BMC Nursing

RESEARCH

Open Access

Artificial intelligence-assisted nursing care: a concept analysis using Walker and Avant approach

Reza Nematollahi Maleki[1,2], Shahla Shahbazi[2,3*], Mina Hoseinzadeh[4], Mansour Ghafourifard[5], Hamed Gholizad Gougjehyaran[1,2] and Amir Faravan[1,2]

Abstract

Background Artificial Intelligence (AI) is increasingly integrated into healthcare, offering transformative potential for nursing practice by enhancing efficiency, accuracy, and patient outcomes. Despite growing interest, the concept of AI-assisted nursing care lacks clear consensus, hindering its clinical operationalization. This study aims to clarify this concept through a concept analysis to inform future research and practice.

Methods The Walker and Avant concept analysis method was utilized to examine 'AI-assisted nursing care.' A literature review was conducted across databases including PubMed, Scopus, ScienceDirect, and Embase, with no temporal limits, yielding 20 relevant records for analysis. The process identified the concept's uses, attributes, antecedents, consequences, and empirical referents.

Results Five defining attributes of AI-assisted nursing care emerged: data-driven decision support, automation of routine tasks, enhanced predictive capabilities, personalization of care, and continuous learning and adaptability. Antecedents included availability of advanced technology, integration into healthcare systems, nursing competence and acceptance, patient data availability, and ethical and regulatory frameworks. Consequences encompassed improved patient outcomes, increased nursing efficiency, enhanced nurses' satisfaction, potential cost savings, and ethical and social challenges. Model, borderline, and contrary cases further illustrated the concept's application.

Conclusion AI-assisted nursing care holds significant promise for revolutionizing clinical practice by improving care quality and nursing workflows. However, its implementation demands addressing technological, ethical, and systemic challenges. Future research should prioritize empirical validation of these findings and promote equitable access to AI technologies across diverse healthcare settings to fully realize its potential.

Keywords Artificial intelligence, Concept analysis, Nursing

*Correspondence:
Shahla Shahbazi
shahbazish6@gmail.com
[1]Student Research Committee, Tabriz University of Medical Sciences, Tabriz, Iran
[2]Department of Medical-Surgical Nursing, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Clinical Research Development Unit, Sina Educational, Research and Treatment Center, Tabriz University of Medical Sciences, Tabriz, Iran
[4]Department of Community Health Nursing, Nursing and Midwifery Faculty, Tabriz University of Medical Sciences, Tabriz, Iran
[5]Medical Education Research Center, Health Management and Safety Promotion Research Institute, Tabriz University of Medical Sciences, Tabriz, Iran

Background

Technological innovations have significantly impacted human life, with Artificial Intelligence (AI) emerging as a key driver of change. AI, powered by machine learning and big data, enables machines to perform tasks like decision-making, pattern recognition, and diagnosis with increasing accuracy [1].

As we witness today, AI is fast being integrated into healthcare, promising to make a revolutionary change in many features of patient care, including nursing practice [2]. In this context, AI-assisted nursing care focuses on augmenting nursing-specific tasks, such as patient monitoring, documentation, and care coordination, rather than broader diagnostic functions typically handled by physicians. The AI-assisted nursing care suggests a paradigm change in how health care is delivered, with possible improvements in efficiency, accuracy, and better patient outcomes [3].

Applications of AI into nursing have started to change many facets of patient care, from administrative services to direct patient care interventions [2, 4]. AI-powered Clinical Decision Support Systems analyze patient data and render real-time recommendations regarding treatment plans, medication dosages, and potential risks [2, 5].

In patient monitoring, AI-enhanced continuous monitoring systems enhance the capacity of nurses to monitor the vital signs of patients to facilitate timely detection of subtle changes indicative of deterioration [2]; wearable devices and smart beds implanted with AI are able to warn nurses about impending problems much earlier than when events become critical, hence offering a proactive approach to interventions in care [6]; in specialized areas such as wound care, computer vision and AI algorithms are being employed in assessing and monitoring wound healing, thus providing objective measurements and treatment recommendations [7]. In addition, AI systems increasingly support medication management, including medication reconciliation, drug interaction checks, and personalized dosing, hence contributing to decreased medication errors and improvement in patient safety [8].

Other administrative applications include the use of Natural Language Processing (NLP) and voice recognition technologies in simplifying nursing documentation and enabling nurses to spend their time more productively in direct patient care [9].

Notwithstanding these developments, the reality of AI adoption and use by nurses still varies largely across health institutions and specialties. While some have adopted AI technologies, many are still in the initial stages of such adoption or exploration processes. Therefore, this study aims to comprehensively analyze the concept of AI-assisted nursing care within the environment of clinical practice. We try to draw on a foundation for future research, policy-making, and practical use by clarifying the attributes, antecedents, and consequences of this concept by utilizing the Walker and Avant method.

