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Systematic Review

Artificial intelligence and the domino effect in nursing: implications for education, clinical care and healthcare systems amid a workforce shortage

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ABSTRACT

Artificial intelligence (AI) is rapidly emerging as a transformative technology in healthcare, offering innovative solutions to address complex challenges such as increasing patient demands, technological advancements, and the global nursing workforce shortage. The integration of AI into nursing practice has the potential to create a domino effect across multiple dimensions of healthcare systems, including clinical care, nursing education, and workforce management. This critical review examines the current evidence on the role of artificial intelligence in nursing and explores its implications for healthcare delivery amid workforce shortages. A comprehensive literature review was conducted using electronic databases including PubMed, Scopus, Web of Science, CINAHL, and Google scholar, focusing on studies published between 2015 and 2025. The findings indicate that AI technologies such as machine learning, predictive analytics, natural language processing, and robotics are increasingly being used to support clinical decision-making, enhance patient monitoring, automate administrative tasks, and improve healthcare efficiency. In nursing education, AI-driven simulation and adaptive learning platforms are enhancing clinical reasoning and skill development among students. However, challenges related to ethical concerns, data privacy, technological infrastructure, and workforce preparedness remain significant barriers to widespread adoption. The review highlights the need for integrating AI competencies into nursing curricula and developing regulatory frameworks to ensure responsible implementation. Artificial intelligence should be viewed as a complementary tool that strengthens nursing practice, enhances patient outcomes, and supports sustainable healthcare systems in the context of ongoing workforce shortages.

Keywords: Artificial intelligence, Nursing practice, Healthcare systems, Workforce shortage, Nursing education, Clinical decision support, Digital health technologies

INTRODUCTION

The global healthcare system is currently experiencing unprecedented challenges due to rising healthcare demands, aging populations, increasing chronic disease burden, and a persistent shortage of healthcare professionals, particularly nurses. The nursing workforce forms the backbone of healthcare delivery and plays a critical role in ensuring quality patient care, safety, and continuity of services. However, the shortage of nurses has become a worldwide concern, affecting both developed and developing nations. According to recent global health workforce estimates, millions of additional nurses will be required over the coming decade to meet healthcare demands and achieve universal health coverage.[1] The shortage has significant implications for patient outcomes, healthcare costs, and system sustainability.

The nursing workforce shortage has been attributed to several interrelated factors including workforce aging, increased workload, burnout, migration, insufficient educational capacity, and evolving healthcare complexities.[2] As healthcare systems struggle to meet increasing demands with limited human resources, innovative technological solutions have emerged as potential strategies to address these challenges. One such transformative development is the integration of artificial intelligence (AI) into healthcare systems.

Artificial intelligence refers to computer systems capable of performing tasks that typically require human intelligence, including learning, reasoning, decision-making, and pattern recognition.[3] AI technologies such as machine learning, natural language processing, predictive analytics, and robotics are increasingly being adopted across healthcare settings to improve efficiency, support clinical decision-making, enhance patient safety, and optimize resource utilization. These technologies have the potential to significantly transform nursing practice, education, and healthcare delivery systems.

In nursing practice, AI-driven systems are being utilized to support clinical decision-making, early disease detection, patient monitoring, and workflow optimization. For example, predictive analytics can identify patients at risk of deterioration, allowing nurses to intervene early and prevent complications.[4] Similarly, AI-enabled monitoring systems can analyze vital signs continuously and alert healthcare professionals to potential health risks. Such innovations have the potential to reduce workload pressures on nurses while improving patient outcomes.

The concept of the “domino effect” in healthcare refers to a chain reaction in which a single intervention or technological change can lead to multiple interconnected outcomes across various components of the healthcare system. The introduction of artificial intelligence into nursing has the potential to initiate such a domino effect by influencing not only clinical practice but also nursing education, workforce management, healthcare policies, and patient engagement.[5] For instance, the integration of AI in clinical care may require nurses to develop new competencies in digital health technologies, which subsequently necessitates modifications in nursing education curricula.

