Artificial Intelligence in Nursing Foundation: Transforming Basic Nursing Care and Decision-Making

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Abstract

Nursing Foundation forms the cornerstone of nursing education and practice by emphasizing essential patient care activities that promote safety, comfort, and holistic well-being. With rapid digital transformation in healthcare, artificial intelligence (AI) has emerged as a powerful tool capable of enhancing basic nursing care and clinical decision-making. AI technologies support nurses through intelligent patient monitoring, predictive risk identification, automated documentation, and evidence-based clinical insights. This integrative review examines the role of artificial intelligence in nursing foundation, focusing on its application in basic nursing care and nursing decision-making. Literature published between 2015 and 2024 was reviewed from major electronic databases, including PubMed, CINAHL, Google Scholar, ScienceDirect, and ProQuest. Findings indicate that AI strengthens patient assessment processes, supports early identification of clinical deterioration, and improves the efficiency of nursing care while reinforcing nurses' clinical judgment. However, ethical concerns, data privacy, technological competency, and infrastructural challenges remain significant barriers. The review concludes that artificial intelligence, when ethically and responsibly integrated, functions as a supportive adjunct that strengthens foundational nursing practice while preserving the humanistic and patient-centred nature of nursing care.

Keywords: Artificial intelligence, nursing foundation, basic nursing care, clinical decision-making, nursing education.

Introduction:

Nursing Foundation forms the bedrock of nursing education and practice by emphasizing essential patient care activities that ensure safety, comfort, and holistic well-being. It encompasses fundamental competencies such as systematic patient assessment, maintenance of hygiene, nutritional support, assistance with mobility, monitoring of vital signs, accurate documentation, and effective communication. These basic

nursing functions are indispensable across healthcare settings and significantly influence the quality of care, patient satisfaction, and clinical outcomes. [1]

The contemporary healthcare environment is characterized by rapid digital advancement, with artificial intelligence (AI) gaining prominence as a transformative force in clinical care delivery. Artificial intelligence involves the use of advanced computational systems capable of processing complex data, recognizing patterns, learning from experience, and supporting decision-making processes. [2] In healthcare, AI technologies are increasingly utilized to enhance patient monitoring, predict health risks, assist with clinical documentation, and optimize care workflows, thereby redefining traditional care models. [3,4]

Within nursing practice, the incorporation of artificial intelligence presents new opportunities for strengthening foundational nursing care. AI-driven applications such as intelligent monitoring devices, predictive alert systems, automated record-keeping tools, and clinical support algorithms assist nurses in identifying patient needs promptly and preventing avoidable complications. [2,5] These innovations improve efficiency and consistency in basic nursing care while addressing growing demands on the nursing workforce. [1]

Clinical decision-making is an integral component of the nursing foundation, requiring continuous interpretation of patient data and timely responses to physiological changes. Artificial intelligence supports this process by continuously integrating real-time and historical patient data, enabling early recognition of evolving clinical trends and the generation of data-informed insights to support nursing care. [6] Rather than replacing professional judgment, artificial intelligence augments clinical reasoning by offering analytical support that informs, but does not replace, nursing decision-making. [3]

Despite expanding AI applications in healthcare, its relevance to the nursing foundation remains inadequately explored, particularly in undergraduate nursing education and basic care contexts. [1,6] Ethical responsibility, data security, technological competence, and infrastructural readiness remain challenges. [3,4] Addressing these issues is essential to prepare nurses for safe, ethical, and technology-supported practice.

Therefore, this review examines the role of artificial intelligence in nursing foundation, focusing on basic nursing care and nursing decision-making, while highlighting opportunities, challenges, and future directions.

Objectives of the Review

General Objective

- To critically examine the role of artificial intelligence in nursing foundation with emphasis on its influence on basic nursing care delivery and clinical decision-making. [1,2]

Specific Objectives

1. To explore emerging concepts and applications of artificial intelligence relevant to foundational nursing practice. [3]
2. To review the utilization of artificial intelligence in supporting essential nursing care activities. [4,5]
3. To analyze the contribution of artificial intelligence in enhancing nursing decision-making and early risk identification. [6]
4. To identify perceived benefits of artificial intelligence in improving efficiency and quality of care. [1,5]
5. To examine challenges, ethical concerns, and limitations associated with AI integration. [2,3]
6. To assess implications for nursing education and competency development. [3,4]
7. To highlight future directions and research opportunities. [1,6]

Methodology:

Type of Review

An integrative review design was adopted to synthesize empirical, conceptual, and practice-based literature related to artificial intelligence in nursing foundation. [7]

Sources of Literature

Literature was retrieved from PubMed, CINAHL, Google Scholar, ScienceDirect, and ProQuest, along with professional nursing organization reports and reference lists.