Table 1 Steps of Walker and Avant's concept analysis of artificial intelligence-assisted nursing care

Phases	Specific Content	Position
1.Select a concept	Artificial Intelligence-Assisted Nursing Care	Background and introduction
2.Determine the purposes of the analysis	To clarify the needs of concept analysis	Background and introduction
3.Identify all uses of the concept	Definition and uses of AI-Assisted Nursing Care	Results
4.Determine the defining attributes	Characteristics that were the most frequently associated with concept "AI-Assisted Nursing Care"	Results
5.Identify a model case	Example of AI-Assisted Nursing Care that encompassed all the attributes	Results
6.Identify borderline, related, contrary, and illegitimate cases	Other examples of AI-Assisted Nursing Care which encompassed some or no identified attributes	Results
7.Identify antecedents and consequences	Events that occur prior to the concept and the outcomes of the concept	Results
8.Define empirical referents	Empirical measures of AI-Assisted Nursing Care	Results

Methods

Design

Walker and Avant's concept analysis method was used as a rigorous and systematic approach to identify descriptions, antecedents, consequences, and empirical referents of the concept. The stages of the concept analysis method are as follows: (1) selecting a concept, (2) determining the aims or purposes of the analysis, (3) identifying all uses of the concept that you can discover, (4) determining the defining attributes, (5) identifying a model case, (6) identifying borderline, related, contrary, invented, and illegitimate cases, (7) identifying antecedents and consequences, and (8) defining empirical referents (Table 1) [10].

Literature search

A literature review was conducted (by Reza Nematollahi Maleki) using multiple health databases, including PubMed, Scopus, ScienceDirect, and Embase. The concepts "Artificial Intelligence," "nurse", "nursing", and "nursing care" were searched using Boolean operators "AND" and "OR" in the title and abstract fields of each database (Supplementary Material 1). No temporal limits were applied and articles published in either English or Persian until 2025/03/30 were retrieved. Studies relevant

to the aim of this study, which contributed to identifying the antecedents, attributes, or consequences of the concept 'AI-Assisted Nursing Care,' were included. Studies outside the scope or those that did not provide relevant information for the study's objectives were excluded. This study was done according to the relevant guidelines for concept analysis and Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist, with quality assessment of included studies conducted using appropriate tools such as the JBI Critical Appraisal Checklists, CASP Checklists, PRISMA-P, and AMSTAR 2, as detailed in the Results.

Results

Initially, 6521 records were identified (by author Reza Nematollahi Maleki) by searching the titles and abstracts of these databases. Subsequently, 23 additional records were manually included, resulting in a total of 6544 records. Duplicate records were removed (by authors Mina Hoseinzadeh and Shahla Shahbazi), leading to an initial selection of 4236 records. Authors Reza Nematollahi Maleki and Mansour Ghafourifard screened the titles and abstracts, applying eligibility criteria to the full texts of 82 selected records. All authors evaluated these 82 studies for inclusion in the concept analysis, consulting the research team to resolve any doubts about inclusion or exclusion. Ultimately, 20 records met the criteria and underwent comprehensive concept analysis (Fig. 1). All 20 full-text studies met methodological thresholds per the JBI Critical Appraisal Checklist for Text and Opinion Papers for commentary and position papers [2, 11–16], the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses for systematic, scoping, and mapping reviews [5, 17–20], the CASP Qualitative Research Checklist for qualitative and think-tank studies [21, 22], the CASP Cohort Study Checklist for cohort and 2-wave studies [23, 24], JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies [25], the PRISMA-P for scoping review protocols [26], JBI Critical Appraisal Checklist for Narrative, Expert Opinion, and Text [27], and the AMSTAR 2 for systematic reviews [28]. All records were managed and organized using EndNote 21 throughout the study.