The rapid adoption of AI technologies has already begun to reshape the healthcare landscape. Clinical decision support systems powered by AI can analyze large datasets and provide recommendations to healthcare professionals, thereby improving diagnostic accuracy and treatment planning.[6] In addition, AI-based administrative systems can automate routine documentation and data entry tasks, allowing nurses to spend more time on direct patient care activities. This redistribution of workload may contribute to improved job satisfaction and reduced burnout among nurses.

Despite its potential benefits, the integration of artificial intelligence into nursing practice also raises several ethical, professional, and operational concerns. One major concern is the possibility that increased reliance on technology may reduce human interaction in patient care. Nursing has traditionally been characterized by compassionate, patient-centered care, and there is ongoing debate regarding whether AI technologies might inadvertently compromise the humanistic aspects of nursing practice.[7] Ensuring that technological innovations complement rather than replace human care is therefore a critical consideration. Another important issue relates to data privacy, security, and ethical use of patient information. AI systems rely heavily on large volumes of health data to function effectively. The collection, storage, and analysis of such data must adhere to strict ethical and regulatory standards to protect patient confidentiality and prevent misuse.[8] Healthcare institutions must therefore implement robust data governance frameworks when integrating AI technologies into clinical practice.

In addition to clinical implications, artificial intelligence has significant potential to transform nursing education. Educational institutions are increasingly incorporating digital simulation platforms, virtual reality environments, and AI-driven adaptive learning systems to enhance student learning experiences.[9] These technologies allow nursing students to practice clinical skills in simulated environments, receive immediate feedback, and develop critical thinking abilities. AI-based learning platforms can also personalize educational content based on individual learning needs, thereby improving educational outcomes.

However, integrating AI into nursing education also requires educators to update curricula, develop digital competencies among faculty members, and ensure that students acquire both technological and clinical skills necessary for modern healthcare environments.[10] Without appropriate educational preparation, future nurses may struggle to effectively utilize emerging technologies in clinical practice.

Healthcare systems are also increasingly exploring AI-driven workforce management solutions to address nursing shortages. Predictive workforce analytics can assist healthcare administrators in forecasting staffing needs, optimizing scheduling, and improving workforce allocation.[11] These tools can help ensure that healthcare facilities maintain adequate staffing levels while minimizing workload imbalances among nurses. Furthermore, the implementation of AI technologies may influence healthcare policy development and strategic planning. Governments and healthcare organizations are beginning to recognize the importance of digital transformation in healthcare systems. National health strategies in several countries now include initiatives aimed at promoting AI adoption in healthcare services.[12] Such initiatives aim to improve healthcare accessibility, efficiency, and quality while addressing workforce challenges.

Despite these promising developments, the adoption of AI in nursing is still at a relatively early stage in many healthcare systems. Several barriers continue to hinder widespread implementation, including limited technological infrastructure, lack of training, financial constraints, and resistance to change among healthcare professionals.[13] Addressing these barriers is essential for ensuring the successful integration of AI technologies into nursing practice and healthcare delivery.

The concept of the domino effect becomes particularly relevant in the context of AI adoption within healthcare systems. The introduction of AI technologies can trigger a cascade of changes across multiple domains, including clinical workflows, educational frameworks, workforce dynamics, healthcare governance, and patient engagement. Understanding these interconnected impacts is essential for ensuring that technological advancements lead to positive outcomes rather than unintended consequences. Moreover, the global nursing shortage further amplifies the need for innovative solutions that can support healthcare professionals while maintaining high standards of patient care. AI technologies have the potential to act as supportive tools that augment human capabilities rather than replace them. By assisting nurses with data analysis, documentation, and clinical decision-making, AI systems can allow healthcare professionals to focus more on patient-centered care and complex clinical tasks.[14]

In summary, artificial intelligence represents a transformative force in healthcare with far-reaching implications for nursing practice, education, and healthcare systems. The integration of AI technologies may initiate a domino effect that influences multiple aspects of healthcare delivery and workforce management. While these technologies offer significant opportunities to address nursing shortages and improve healthcare outcomes, careful consideration must be given to ethical, educational, and operational challenges associated with their implementation.