Inclusion Criteria

- AI application in nursing or healthcare relevant to basic nursing care
- Nursing decision-making, monitoring, safety, or education
- Peer-reviewed, full-text English articles

Exclusion Criteria

- Physician-focused AI applications
- Advanced diagnostics unrelated to nursing foundation
- Editorials and non-scholarly publications

Concept of Artificial Intelligence

Definition

In the healthcare context, artificial intelligence refers to the use of computational systems designed to analyze large volumes of clinical data and generate insights that support learning, reasoning, and decision-making in patient care. [1]

Types of Artificial Intelligence

Artificial intelligence applied in nursing practice can be understood through the following key types, each contributing uniquely to foundational nursing care.[1]

Machine Learning (ML)

Machine learning is a type of artificial intelligence that allows systems to learn from past data and improve their performance over time without being manually programmed for every situation.[5] In nursing practice, machine learning helps identify trends and predict patient outcomes based on continuously collected data.

Example:

A machine-learning-based system may analyse a patient's blood pressure, pulse rate, temperature, and oxygen saturation over several hours. If the system detects patterns suggesting early sepsis or respiratory distress, it alerts the nurse to initiate timely assessment and interventions, even before visible clinical symptoms appear.[5]

Deep Learning

Deep learning is a more advanced form of machine learning that uses multiple layers of data processing to interpret complex and large-scale information.[6] It is particularly useful in continuous monitoring and pattern recognition, where subtle changes may indicate serious clinical conditions.

Example:

In an intensive care or high-dependency unit, deep learning algorithms can analyze continuous vital sign data to detect early signs of patient deterioration, such as impending cardiac or respiratory failure.[6] This assists nurses in making quick, evidence-based decisions regarding escalation of care.

Natural Language Processing (NLP)

Natural language processing enables computers to understand, interpret, and organize human language.[7] In the nursing foundation, NLP supports accurate and efficient documentation by converting spoken or written nursing notes into structured electronic records.

Example:

A nurse may verbally document patient observations during rounds. An NLP-enabled system converts this narration into standardized nursing documentation within the electronic health record, reducing documentation time and minimizing errors while allowing the nurse to spend more time on direct patient care.[7]

Rule-Based Systems

Rule-based artificial intelligence systems operate based on predefined clinical guidelines and rotocols.[8] These systems generate alerts or reminders when specific conditions are met, ensuring adherence to standard nursing practices.

Example:

A rule-based system may remind the nurse to reposition a bedridden patient at regular intervals to prevent pressure injuries or alert the nurse if a medication dose exceeds recommended limits.[8] This supports consistency and safety in basic nursing care.

Artificial Intelligence versus Traditional Clinical Decision Support Systems:

Traditional clinical decision support systems primarily rely on static, rule-based algorithms derived from predefined clinical guidelines, which limits their ability to respond to dynamic changes in patient conditions. [9] While these systems provide helpful reminders and alerts, they function only within predefined conditions and do not adapt to individual patient variations. [9] Their responses remain the same regardless of changes in patient status over time.

Artificial intelligence, on the other hand, continuously learns from real-time and historical patient data. [1,5] It adapts its recommendations based on evolving clinical patterns, making it more responsive to individual patient needs. For instance, while a traditional system may alert a nurse only when a vital sign crosses a fixed threshold, an AI system can recognize gradual deterioration trends and provide early warnings. [5]

In the nursing foundation, this distinction is significant. Artificial intelligence enhances clinical decision-making by offering dynamic, data-driven insights, while the nurse remains responsible for interpreting these insights and delivering compassionate, patient-centred care. [2,4] Thus, AI functions as a supportive partner that strengthens, rather than replaces, the nurse's professional role.