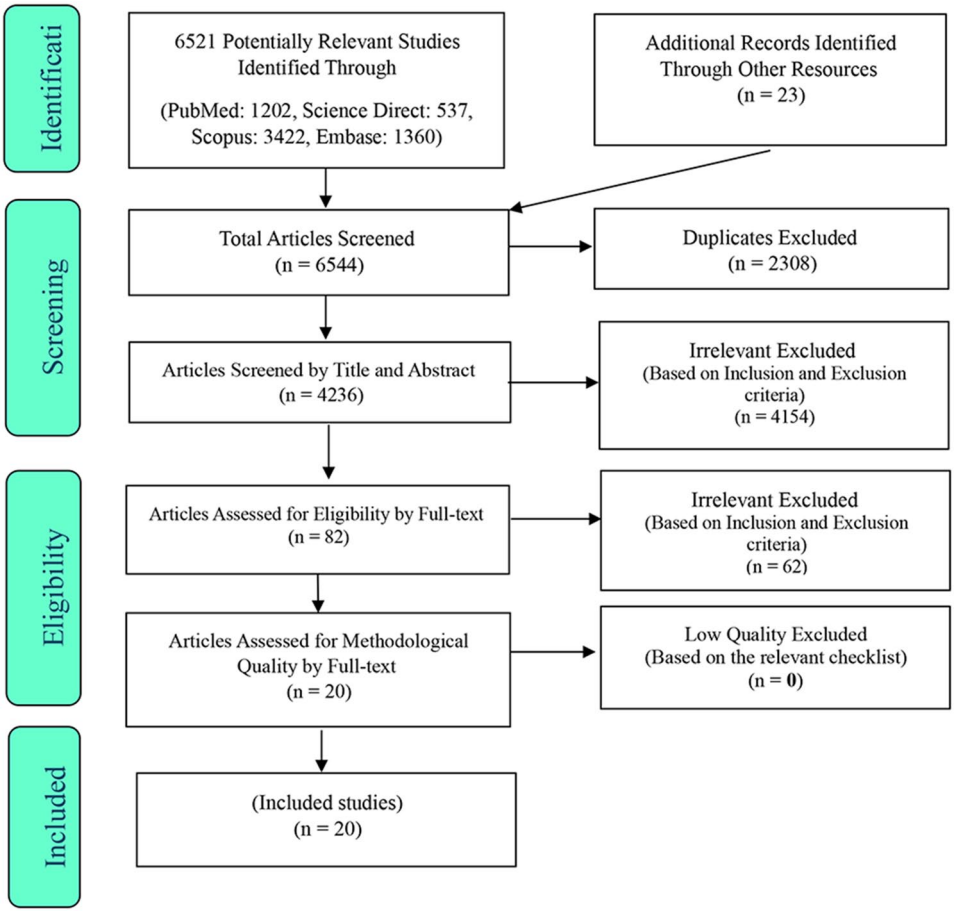

Fig. 1 Flow diagram of 'AI-Assisted Nursing Care' concept analysis study

Identifying the use of the concept

To explore the concept of AI-assisted nursing care, it is essential to understand the distinct meanings of the key terms from various sources:

Artificial intelligence

AI Refers to the simulation of human intelligence processes by computer systems, including learning, reasoning, and self-correction. In healthcare, AI encompasses technologies such as machine learning and natural language processing that assist in data analysis and decision-making [29].

Nursing care

Encompasses the holistic care provided to patients, emphasizing the physical, emotional, and spiritual health needs of individuals, while ensuring safety and well-being [30].

Combining these definitions, AI-assisted nursing care can be described as the integration of AI technologies into nursing practice to enhance patient outcomes and optimize care delivery.

AI-assisted nursing care in nursing literature

The literature on AI-assisted nursing care emphasizes both individual and professional dimensions. The individual approach focuses on raising awareness among nursing professionals about the potential benefits and applications of AI technologies. This includes ongoing education to enhance technological competencies, promote positive attitudes towards AI, and encourage responsible practices when implementing these tools.

On the other hand, the professional approach highlights the importance of interdisciplinary collaboration and effective utilization of AI in clinical settings. Studies suggest that AI can be deployed to augment nursing roles through clinical decision support, real-time patient monitoring, and the automation of administrative tasks [31]. For instance, AI tools can enhance the efficiency of documentation processes and reduce the likelihood of human errors during patient care [32].

Clinical integration of AI

AI-assisted nursing care can be achieved through two primary strategies: technological integration and organizational support. Technological integration involves employing AI-driven systems in patient assessment, diagnostics, and predictive analytics [33]. By leveraging these technologies, nurses can deliver timely and personalized care, ensuring that interventions are tailored to individual patient profiles [21]. Organizational Support encompasses effective organizational strategies, which are necessary to facilitate the implementation of AI-assisted nursing care; this includes creating an infrastructure that supports the use of AI technologies, such as electronic health record systems that incorporate decision support features. Furthermore, healthcare facilities should provide training and resources to enable nurses to effectively utilize AI applications in their practice.

Overall, the synthesis of literature indicates that AI-assisted nursing care is not merely about incorporating technology but about reimagining nursing practices to enhance patient outcomes through a collaborative, informed, and data-driven approach.

In conclusion, the exploration of AI-assisted nursing care highlights its growing importance in today's healthcare landscape. By clarifying its definition and core components, this analysis aims to provide an essential framework for the ongoing integration of AI into nursing practice, ultimately contributing to improved patient safety, efficiency, and care quality in clinical settings.