Therefore, this critical review aims to examine the impact of artificial intelligence on nursing practice, nursing education, and healthcare systems in the context of global workforce shortages. The review also explores the potential domino effects associated with AI integration and highlights key opportunities, challenges, and future directions for healthcare institutions and policymakers.

METHODS

This study employed a critical review methodology to examine the existing literature related to artificial intelligence in nursing and its implications for nursing education, clinical practice, and healthcare systems amid workforce shortages. A critical review approach was selected because it allows for comprehensive analysis, interpretation, and synthesis of existing research findings while identifying gaps in current knowledge.[15]

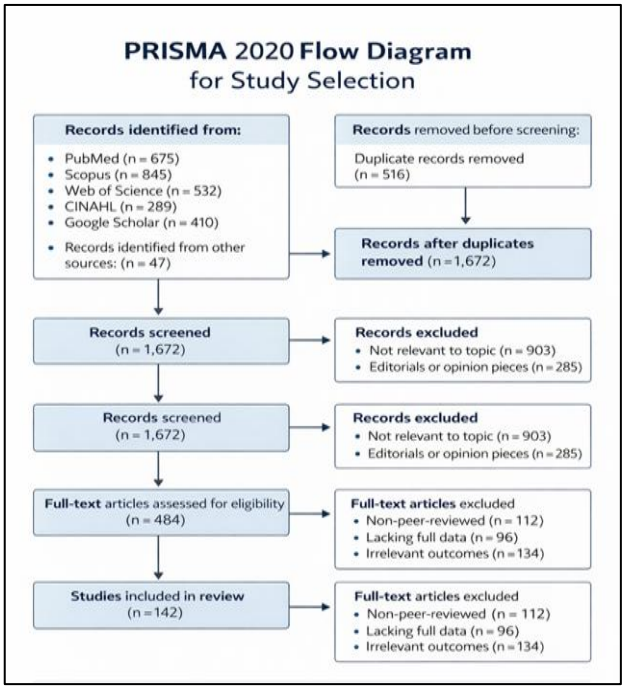

Figure 1: PRISMA flow diagram.

Study design

The review followed a structured process involving systematic literature search, study selection, data extraction, and thematic analysis show in figure 1. Although not a full systematic review, the methodology incorporated elements from established review frameworks such as the Preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines to ensure transparency and methodological rigor.[16]

Search strategy

A comprehensive literature search was conducted across multiple electronic databases to identify relevant peer-

reviewed publications. The databases included PubMed, Scopus, Web of science, CINAHL, and Google scholar, which were selected due to their extensive coverage of healthcare, nursing, medical, and interdisciplinary research literature. The search strategy involved the use of predefined keywords combined with Boolean operators to retrieve studies related to artificial intelligence and nursing.

The primary search terms included "Artificial Intelligence," "Nursing Practice," "Nursing Education," "Clinical Decision Support Systems," "Healthcare Workforce Shortage," "Digital Health Technologies," and "AI in Healthcare." These keywords were combined using Boolean operators such as AND and OR to broaden or refine the search results. For example, search combinations included "Artificial Intelligence AND Nursing," "Artificial Intelligence AND Healthcare Workforce," "AI AND Nursing Education," and "Machine Learning AND Clinical Decision Support."

The literature search was restricted to studies published between 2015 and 2025 in order to focus on the most recent developments in artificial intelligence technologies and their applications within healthcare systems.[17]

Inclusion criteria

Studies were included in the review if they met the following criteria: they were peer-reviewed journal articles published in English between 2015 and 2025; they discussed applications of artificial intelligence in nursing practice, nursing education, or healthcare systems; and they addressed areas such as workforce management, clinical decision support, or digital health technologies. Only studies that fulfilled all of these criteria were considered eligible for inclusion in the review.

Exclusion criteria

The following types of publications were excluded from the review: conference abstracts without available full text, editorials and opinion pieces lacking empirical evidence, articles not related to nursing or healthcare applications, and studies that focused exclusively on artificial intelligence applications outside the healthcare sector.