Applications of Artificial Intelligence in Nursing Foundation

Artificial intelligence has a growing role in strengthening foundational nursing care by supporting nurses in assessment, routine care delivery, documentation, and medication safety.[1,3] The application of AI in nursing foundations enhances accuracy, efficiency, and patient safety while allowing nurses to focus on compassionate, patient-centred care.[2,5]

Table 1. Applications of Artificial Intelligence in Nursing Foundation

Domain of Nursing Foundation	AI Application	Role in Basic Nursing Care	Illustrative Example
Patient Assessment	AI-based vital signs monitoring	Continuous analysis of physiological parameters and detection of abnormal trends	An AI system alerts a nurse about gradual oxygen desaturation before visible distress
Risk Identification	Predictive analytics	Early identification of patients at risk for infection, falls, or deterioration	AI predicts high fall risk in elderly patients based on mobility data
Early Warning Systems	Intelligent alert systems	Supports timely nursing intervention and escalation of care	AI generates an early warning score indicating possible sepsis
Hygiene & Comfort Care	AI-supported care scheduling	Assists in planning individualised hygiene and comfort measures	AI recommends repositioning frequency based on skin integrity
Nutrition Monitoring	AI-driven intake analysis	Identifies inadequate nutritional intake and weight changes	AI alerts nurse to reduced oral intake over consecutive days
Mobility & Safety	Motion-sensing AI tools	Prevents falls and supports safe patient movement	Bed-exit sensor alerts nurse when patient attempts unsafe ambulation
Pressure Injury Prevention	Predictive skin integrity models	Supports timely repositioning and pressure relief	AI warns prolonged immobility exceeding safe duration
Nursing Documentation	Automated documentation systems	Reduces documentation time and improves accuracy	AI auto-generates nursing progress notes from care data
Medication Safety	AI-enabled medication checks	Prevents medication errors and adverse drug reactions	AI flags overdose risk based on age and renal function
Clinical Decision Support	AI-assisted decision tools	Enhances nursing judgment through data-driven insights	AI suggests evidence-based nursing interventions

Artificial Intelligence in Patient Assessment

Patient assessment is a fundamental nursing responsibility that involves continuous observation, interpretation of clinical signs, and timely reporting.[1] Artificial intelligence supports nurses by analyzing patient data in real time and identifying early changes in health status. [2]

Vital Signs Monitoring

AI-enabled monitoring systems continuously collect and analyze vital signs such as heart rate, blood pressure, respiratory rate, oxygen saturation, and body temperature.[3] Unlike traditional monitors that display values at a given moment, AI systems identify trends and patterns over time.[4]

Example:

An AI-powered bedside monitor detects a gradual increase in respiratory rate and a slight drop in oxygen saturation during night hours. The system alerts the nurse before the patient develops visible respiratory distress, enabling early intervention.[4]

Risk Prediction

Artificial intelligence uses historical and real-time data to predict potential health risks such as infection, deterioration, or complications, allowing nurses to prioritize care based on individual patient needs. [5]

Example:

An AI system analyzes a post-operative patient's vital signs, mobility level, and laboratory values and identifies a high risk for infection. The nurse is alerted to intensify monitoring and preventive care.[5]

Early Warning Systems

AI-based early warning systems help nurses identify clinical deterioration at an early stage by integrating multiple patient parameters into a single alert mechanism.[6]

Example:

A medical ward uses an AI early warning system that combines heart rate, blood pressure, and level of consciousness to generate alerts when a patient is at risk of shock or sepsis, prompting immediate nursing assessment. [6]

Artificial Intelligence in Basic Nursing Care

Basic nursing care forms the foundation of nursing and focuses on maintaining patient comfort, dignity, safety, and functional ability.[7] Artificial intelligence enhances these care activities by supporting timely and individualized interventions.[8]

Hygiene and Comfort Care

AI-supported care planning tools help nurses schedule hygiene care based on patient condition, mobility, and comfort needs.[9]

Example:

An AI system recommends appropriate timing for bed baths and oral care for critically ill patients based on skin condition, sweating patterns, and mobility limitations, helping nurses provide individualized comfort care.[9]

Nutrition Monitoring

Artificial intelligence assists nurses in monitoring nutritional intake and identifying patients at risk of malnutrition.[10]

Example:

An AI application tracks a patient's food intake and weight changes and alerts the nurse if calorie intake is consistently low, prompting nutritional assessment and intervention.[10]

Mobility and Fall Prevention

AI-enabled movement sensors and monitoring systems support nurses in preventing falls and promoting safe mobility.[11]

Example:

A patient with limited mobility attempts to get out of bed without assistance. An AI-based sensor system detects unusual movement and alerts the nurse, preventing a potential fall.[11]

Pressure Injury Prevention

Artificial intelligence supports nurses in preventing pressure injuries by analyzing patient positioning, skin integrity, and duration of immobility.[12]