Defining attributes of AI-assisted nursing care

AI-assisted nursing care concept embodies several defining attributes that collectively contribute to its understanding and application in clinical practice. Each attribute reflects the integration of AI technologies into nursing and highlights the potential benefits for patient outcomes and healthcare workflows. Based on the attributes AI-Assisted Nursing Care can be defined as:

AI-assisted nursing care represents a transformative shift in the field, where technology acts as a collaborative partner to nurses. By combining human expertise with AI's analytical power, this approach enhances care quality, boosts efficiency, and delivers a proactive, individualized patient experience. It is a holistic integration of innovation into the heart of nursing practice, designed to meet the demands of modern healthcare. Below are detailed descriptions of the defining attributes based on current literature:

1. **Data-Driven Decision Support**: AI analyzes patient data, like vital signs and medical records, to give nurses evidence-based recommendations. For example, it can flag potential risks, helping nurses make informed decisions quickly; this is supported by research showing AI improves precision in diagnoses and treatment plans by analyzing patient data, recognizing patterns, and flagging outliers [2, 25]. AI-driven systems continuously analyze patient data to detect early deterioration, enabling timely interventions and reducing adverse events [34]. AI facilitates evidence-based decisions by analyzing extensive patient data, research, and medical literature using natural language processing and machine learning, enhancing diagnosis and intervention accuracy [11].

2. **Automation of Routine Tasks**: AI handles repetitive tasks, such as scheduling or documentation, freeing nurses to focus on direct patient care. Studies highlight this reduces workload, with examples like automated nurse rostering and scheduling reducing workload and enhancing efficiency [12]. AI automates vital sign monitoring and data collection, reducing nurses' interaction time with patients from 18 minutes to 10 minutes using intelligent surveillance systems [23]. More than half of nurses' time is spent on non-professional activities like waiting for doctor's approval (85 minutes daily) and inputting duplicate data, which AI can automate, saving up to 10% of their time [27]. 67.2% of nurse managers reported robots significantly lower workloads without replacing nurses, aiding in delivering medications and patient monitoring and also Robotic Process Automation (RPA) automates administrative tasks like appointment scheduling and medication reminders, improving workflow [27].
3. **Enhanced Predictive Capabilities**: By identifying patterns in patient data, AI can predict risks, such as the deterioration of a patient's condition, enabling timely nursing interventions.; this allows nurses to intervene early, improving outcomes, as seen in reviews of AI for risk prevention [18]. AI-enhanced clinical decision support tools rapidly generate nursing diagnoses, calculate patient fall risk predictions, and develop decision trees to prevent catheter-associated urinary tract infections [13]. Machine learning, specifically deep learning, has been experimented to predict pain sensation and physical deterioration for acute critical conditions [25]. Predictive analytics for patient risk assessment, such as likelihood of readmissions or infections, allows healthcare providers to take proactive measures [14].
4. **Personalization of Care**: AI tailors care to individual needs using patient-specific data, enhancing treatment plans. AI algorithms analyze patient data, identify care gaps, and provide recommendations for appropriate interventions, facilitating coordinated and personalized care delivery [35]. Nurses envisioned AI's potential for early detection and saving lives, which could enhance personalized patient outcomes, emphasizing a harmonious integration [36]. AI's analytical prowess opens the door to a new era of patient care, promising a level of personalization previously unattainable [36].
5. **Continuous Learning and Adaptability**: AI systems improve over time by learning from new data, ensuring relevance. Research shows nurses' data feed into AI, enhancing its accuracy for future care through continuous learning and adaptability [15].

Model case

Nurse Emily is caring for Mr. Thompson, a 68-year-old man recovering from hip replacement surgery in a hospital equipped with an advanced AI system. This system fully incorporates all five attributes, enhancing every aspect of Emily's care. The AI systems continuously monitor Mr. Thompson's vital signs and lab results. When it detects a slight drop in blood pressure and a minor increase in heart rate, it alerts Emily to early signs of dehydration. She reviews the AI's analysis and adjusts his IV fluids promptly using clinical judgement, preventing a potential setback. The system automatically updates Mr. Thompson's electronic health record (EHR) with his latest vitals and Emily's observations. It also schedules his physical therapy sessions based on his progress and the therapist's availability, allowing Emily to focus on direct patient care instead of administrative tasks. It analyzes Mr. Thompson's age, medication history, and sleep patterns, predicting a high risk of post-operative delirium. It suggests adjusting his pain management to avoid sedatives and scheduling quiet hours for rest. Emily, after a thorough assessment and validating the AI's analysis, implements these recommendations, reducing his risk of confusion. Knowing Mr. Thompson has a history of anxiety, the AI system customizes his care plan by recommending mindfulness exercises and adjusting medications to minimize anxiety triggers. Emily first makes sure the new care plan is valid and evidence-based and then she acts based on her own judgment and AI's analysis to help him feel more comfortable during recovery without causing any unintentional harm. After Mr. Thompson recovers successfully, it incorporates his data to improve its algorithms for future patients. It also integrates the latest research on post-operative care, ensuring Emily's interventions remain cutting-edge.