Study selection process

The initial search generated a large number of articles across the selected databases. After removing duplicates, the titles and abstracts of remaining studies were screened to determine relevance. Studies that appeared relevant based on title and abstract were then subjected to full-text review.

The study selection process was carried out in three stages. First, potential studies were identified through comprehensive database searches. Second, the titles and abstracts of the retrieved records were screened to assess their relevance. Finally, the remaining studies underwent a full-text review to determine their eligibility for inclusion in the review.

This process ensured that only studies directly relevant to the research objectives were included in the final analysis.[18]

Data extraction

Data from the selected studies were extracted using a standardized data extraction form to ensure consistency and accuracy in data collection. The information obtained from each article included the author and year of publication, country of study, study design, population or setting, artificial intelligence technology used, key findings, and implications for nursing practice, education, or healthcare systems. These variables were carefully reviewed and recorded to enable a comprehensive understanding of the existing evidence related to artificial intelligence in nursing. The extracted data were then systematically organized into thematic categories, which facilitated the analysis, synthesis, and comparison of findings across the included studies. This approach helped identify recurring themes and patterns related to the application of artificial intelligence in nursing practice, education, and healthcare systems.

Quality assessment

Although this review was not conducted as a fully systematic review, efforts were made to evaluate the methodological quality of the included studies to ensure the reliability and relevance of the findings. The quality assessment focused on several key aspects, including the rigor of the study design, adequacy of sample size, appropriateness of data analysis methods, and the overall relevance of each study to the research objectives. These criteria were used to determine the strength and credibility of the evidence presented in the selected articles. Studies that demonstrated strong methodological quality, clear research design, and direct relevance to the topic of artificial intelligence in nursing were prioritized during the synthesis and interpretation of findings. This approach helped ensure that the review was based on credible and meaningful evidence while providing a comprehensive understanding of the current state of research in this area.

Ethical considerations

As this study involved analysis of previously published literature, formal ethical approval was not required. However, ethical research practices were maintained throughout the review process. All sources were appropriately cited and acknowledged to ensure academic integrity.

RESULTS

The literature included in this critical review highlighted the rapidly expanding role of AI in nursing practice,

nursing education, and healthcare system management. The analysis of selected studies revealed several key themes demonstrating how AI technologies contribute to addressing nursing workforce shortages while simultaneously transforming healthcare delivery.

These themes included the application of AI in clinical decision-making, patient monitoring systems, nursing education, healthcare workforce management, and administrative workflow optimization. The findings also revealed emerging ethical considerations and implementation challenges associated with AI integration in healthcare settings.[19]

Artificial intelligence in clinical decision support

One of the most prominent applications of AI identified in the reviewed literature is its role in supporting clinical decision-making. AI-powered clinical decision support systems (CDSS) utilize large datasets, machine learning algorithms, and predictive analytics to assist healthcare professionals in diagnosing conditions, identifying patient risks, and determining appropriate treatment plans. These systems analyze electronic health records, laboratory data, and clinical indicators to generate recommendations that support healthcare professionals in making informed decisions.[20]

Studies indicate that AI-assisted decision support systems have significantly improved diagnostic accuracy and patient safety in several clinical settings. For example, predictive algorithms have been used to identify patients at risk of sepsis, cardiac arrest, and respiratory failure before the onset of clinical deterioration. Early detection allows nurses to initiate timely interventions and collaborate with interdisciplinary teams to prevent complications.[21] In addition, AI-based decision support tools have been shown to reduce cognitive workload among nurses by synthesizing complex patient information into actionable insights. This is particularly important in high-acuity environments such as intensive care units and emergency departments, where nurses must process large volumes of data while managing critically ill patients.[22]

However, some studies emphasized that overreliance on AI systems may potentially undermine clinical judgment if healthcare professionals become overly dependent on automated recommendations. Maintaining a balance between technological support and professional expertise remains an important consideration in AI-assisted clinical environments.[23]