Example:

An AI system alerts the nurse when a bedridden patient has remained in one position for too long, prompting timely repositioning to prevent pressure ulcers.[12]

Artificial Intelligence in Nursing Documentation:

Accurate documentation is essential in the nursing foundation, but it often contributes to an increased workload.[13] Artificial intelligence simplifies documentation processes while maintaining accuracy and completeness.[14]

Nursing Automated Notes:

AI systems assist in generating nursing notes based on patient data and nursing activities.[13]

Example:

After recording vital signs and care activities, an AI system automatically drafts a nursing progress note, which the nurse reviews and validates, saving time and reducing errors.[14]

Electronic Health Records:

AI improves the organization and accessibility of electronic health records by highlighting relevant patient information for nursing care.[15]

Example:

An AI-enhanced EHR displays prioritized nursing alerts such as abnormal vital signs or overdue care activities, helping nurses focus on critical tasks.[15]

Reduction of Documentation Burden:

By automating routine documentation, artificial intelligence reduces administrative workload and allows nurses to spend more time on direct patient care.[14]

Example:

Voice-assisted AI tools enable nurses to document care activities verbally during bedside care, reducing time spent on manual data entry.[14]

Artificial Intelligence in Medication Safety:

Medication administration is a high-risk nursing activity requiring accuracy and vigilance.[16] Artificial intelligence supports nurses in minimizing medication-related errors and ensuring patient safety. [17]

Medication Error Prevention:

AI systems cross-check medication orders with patient data to identify potential errors before administration.[16]

Example:

An AI system alerts the nurse when a medication is prescribed to a patient with a documented drug allergy, preventing an adverse reaction.[16]

Dosage Alerts:

Artificial intelligence provides real-time dosage alerts based on patient age, weight, renal function, and clinical condition.[17]

Example:

Before administering a drug, the AI system warns the nurse that the dose exceeds safe limits for an elderly patient, prompting clarification with the physician.[17]

Monitoring Adverse Effects:

AI tools assist nurses in identifying early signs of adverse drug reactions by analyzing patient symptoms and vital signs.[18]

Example:

An AI system detects a pattern of declining blood pressure and increased heart rate after medication administration and alerts the nurse to assess for possible adverse effects.[18]

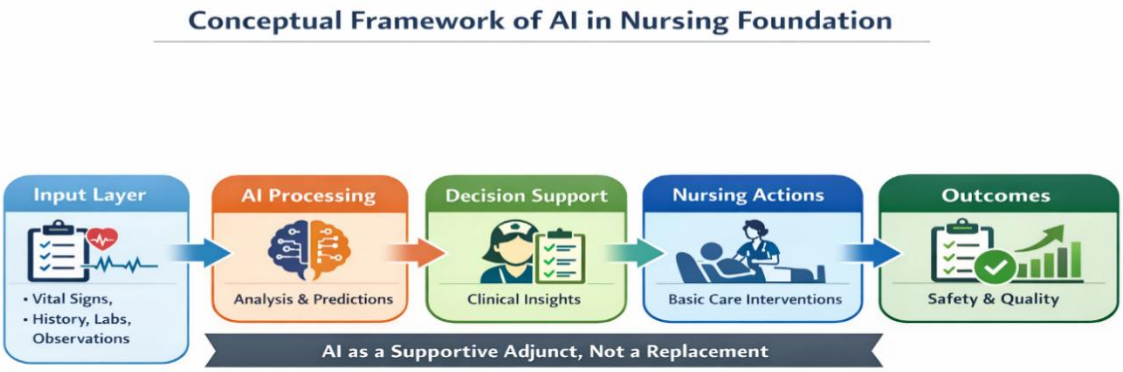

Figure 1. Conceptual Framework of Artificial Intelligence in Nursing Foundation

Artificial intelligence in nursing foundation functions as a supportive tool that enhances patient assessment, decision-making, and basic nursing care while preserving the nurse's central role and humanistic approach to care. The framework demonstrates how AI integrates patient data, intelligent processing, and nursing actions to improve care outcomes.

1. **Input Layer – Patient Data:**

The foundation of AI-assisted nursing care begins with data collected continuously through routine nursing activities. This includes:

- Vital signs (heart rate, blood pressure, respiratory rate, oxygen saturation, temperature)
- Nursing observations (skin condition, mobility, level of consciousness)
- Patient history (medical conditions, allergies, medications)
- Laboratory findings (blood tests, imaging results)
- Care activity records (hygiene, nutrition, mobility interventions)

This comprehensive patient information serves as the input for AI systems to analyze and identify patterns.

