamentally differs from previous methods, principles, and models used for the simulation and strategic management of real-world problems, which have evolved into network-based relationships extending beyond cyberspace into the global system itself (Ventura-Silva et al., 2024). AI is expanding the boundaries of human activity in the economy, culture, and healthcare. At the same time, it presents societal challenges associated with the digital divide, unequal access to technology, labor market transformations, unemployment concerns, and the widespread use of neural network technologies.

The key factors contributing to the successful integration of AI into nursing education include:

1. *Recognition of AI's potential.* The potential value of generative AI has been highlighted by M. Hong et al., who reported positive perceptions of its ability to diversify educational resources, enhance students' learning experiences, and improve educational quality. AI tools promote student engagement, support self-directed learning, and provide rapid access to medical knowledge, thereby strengthening confidence in their educational value (Hong et al., 2025).

2. *Students' interest and readiness.* Contemporary students demonstrate positive attitudes toward AI, a willingness to integrate technology into their professional activities, and intentions to use AI in future clinical practice. Notably, healthcare students currently utilize generative AI (GenAI) for information retrieval, explanation of complex concepts, and assistance with clinical tasks such as diagnostic reasoning and patient assessment. Future nurses often describe GenAI as a fast and accessible source of knowledge.

3. *Integration of AI into curricula.* Ahmed (2024) emphasizes the necessity of incorporating AI into nursing education programs through dedicated training initiatives and specialized courses that enhance students' preparedness to use emerging technologies effectively.

4. *Creation of a supportive environment for AI use.* Medical education institutions should establish conditions that facilitate students' acquisition of AI-related competencies, enabling them to adapt successfully to the evolving landscape of healthcare practice.

Major Barriers to Effective AI Integration

1. *Data privacy and security concerns.* AI applications require the collection and analysis of large volumes of healthcare data, which may threaten patient confidentiality. Data protection issues and vulnerability to cyberattacks remain significant concerns.

2. *Lack of the human element in care delivery.* Although AI performs effectively in analytical and diagnostic tasks, it cannot fully replace the human interaction, empathy, and emotional support that are essential components of clinical practice.

3. *Cost and accessibility of technology.* The development and implementation of AI systems require substantial financial investments that may be beyond the reach of many healthcare institutions, particularly in low- and middle-income countries.

4. *Ethical and academic risks.* Among the major concerns is the accuracy and reliability of AI-generated information (Savitska & Livitska, 2022). Additional risks include misinformation, reduced interaction between educators and students, and the limitations of AI in addressing complex clinical situations.

5. *Infrastructure and educational environment limitations.* Students frequently report restricted functionality of certain AI systems, which may misinterpret queries or generate ambiguous responses. Insufficient technological infrastructure and concerns regarding job displacement represent major barriers. Educators likewise report inadequate institutional support and a lack of appropriate conditions for AI implementation.

To minimize these risks, it is essential to develop specialized educational programs, establish robust data governance and storage frameworks, and create and optimize centralized medical imaging archives and related infrastructure. The principal directions for the development and application of AI in healthcare systems in 2026 include: implementation of advanced AI systems for clinical decision support, automation of routine processes, and enhancement of healthcare management efficiency; increased adoption of AI by healthcare stakeholders and broader implementation of AI solutions within medical universities and healthcare institutions; scaling of best practices and development of standardized use-case scenarios; continuous training of healthcare professionals in the practical application of AI technologies; provision of appropriate infrastructure and data management systems to expand AI adoption and improve the quality of nursing practice; ongoing monitoring of the effectiveness and safety of AI technologies in the delivery of nursing care; ensuring compliance with information security and data protection requirements.

3. Conclusions

One of the key priorities for the future development of artificial intelligence (AI) in healthcare, and particularly in nursing practice, is the identification of areas where effective solutions to clinical challenges are still lacking, as well as the exploration of new application scenarios. Addressing these needs will require the development of novel funding mechanisms for AI-based solutions at the national level. In the medium term, it is essential to investigate fundamentally new directions and approaches to the application of AI technologies in healthcare. Among the most promising developments is the broader adoption of generative AI technologies, particularly large language models (LLMs), as well as the exploration of AI agent-based approaches. Such agents can exchange information and task outcomes with other agents while interacting with users – including patients and healthcare professionals – through natural language. These capabilities may provide a substantial impetus for the deeper integration of AI into healthcare systems. Another important trend is the transition toward comprehensive

AI-driven solutions, including multimodal AI and predictive analytics. These technologies are capable of analyzing not only data derived from medical information systems and diagnostic imaging repositories but also patient-generated data, including information related to social determinants of health and data collected from emerging digital health devices.

This evolution is expected to shift the focus from isolated machine-learning models and narrowly specialized intelligent systems toward integrated health management platforms capable of aggregating and analyzing diverse sources of “big data” through AI agents and domain-specific large language models. Such a transformation has the potential to significantly enhance the effectiveness of healthcare digitalization and support data-driven decision-making across healthcare settings. Finally, one of the most significant future developments in the role of AI in healthcare will be the rapid advancement of digital patient assistants. These technologies are expected to promote greater patient engagement in self-care, strengthen preventive healthcare strategies, and encourage adherence to healthy lifestyles. The outlined trends also highlight the urgent need to prepare healthcare professionals for effective collaboration with AI technologies. This represents a critically important challenge requiring a comprehensive, multi-level approach. Currently, a gap exists between the rapid implementation of innovative AI tools in clinical practice and healthcare professionals’ readiness to utilize these technologies effectively. Consequently, the transformation of traditional nursing education has become imperative. Future nurses must not only possess strong academic and clinical knowledge but also develop digital literacy, critical evaluation skills, and the ability to assess technological solutions from ethical and professional perspectives.

Moreover, innovative educational technologies can enhance the effectiveness of professional training by promoting flexibility, personalization, and learner-centered approaches. In the future, nursing education will become increasingly interconnected with AI technologies. As AI continues to reshape clinical practice, educational processes will likewise need to evolve. Therefore, nursing curricula must remain adaptive and responsive to technological advances while preserving the fundamental principles of ethics, professionalism, and patient-centered care.

The future of nursing practice is inextricably linked to artificial intelligence, and the success of this integration will depend on the healthcare community’s willingness to embrace change and innovation. The quality of nursing education will play a decisive role in determining the effectiveness and safety of healthcare in the years ahead. Ultimately, a comprehensive approach that combines technological innovation with humanistic values will provide the foundation for the sustainable development of healthcare systems in the future.

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