AI-enabled patient monitoring systems

Another key finding from the literature is the increasing use of AI-driven patient monitoring technologies. These systems integrate wearable devices, smart sensors, and predictive analytics to continuously monitor patient vital signs and physiological parameters. Such technologies enable real-time monitoring and early detection of patient deterioration, thereby improving patient safety and reducing hospital complications.[24]

AI-based monitoring systems have demonstrated particular benefits in managing patients with chronic conditions such as heart failure, diabetes, and respiratory diseases. Continuous monitoring allows healthcare professionals to detect subtle physiological changes that may indicate worsening conditions. Early alerts generated by AI systems enable nurses to intervene promptly and prevent adverse events.[25] Remote monitoring technologies also play a critical role in expanding healthcare accessibility, particularly in rural and underserved areas. Through telehealth platforms and AI-powered monitoring tools, nurses can provide remote patient management and follow-up care without requiring frequent hospital visits. This approach helps optimize healthcare resources while addressing workforce limitations in healthcare systems.[26]

Table 1: Summary of key findings on the impact of artificial intelligence in nursing.

Theme/domain	AI application	Key findings	Implications for nursing practice and healthcare systems
Clinical decision support	AI-based clinical decision support systems (CDSS), predictive analytics	AI systems assist in early diagnosis, risk prediction, and treatment recommendations. Improved detection of conditions such as sepsis and cardiac deterioration.[19]	Enhances diagnostic accuracy, supports clinical judgment, and improves patient safety while reducing nurses' cognitive workload.
Patient monitoring systems	Wearable sensors, smart monitoring devices, AI-driven early warning systems	Continuous monitoring of vital signs enables early detection of patient deterioration and improves chronic disease management.[20]	Enables proactive interventions, improves patient outcomes, and reduces hospital readmissions.
Remote care and telehealth	AI-supported telemedicine platforms and remote monitoring tools	Facilitates healthcare delivery in rural and underserved areas and supports continuity of care.[21]	Expands healthcare accessibility and reduces healthcare facility burden.

Continued.

Theme/domain	AI application	Key findings	Implications for nursing practice and healthcare systems
Nursing education	AI-driven simulation learning, adaptive learning platforms, virtual patients	Improves critical thinking, clinical reasoning, and individualized learning experiences among nursing students.[22]	Requires curriculum reform and development of digital competencies among nursing educators and students.
Workforce management	AI-based predictive workforce analytics and scheduling systems	Helps forecast staffing needs, optimize nurse scheduling, and balance workload distribution.[23]	Reduces nurse burnout, improves workforce allocation, and enhances healthcare system efficiency.
Administrative automation	Natural language processing, AI-assisted documentation systems	Automates clinical documentation and data entry processes, reducing time spent on administrative tasks.[24]	Allows nurses to focus more on direct patient care and improves workflow efficiency.
Ethical and regulatory issues	Data governance frameworks, algorithm transparency	Concerns related to patient privacy, data security, and transparency in AI algorithms.[25]	Necessitates development of ethical guidelines, policy frameworks, and regulatory oversight.
Implementation barriers	Infrastructure limitations, lack of training, resistance to change	Limited technological infrastructure and insufficient digital literacy among healthcare professionals hinder AI adoption.[26]	Requires investment in infrastructure, workforce training, and organizational change management.

Table 2: Advantages and challenges of artificial intelligence in nursing.

Category	Advantages of AI in nursing	Challenges/limitations
Clinical decision support	Improves diagnostic accuracy, assists in early detection of patient deterioration	Risk of overreliance on technology and reduced clinical judgment
Patient monitoring	Continuous monitoring and early warning systems improve patient safety	Alarm fatigue and potential data overload
Nursing education	AI simulation and adaptive learning enhance clinical reasoning and skill development	Need for curriculum revision and faculty training
Administrative efficiency	Automation of documentation and scheduling reduces workload	Implementation costs and technological infrastructure requirements
Workforce management	Predictive analytics helps optimize staffing and reduce nurse burnout	Algorithm bias and ethical concerns in workforce allocation
Healthcare accessibility	Telehealth and AI monitoring improve care for rural and remote populations	Digital divide and unequal access to technology
Healthcare system efficiency	Improves workflow efficiency and reduces operational costs	Integration challenges with existing healthcare systems
Ethical and legal issues	Supports evidence-based decision making	Data privacy concerns, cybersecurity risks, and regulatory gaps

Table 3: AI technologies used in nursing.