2. AI Processing Layer:

AI systems apply machine learning algorithms, predictive models, and rule-based clinical protocols to process patient data. This layer enables:

- Detection of trends and subtle changes in patient status
- Early prediction of risks such as infection, falls, or pressure injuries
- Generation of intelligent alerts and evidence-based recommendations

By analyzing historical and real-time data, AI assists in recognizing deterioration before it becomes clinically apparent.

3. Nursing Decision-Making Layer:

The outputs generated by AI support nurses in making informed, timely, and evidence-based decisions. Key functions include:

- Highlighting priority care needs
- Providing early warning alerts for clinical deterioration
- Suggesting individualized nursing interventions based on patient risk profiles

Importantly, AI does not replace professional judgment. The nurse interprets AI insights, applies clinical experience, and considers ethical reasoning to make final decisions.

4. Nursing Actions – Basic Nursing Care:

Based on AI-supported decision-making, nurses deliver foundational care, including:

- Timely patient assessment and monitoring
- Hygiene and comfort care
- Nutrition and mobility support
- Safe medication administration
- Patient safety interventions such as fall and pressure injury prevention

AI enables individualized care planning, allowing nurses to anticipate patient needs and intervene proactively.

5. Outcomes Layer:

Integration of AI in foundational nursing practice results in improved outcomes such as:

- Enhanced patient safety and reduced complications
- Improved quality of basic nursing care
- Increased efficiency in nursing workflow
- Strengthened patient-centred care
- Timely interventions leading to better recovery and satisfaction

Core Principle:

Artificial intelligence functions as a supportive adjunct, not a replacement, reinforcing the nurse's professional role. By providing timely insights and predictive guidance, AI enhances care quality while preserving the humanistic, compassionate, and patient-centred values central to nursing.

Role of Artificial Intelligence in Nursing Decision-Making

Artificial intelligence supports nursing decision-making by enhancing data interpretation, early risk recognition, and evidence-based care while preserving professional judgment. [19,20]

Nursing decision-making is a continuous and complex process that requires nurses to assess patient conditions, prioritize care, and respond promptly to changes in health status.[19] Artificial intelligence plays a supportive role by enhancing the nurse's ability to interpret clinical information and make informed decisions, particularly in foundational nursing practice where timely interventions are crucial.[19,20]

Example:

In a medical ward, an AI-based decision support system continuously analyzes trends in respiratory rate, oxygen saturation, and temperature. When these parameters indicate a potential risk of infection or respiratory compromise, the system alerts the nurse, supporting early assessment and escalation of care. The nurse then applies professional judgment to confirm findings and initiate appropriate nursing interventions.[20]

Thus, artificial intelligence strengthens nursing decision-making by improving accuracy, promoting early recognition of health risks, and supporting evidence-based practice, while the nurse remains the central decision-maker.[19]

Benefits, Challenges, and Future Directions:

The integration of artificial intelligence into the nursing foundation contributes to improved care quality, workflow efficiency, and patient safety. However, successful implementation is challenged by limited technological competency, dependence on data quality, infrastructure and cost constraints, ethical and legal considerations, and the risk of over-reliance. Future directions include AI-assisted bedside care, predictive nursing models, and the integration of AI literacy into nursing education to promote safe and effective use. [21-24]

Ethical, Legal, and Professional Considerations

Artificial intelligence integration raises ethical concerns related to patient autonomy, privacy, data security, algorithmic bias, and professional accountability. Nurses remain ethically and legally responsible for care decisions, and AI must function as a supportive tool rather than a replacement for human judgment.

Limitations of the Review

This review is limited by the inclusion of English-language literature only and variability in study designs and AI technologies, which may affect generalizability.

Implications:

- **Nursing Practice**

Artificial intelligence supports nurses in delivering timely and safe foundational nursing care by facilitating early risk recognition and proactive interventions. It supports patient monitoring, early identification of health risks, and prevention of complications. By reducing routine workload, AI allows nurses to spend more time on direct patient care. Nurses remain responsible for all care decisions, and AI is used only as a supportive tool.

- **Nursing Education**

Nursing education should include basic knowledge of artificial intelligence. Students need to learn how to use AI tools safely, understand data provided by AI, and apply critical thinking in clinical practice. This will help future nurses work confidently in technology-based healthcare settings.