Borderline case

Nurse Liam works at a mid-sized clinic with a basic AI system, which supports some attributes but not others. He's caring for Mrs. Garcia, a 52-year-old woman with type 2 diabetes. The AI system automates Mrs. Garcia's appointment scheduling and sends her reminders for check-ups and medication refills. It also transcribes Liam's verbal notes into her EHR, reducing his documentation time. The system compiles Mrs. Garcia's blood sugar readings and weight into a dashboard, alerting Liam when her levels are abnormal. This helps him quickly adjust her insulin dosage when needed, though it doesn't offer detailed recommendations.

Contrary case

Nurse Sarah works in a rural health center with no AI tools, relying entirely on traditional methods to care for Mr. Patel, a 75-year-old man with chronic heart failure.

Table 2 Attributes, antecedents, and consequences of 'AI-Assisted nursing care' concept

Antecedents	Attributes	Consequences
Availability of Advanced Technology	Data-Driven Decision Support	Improved Patient Outcomes
Integration into Healthcare Systems	Automation of Routine Tasks	Increased Efficiency in Nursing Practice
Nursing Competence and Acceptance	Enhanced Predictive Capabilities	Enhanced Nurse Satisfaction
Patient Data Availability	Personalization of Care	Potential Cost Savings
Ethical and Regulatory Frameworks	Continuous Learning and Adaptability	Ethical and Social Challenges

Sarah records Mr. Patel's vital signs manually and reviews his paper chart. When his weight increases slightly, she misses the early sign of fluid retention until he reports shortness of breath days later, delaying treatment. Sarah spends hours scheduling appointments, handwriting notes, and managing supplies. This workload reduces her time to educate Mr. Patel on diet and medication, increasing his risk of worsening symptoms. As a typical nurse, Sarah can't foresee Mr. Patel's risk of a heart failure exacerbation. When he develops severe edema unexpectedly, she reacts after the fact, adjusting his diuretics under pressure. The clinic uses a standard heart failure plan for all patients. Despite Mr. Patel's limited mobility and preference for low-sodium cultural foods, his care isn't tailored, missing chances to improve his adherence and comfort. Sarah lacks access to updated guidelines or data insights. Her care is based on outdated training, potentially overlooking newer, more effective heart failure treatments. One of his coworkers suggests that Sarah uses AI for selecting nursing diagnoses, but she refuses, stating, 'I cannot rely on a machine and do not trust AI!

Identify antecedents and consequences

Walker and Avant (2011) provided a clear definition of antecedents as events or attributes that precede the occurrence of a concept, whereas consequences refer to events that ensue from the concept's occurrence [10]. In this study, it was crucial to identify and examine the associated antecedents and consequences (Table 2). Therefore, the antecedents and consequences investigated are as follows:

Antecedents

1. **Availability of Advanced Technology**: AI-assisted nursing care requires access to hardware (e.g., sensors, computers) and software (e.g., machine learning algorithms) capable of processing healthcare data. Research on AI in cardiovascular ICUs highlights the need for high-performance computing and sensor technology to monitor patients and support decision-making, emphasizing technological infrastructure as a prerequisite [28]. Studies on nursing education stress that AI tools like virtual assistants require advanced hardware and software, such as cloud computing, to deliver educational content or patient care support, underscoring technological readiness [15]. A review of AI applications in nursing care identifies the necessity of robotics and intelligent surveillance systems, which depend on cutting-edge tech for tasks like patient monitoring, as a foundational requirement [18]. Nurses envision AI's potential only with access to smart devices such as smart beds and wearable sensors, illustrating that without such technology, AI-assisted care cannot function effectively in practice [36].
2. **Integration into Healthcare Systems**: Successful implementation depends on embedding AI tools into existing workflows, such as hospital EHR systems or telehealth platforms, requiring technical compatibility and staff training as noted in studies on clinical decision support systems, where lack of integration delays care delivery [20]. A rapid review of AI in nursing care emphasizes that integration of AI systems and hospital workflows (e.g., triage systems) is critical for real-time application, highlighting system integration as a must [18]. Research on AI's impact in healthcare settings points out that without integration into scheduling or monitoring systems, automation benefits are lost, requiring hospitals to adapt their infrastructure first [12]. A qualitative study reveals nurses' expectations that AI integrates with existing tools like patient management software, necessitating prior system alignment for effective care delivery [36].
3. **Nursing Competence and Acceptance**: Nurses must have baseline technological literacy and a willingness to adopt AI tools. Studies on AI education stress that nurses need training in AI basics (e.g., interpreting outputs) to use it effectively, with competence being a barrier if unmet, as seen in curriculum development efforts [15]. Research on AI's future in nursing notes that acceptance hinges on nurses' comfort with technology, with resistance due to inadequate skills stalling implementation, making training a prerequisite [20]. Another study highlights that nurses' proactive learning and acceptance of AI are vital, with reluctance or lack of competence preventing its integration into daily practice [22]. Qualitative insights show nurses actively seeking AI training to enhance collaboration,