AI technology	Description	Application in nursing	Examples of use in healthcare	Impact on nursing practice
Machine learning (ML)	A subset of AI that enables systems to learn from data and improve performance without explicit programming.[35]	Risk prediction, disease detection, patient outcome prediction	Predicting patient deterioration, sepsis detection, clinical decision support systems	Supports nurses in early identification of high-risk patients and enhances evidence-based decision making
Natural language processing (NLP)	AI technology that enables computers to understand and analyse human language from clinical documentation.[36]	Automated documentation, analysis of electronic health records (EHR), clinical text interpretation	Voice-to-text clinical documentation, extracting patient data from medical records	Reduces documentation burden and improves data accessibility for nurses

Continued.

AI technology	Description	Application in nursing	Examples of use in healthcare	Impact on nursing practice
Robotics	Use of intelligent robotic systems capable of performing physical or cognitive healthcare tasks.[37]	Assistance in patient care, medication delivery, rehabilitation support	Surgical robots, patient-assistance robots, automated medication dispensing systems	Reduces physical workload for nurses and improves efficiency in patient care delivery
Predictive analytics	AI-driven analysis of historical and real-time healthcare data to forecast patient outcomes and risks.[38]	Early warning systems, patient monitoring, hospital resource planning	Predicting hospital readmissions, identifying risk of falls, monitoring chronic disease progression	Enables proactive nursing interventions and improves patient safety
Computer vision	AI technology that interprets visual information from images and videos.[39]	Patient monitoring, wound assessment, fall detection	Monitoring patient mobility, analysing medical imaging, pressure ulcer detection	Enhances assessment accuracy and supports clinical observation
Virtual assistants/ chatbots	AI-powered conversational agents that interact with patients or healthcare providers.[40]	Patient education, triage assistance, appointment scheduling	Symptom checking tools, patient follow-up reminders	Reduces workload on nurses and improves patient communication
Wearable health technology	Smart devices that continuously collect physiological data and integrate with AI systems.[41]	Remote monitoring and chronic disease management	Smart watches monitoring heart rate, glucose monitoring devices	Enables continuous patient monitoring and early clinical intervention

In addition to improving patient outcomes, AI-enabled monitoring technologies can reduce nurse workload by automating routine patient assessments and generating alerts when clinical thresholds are exceeded. However, concerns have been raised regarding alarm fatigue and the potential for excessive alerts, which may contribute to staff stress if not appropriately managed.[27]

Artificial intelligence in nursing education

The integration of artificial intelligence in nursing education represents another significant theme identified in the literature. Educational institutions are increasingly adopting AI-based learning platforms, virtual simulation technologies, and adaptive educational systems to enhance student learning experiences. These technologies allow nursing students to practice clinical scenarios in safe simulated environments while receiving real-time feedback on their performance.[28]

AI-driven simulation platforms enable students to develop clinical reasoning, decision-making, and critical thinking skills through interactive case-based learning. Virtual patient simulations replicate real-world clinical situations, allowing students to apply theoretical knowledge in practical scenarios without risk to patient safety.[29]

Adaptive learning technologies represent another innovative educational application of AI. These systems analyze student performance and adjust educational content to meet individual learning needs. Personalized learning pathways help students strengthen knowledge gaps while progressing at their own pace.[30]

Despite these advantages, the literature indicates that integration of AI technologies in nursing education requires significant curriculum reform and faculty development. Educators must acquire digital competencies and technological skills in order to effectively incorporate AI-based teaching strategies. Additionally, nursing curricula must balance technological training with the development of compassionate, patient-centered care skills.[31]

AI and healthcare workforce management

The shortage of nursing professionals remains a major challenge for healthcare systems worldwide. AI-driven workforce management tools have emerged as innovative solutions to optimize staffing, scheduling, and workforce allocation. Predictive analytics can analyze historical staffing patterns, patient acuity levels, and hospital admission trends to forecast future workforce needs.[32]