- **Nursing Administration**

Nursing administrators are responsible for planning and implementing AI systems in healthcare settings. This includes providing training, maintaining infrastructure, and ensuring ethical and safe use of technology. Clear policies are needed to protect patient data and guide nursing practice.

- **Nursing Research**

More research is needed to study the use of artificial intelligence in the nursing foundation. Nurse-led research can help evaluate its effectiveness, patient outcomes, and ethical issues. Research findings will support the safe and effective use of AI in nursing care.

Conclusion

Artificial intelligence has the potential to significantly transform the nursing foundation by enhancing basic nursing care and clinical decision-making. When ethically integrated, artificial intelligence supports proactive and individualized nursing care, improves care efficiency, and enhances patient safety while preserving the core values of compassionate and patient-centred nursing practice.

References:

1. Hassanein K, El Arab S, Abdrbo A, et al. Artificial intelligence in nursing: an integrative review of clinical and operational impacts. J Adv Nurs. 2024;81(3):701–715.
2. Asiri TY, Alghamdi HK, Alharbi RM, et al. Artificial intelligence and nursing care: transforming patient assessment and workflow. Comput Inform Nurs. 2024;42(6):312–320.
3. Chen M, Hao Y, Hwang K, et al. Disease prediction by machine learning over electronic health records. J Biomed Inform. 2019; 94:103–120.

4. Liu Y, Chen PC, Krause J, Peng L. How AI helps nurses improve patient care: a review of applications and outcomes. Nurs Outlook. 2023;71(5):555–567.
5. Jiang F, Jiang Y, Zhi H, et al. Artificial intelligence in healthcare: past, present, and future. Stroke Vasc Neurol. 2017;2(4):230–243.
6. Sutton RT, Pincock D, Baumgart DC, et al. An overview of clinical decision support systems: benefits, risks, and strategies for success. NPJ Digit Med. 2020; 3:17.
7. Shortliffe EH, Sepúlveda MJ. Clinical decision support in the era of artificial intelligence. JAMA. 2018;320(21):2199–2200.
8. Rajkomar A, Dean J, Kohane I. Machine learning in medicine. N Engl J Med. 2019; 380:1347–1358.
9. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019; 25:44–56.
10. Mesko B, et al. The role of artificial intelligence in patient safety and nursing care. BMC Nurs. 2021; 20:32.
11. Kim J, Park H. AI-based fall prevention and mobility monitoring in hospitalized patients: a systematic review. J Clin Nurs. 2022;31(5-6):701–713.
12. Chen L, Wang L, Zhang Q. Predictive analytics for pressure injury prevention in nursing care using AI. Comput Methods Programs Biomed. 2021; 198:105791.
13. Dos Santos M, et al. AI and automated documentation in nursing: reducing workload and errors. J Nurs Manag. 2022;30(4):1063–1075.
14. Alaa AM, et al. AI-assisted electronic health records and nursing documentation. NPJ Digit Med. 2021; 4:40.
15. Patel B, et al. Enhancing EHR usability with artificial intelligence in nursing practice. Comput Inform Nurs. 2020;38(3):137–145.
16. Reddy S, et al. Artificial intelligence in medication safety: current applications and future opportunities. J Patient Saf. 2022;18(2):95–102.
17. Uvais NA, et al. Clinical decision support and dosage alerts using AI in nursing care. Comput Methods Programs Biomed. 2021; 205:106062.
18. Liu Y, et al. Monitoring adverse drug reactions using AI: nursing implications. J Clin Nurs. 2022;31(19-20):2900–2912.
19. Berner ES, La Lande TJ. Overview of clinical decision support systems. In: Handbook of Medical Informatics. 2020:1–14.
20. Esteva A, et al. Artificial intelligence in clinical decision-making: opportunities and challenges. Nat Med. 2019; 25:44–56.
21. Mesko B, et al. AI in nursing care: improving quality, safety, and efficiency. BMC Nurs. 2021; 20:32.
22. Topol EJ. Deep medicine: how artificial intelligence can make healthcare human again. Basic Books; 2019.
23. Morley J, et al. Ethics and governance of AI in healthcare. Lancet Digit Health. 2020;2(8): e435– e436.

24. Lin S, et al. Future of AI in nursing education and practice. Comput Inform Nurs. 2023;41(7):415–425.