indicating that competence and openness are essential preconditions for AI-assisted care to succeed [36].

4. **Patient Data Availability**: The presence of comprehensive, high-quality patient data (e.g., from monitoring devices or historical records) is essential for AI to function effectively. AI relies on large datasets for predictive analytics, with studies showing that incomplete or poor-quality data from EHRs limits its accuracy in nursing care, making data availability critical [18]. Studies on AI's predictive capabilities note that historical and current patient data (e.g., vital signs) are necessary inputs, with gaps in data collection undermining AI's effectiveness [28]. A study on AI's impact in healthcare settings highlights that standardized, accessible data is a must for automation and decision support, requiring prior investment in data infrastructure [12]. Nurses' use of AI for early detection depends on continuous data streams, with research indicating that without this, AI cannot deliver actionable insights in practice [36].
5. **Ethical and Regulatory Frameworks**: Before AI-assisted care can occur, policies must address issues like accountability, bias, and patient consent; ethical guidelines are essential, with studies on AI ethics in nursing noting that unclear accountability (e.g., who's responsible for AI errors) prevents its adoption, requiring frameworks first [16]. Research on AI's impact stresses that regulatory approval (e.g., FDA standards for medical AI) is a prerequisite, ensuring safety and trust before nurses can rely on it in care settings [12]. A rapid review identifies privacy laws (e.g., HIPAA) as critical for AI handling patient data, with non-compliance halting implementation until regulations are met [18]. Papers on AI education highlight that ethical training for nurses on bias and consent is needed before AI use, embedding these frameworks into practice as a foundational step [15]. Nurses' perspectives in qualitative studies emphasize the need for clear ethical policies to feel confident using AI, with regulatory clarity being a precondition for its acceptance [36]. For example, WHO's AI ethics principles [37].

Consequences

Consequences of AI-assisted nursing care

1. **Improved Patient Outcomes**: Early detection of issues (e.g., sepsis) and personalized care plans lead to better recovery rates and reduced mortality, as evidenced by trials of AI in critical care settings. A study at Stanford Medicine demonstrated that an AI model reduced deterioration events by 10.4% among high-risk patients, leading to better clinical outcomes, such as fewer ICU transfers [24]. AI-powered tools also personalize care plans, improving treatment efficacy and patient satisfaction, contributing to reduced mortality rates and shorter hospital stays [27].
2. **Increased Efficiency in Nursing Practice**: Automation frees up time, allowing nurses to focus on direct care, with studies showing reduced documentation burdens in AI-supported environments. A rapid review found that AI systems reduce the time nurses spend on supervision and control tasks, increasing time for direct patient interaction, which enhances workflow efficiency [18]. Another study notes that AI automation of documentation and scheduling minimizes errors and streamlines nursing practice, allowing nurses to prioritize critical care [2].
3. **Enhanced Nurse Satisfaction**: When used collaboratively, AI can reduce burnout by alleviating workload pressures, though some articles note mixed feelings if nurses feel overshadowed by technology. Research suggests that AI helps alleviate stress, burnout, and compassion fatigue, with nurses reporting improved well-being when administrative burdens are reduced [27]. Qualitative studies exploring nurses' perspectives on AI highlight benefits like feeling empowered and less overwhelmed, potentially improving job retention [36].
4. **Potential Cost Savings**: By preventing complications or optimizing resource use, AI-assisted care may lower healthcare costs, a point often raised in economic analyses of AI adoption. Institutions adopting AI report significant reductions in operating costs, with some achieving up to 25% savings by preventing costly complications and optimizing resource allocation [27]. AI's predictive capabilities reduce the need for intensive care, lowering overall healthcare expenditures [2].
5. **Ethical and Social Challenges**: Consequences also include risks like over-reliance on AI, data privacy breaches, or unequal access to technology, which literature identifies as ongoing concerns. Studies discuss skepticism about AI's validity and reliability, with nurses needing to address data privacy concerns and ensure transparency to maintain trust [16].