Healthcare administrators can utilize AI-based workforce planning tools to ensure adequate nurse staffing while minimizing scheduling conflicts and workload imbalances. Improved staffing management contributes to better patient outcomes, reduced nurse burnout, and enhanced job satisfaction.[33]

AI-powered scheduling systems can also automate administrative tasks related to shift assignments, leave management, and workforce distribution. Automation reduces the administrative burden on nurse managers and allows healthcare organizations to allocate human resources more efficiently.[34]

However, the literature also highlights potential challenges associated with AI-driven workforce management. Algorithmic decision-making may introduce biases if datasets used for training AI systems contain incomplete or skewed information. Healthcare organizations must therefore ensure transparency and fairness when implementing AI-based staffing systems.[35]

Automation of administrative tasks

Administrative documentation and data entry represent a significant portion of nursing workload in many healthcare settings. AI technologies have been increasingly used to automate these tasks through natural language processing and intelligent documentation systems.[36] Voice recognition technologies and AI-powered clinical documentation tools can automatically convert spoken clinical notes into electronic health records. This automation reduces the time nurses spend on documentation and allows them to focus more on direct patient care.[37]

Similarly, AI systems can streamline hospital operations by automating appointment scheduling, patient registration, and resource allocation. These technologies contribute to improved healthcare efficiency while reducing operational costs.[38]

Nevertheless, studies emphasize the importance of maintaining human oversight in automated systems to ensure accuracy and prevent potential errors in clinical documentation.

Ethical and regulatory considerations

The increasing adoption of artificial intelligence in healthcare has also raised significant ethical and regulatory concerns. One major issue relates to patient privacy and data security. AI systems require access to large volumes of patient data to function effectively, making data protection a critical priority for healthcare institutions.[39]

Another ethical concern involves transparency in AI decision-making processes. Many AI algorithms function as “black box” systems, meaning that the reasoning behind their recommendations may not always be fully transparent to healthcare professionals. Lack of transparency may reduce trust in AI technologies among healthcare providers.[40]

Furthermore, concerns have been raised regarding potential job displacement resulting from increased automation. While AI technologies are primarily intended to support healthcare professionals rather than replace them, some nurses fear that technological advancements may alter traditional nursing roles.[41]

Despite these concerns, most studies suggest that AI technologies are more likely to augment nursing practice rather than replace human care. Nurses continue to play a vital role in providing emotional support, clinical judgment, and patient advocacy, which cannot be fully replicated by machines.

Barriers to AI implementation

Several barriers to AI adoption were identified in the reviewed literature. These include limited technological infrastructure, insufficient training among healthcare professionals, financial constraints, and resistance to technological change.[42]

Healthcare organizations must invest in infrastructure development, workforce training, and policy frameworks to ensure successful AI implementation. Interdisciplinary collaboration among healthcare professionals, engineers, policymakers, and educators is essential for maximizing the benefits of AI technologies. Overall, the results of this review demonstrate that artificial intelligence has the potential to create a domino effect across multiple aspects of nursing practice and healthcare systems. The integration of AI technologies influences clinical workflows, educational strategies, workforce management, and healthcare policy development.

DISCUSSION

The findings of this critical review highlight the transformative potential of artificial intelligence in addressing contemporary challenges within nursing and healthcare systems. AI technologies are increasingly recognized as powerful tools capable of improving healthcare efficiency, supporting clinical decision-making, and enhancing patient outcomes. At the same time, the integration of AI into healthcare systems has broader implications that extend beyond technological adoption, influencing workforce dynamics, education, policy development, and ethical considerations.

One of the most significant implications of AI integration is its potential to mitigate the effects of the global nursing workforce shortage. Healthcare systems worldwide are facing increasing pressure due to rising patient demands and limited human resources. AI technologies can help alleviate these pressures by automating routine tasks, optimizing workflow processes, and supporting clinical decision-making.[43]

By reducing administrative burdens and enabling more efficient patient monitoring, AI systems allow nurses to allocate more time to direct patient care. This shift has the potential to improve job satisfaction and reduce burnout among healthcare professionals. Burnout has been

identified as a major contributor to nurse turnover and workforce shortages, making technological solutions that reduce workload particularly valuable.[44]

The concept of the domino effect is particularly relevant when examining the broader implications of AI adoption in nursing. The integration of AI technologies does not occur in isolation; rather, it triggers interconnected changes across multiple domains of healthcare systems. For example, the implementation of AI-assisted clinical decision support systems requires nurses to develop new competencies related to digital literacy, data interpretation, and technology management. This need for new competencies subsequently influences nursing education and curriculum development.[45]

Educational institutions must therefore adapt their teaching strategies to prepare future nurses for technologically advanced healthcare environments. Incorporating digital health education, informatics training, and AI literacy into nursing curricula will be essential for ensuring that graduates possess the necessary skills to effectively utilize emerging technologies. Failure to update educational programs may create gaps between technological advancements and workforce readiness.

Another important aspect of AI adoption is its potential to improve healthcare accessibility and equity. Telehealth platforms and remote monitoring technologies powered by AI can extend healthcare services to rural and underserved populations. These innovations enable nurses to provide continuous patient monitoring and follow-up care without requiring physical hospital visits. As a result, healthcare systems can reach larger populations while optimizing limited human resources.[46]

However, while AI technologies offer numerous benefits, their implementation must be approached with caution. Ethical considerations remain a critical aspect of AI integration in healthcare. Protecting patient privacy, ensuring data security, and maintaining transparency in AI algorithms are essential for building trust among healthcare professionals and patients. Healthcare organizations must establish clear governance frameworks to regulate the use of AI technologies and ensure compliance with ethical standards.

Another concern involves the potential impact of AI technologies on professional roles and responsibilities. Some healthcare professionals fear that increased automation may lead to job displacement or devaluation of professional expertise. However, the literature suggests that AI technologies are more likely to augment human capabilities rather than replace healthcare professionals. Nurses possess unique interpersonal, ethical, and critical thinking skills that cannot be replicated by machines.[47]

Instead of replacing nurses, AI technologies should be viewed as collaborative tools that support healthcare professionals in delivering high-quality patient care. Successful integration of AI requires a collaborative approach in which technology developers work closely with healthcare professionals to design systems that align with clinical workflows and professional values.

Healthcare policy also plays an important role in shaping the future of AI in nursing. Governments and healthcare organizations must develop regulatory frameworks that support innovation while ensuring patient safety and ethical standards. Investment in digital infrastructure, workforce training, and research initiatives will be essential for maximizing the benefits of AI technologies in healthcare systems.

Despite its promising potential, the adoption of AI in healthcare remains uneven across different regions and healthcare institutions. Resource limitations, technological disparities, and lack of training opportunities may hinder the implementation of AI solutions in certain healthcare settings. Addressing these disparities will be crucial for ensuring equitable access to technological advancements. Future research should focus on evaluating the long-term impact of AI technologies on nursing practice, patient outcomes, and healthcare system efficiency. Empirical studies examining real-world implementation of AI systems will provide valuable insights into best practices and potential challenges associated with technological integration.

CONCLUSION

Artificial intelligence is rapidly transforming healthcare systems and has significant implications for nursing practice, education, and workforce management. The findings of this critical review demonstrate that AI technologies such as machine learning, predictive analytics, robotics, and natural language processing can support clinical decision-making, improve patient monitoring, and enhance healthcare efficiency. These innovations have the potential to reduce the burden on nurses and partially address the global nursing workforce shortage.[42] However, the integration of AI into healthcare also creates a domino effect that influences nursing education, professional roles, healthcare policies, and ethical considerations. To maximize the benefits of AI, nursing curricula must incorporate digital health competencies and technological literacy. Healthcare organizations must also establish strong regulatory frameworks to ensure ethical use, data security, and transparency in AI applications. Ultimately, artificial intelligence should be viewed as a supportive tool that enhances, rather than replaces, the humanistic and compassionate aspects of nursing care.

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