Empirical referents

Empirical referents are measurable indicators that demonstrate the presence and extent of the concept of AI-assisted nursing care. The following validated tools and scales align with the identified attributes, providing concrete means to assess their application in clinical practice:

Data-driven Decision Support The Diagnostic Odds Ratio (DOR) and Likelihood Ratios (LR+ and LR-) measure the accuracy of AI-powered Clinical Decision Support Systems in delivering evidence-based recommendations. These metrics evaluate how effectively AI enhances nurses' decision-making by comparing system outputs to clinical standards, ensuring precision in care delivery [5].

Automation of Routine Tasks The MIDENF Scale quantifies workload reduction by scoring the time and effort of nursing tasks pre- and post-automation (e.g., via Robotic Process Automation). A decrease in scores post-AI implementation reflects increased efficiency, objectively capturing this attribute's impact [27].

Enhanced Predictive Capabilities The Modified Early Warning Score (MEWS), augmented by AI and assessed with AUC-ROC, measures the accuracy of AI-enhanced Continuous Monitoring Systems in predicting patient risks. Higher AUC values indicate superior predictive performance, enabling proactive nursing interventions [2].

Personalization of Care The Individualized Care Scale (ICS) – Nurse Version, adapted for observational use, assesses the degree of care personalization facilitated by AI systems. Higher scores on ICS subscales post-AI implementation demonstrate tailored care delivery, aligning with patient-specific needs [35, 36].

Continuous Learning and Adaptability Cumulative Sum (CUSUM) Analysis tracks AI system performance improvements over time, such as increased accuracy in predictions as new data is integrated. A downward CUSUM trend signifies adaptability, ensuring ongoing relevance in nursing practice [15].

Discussion

The concept of AI-assisted nursing care, as explored through this concept analysis using the Walker and Avant method, represents a pivotal development in the integration of technology into healthcare. The concept is characterized by five defining attributes: data-driven decision support [2, 11, 25, 34], automation of routine tasks [27], enhanced predictive capabilities [13, 14, 18, 25], personalization of care [35, 36], and continuous learning and adaptability [15]. These attributes collectively enhance nursing practice by providing real-time, evidence-based insights for clinical decision-making, reducing administrative burdens, predicting patient deterioration, tailoring interventions to individual needs, and ensuring AI systems remain current with medical advancements. For instance, data-driven decision support and predictive capabilities align with findings from studies highlighting AI's role in improving clinical outcomes [38].

The successful adoption of AI-assisted nursing care hinges on several antecedents: availability of advanced technology [15, 18, 28], integration into healthcare systems [12, 18, 20, 36], nursing competence and acceptance [15, 20, 22, 36], patient data availability [12, 18, 28], and ethical and regulatory frameworks [12, 15, 16, 18, 36]. These prerequisites emphasize the systemic changes required for implementation. Advanced technology and data availability are foundational, yet their effectiveness depends on seamless integration into clinical workflows [12]. Moreover, ethical frameworks are essential to address concerns like data privacy and algorithmic bias, ensuring trust and accountability [16] as in a study of Elendu. et al. [39] it is stressed that ethics must remain at the forefront in the ever-evolving realm of healthcare technology and medical ethics, such as autonomy, beneficence, non-maleficence, and justice, should remain foundational in guiding ethical practices in AI in healthcare. These antecedents highlight the collaborative effort needed among technologists, administrators, and nurses to overcome implementation barriers.

AI-assisted nursing care yields a spectrum of consequences, both positive and challenging. Improved patient outcomes [27], such as reduced adverse events and shorter hospital stays, reflect AI's potential to enhance care quality [40]. While this analysis highlights increased efficiency and enhanced nurse satisfaction as key benefits of AI-assisted nursing care [27], contrasting evidence exists. For instance, studies by Qaladi et al. (2025) and Alhutelh et al. (2022) report that 80.7 and 65% of nurses, respectively, fear job displacement due to AI, reflecting worries about automation overshadowing human roles [41, 42]. Potential cost savings [2, 27] further underscore AI's value. However, ethical and social challenges, including privacy risks and over-reliance on technology, require careful management [16].

Limitations and future directions

This analysis, grounded in literature up to 2025, may not capture subsequent AI advancements. The empirical referents, while promising, lack fully standardized tools, limiting their current applicability. Future research should validate these findings empirically, refine measurement instruments, and address equitable AI access across diverse healthcare contexts.

Conclusion

AI-assisted nursing care holds immense potential to revolutionize nursing by enhancing patient outcomes, efficiency, and nurses' well-being. This concept analysis, through its systematic exploration of attributes, antecedents, consequences, and referents, provides a robust

framework for its understanding and implementation. As healthcare evolves, sustained efforts in education, research, and ethical governance will ensure AI augments nursing practice effectively, preserving the profession's core focus on compassionate, high-quality care.

Abbreviations

AI	Artificial Intelligence
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
EHR	Electronic Health Record

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-025-03818-y.

Supplementary Material 1

Supplementary Material 2

Acknowledgements
The research was approved and Supported by Student Research Committee, Tabriz University of Medical Sciences (Grant Number: 76217).

Author contributions
RN: Conceptualization, methodology, investigation, interpretation of data, writing original draft, validation, review & editing; MG: Methodology, investigation, validation, review & editing AF, HG, MH, SS: Review & editing. All authors reviewed the manuscript and agreed on the final version.

Funding
The present study was financially supported by Student Research Committee of Tabriz University of Medical Sciences, Tabriz, Iran.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This study was approved by ethical committee of Tabriz University of Medical Sciences (IR.TBZMED.VCR.REC.1404.106). This study is a concept analysis using the Walker and Avant approach based on a literature review and did not involve human or animal subjects, experiments, or the use of human cell or tissue samples.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 21 April 2025 / Accepted: 28 August 2025
Published online: 24 September 2025

References

1. Rawas S. AI: the future of humanity. Discover Artif Intel. 2024;4(1):25.
2. Rony MKK, Parvin MR, Ferdousi S. Advancing nursing practice with artificial intelligence: enhancing preparedness for the future. Nurs Open. 2024;11(1).
3. Ventura-Silva J, Martins MM, LdL T, AdCa F, Pereira S, Zuge SS, Ribeiro OMPL. Artificial intelligence in the organization of nursing Care: a scoping review. Nurs Rep. 2024;14(4):2733–45.
4. Martinez-Ortigosa A, Martinez-Granados A, Gil-Hernández E, Rodriguez-Arrastia M, Ropero-Padilla C, Román P. Applications of artificial intelligence in nursing care: a systematic review. J Nurs Manag. 2023.
5. Elhaddad M, Hamam S. AI-Driven clinical decision support systems: an ongoing pursuit of potential. Cureus. 2024;16(4):e57728.
6. Maleki Varnosfaderani S, Forouzanfar M. The role of AI in hospitals and clinics: transforming healthcare in the 21st Century. Bioeng (Basel). 2024;11(4).
7. Reifs D, Casanova-Lozano L, Reig-Bolaño R, Grau-Carrion S. Clinical validation of computer vision and artificial intelligence algorithms for wound measurement and tissue classification in wound care. Inf Med unlocked. 2023;37:101185.
8. Babel A, Taneja R, Mondello Malvestiti F, Monaco A, Donde S. Artificial intelligence solutions to increase medication adherence in patients with non-communicable diseases. Front Digit Health. 2021;3:669869.
9. Nashwan AJ, Abujaber A, Ahmed SK. Charting the future: the role of AI in transforming nursing documentation. Cureus. 2024;16(3):e57304.
10. Walker LO, Avant KC. Strategies for theory construction in nursing. Vol. 4. River, NJ: Pearson/Prentice Hall Upper Saddle; 2005.
11. Parikh RB, Teeple S, Navathe AS. Addressing bias in artificial intelligence in health care. JAMA. 2019;322(24):2377–78.
12. Pailaha AD. The impact and issues of artificial intelligence in nursing science and healthcare settings. Sage Open Nurs. 2023;9:23779608231196847.
13. Artificial intelligence in nursing. https://www.myamericannurse.com/ai-artificial-intelligence-in-nursing.
14. The role of artificial intelligence in nursing informatics. https://www.Nursecom/blog/artif-Intel-In-Nurs-Inf-Nsp.
15. Glauberman G, Ito-Fujita A, Katz S, Callahan J. Artificial intelligence in nursing education: opportunities and challenges. Hawaii J Health Soc Welf. 2023;82(12):302–05.
16. Robert N. How artificial intelligence is changing nursing. Nurs ManAge. 2019;50(9):30–39.
17. Secinaro S, Calandra D, Secinaro A, Muthurangu V, Biancone P. The role of artificial intelligence in healthcare: a structured literature review. BMC Med Inf Decis Mak. 2021;21(1):125.
18. Seibert K, Domhoff D, Bruch D, Schulte-Althoff M, Fürstenau D, Biessmann F, Wolf-Ostermann K. Application scenarios for artificial intelligence in nursing care: rapid review. J Med Internet Res. 2021;23(11):e26522.
19. Mehta N, Pandit A, Shukla S. Transforming healthcare with big data analytics and artificial intelligence: a systematic mapping study. J Biomed Inf. 2019;100:103311.
20. Buchanan C, Howitt ML, Wilson R, Booth RG, Risling T, Bamford M. Predicted influences of artificial intelligence on the domains of nursing: scoping review. JMIR Nurs. 2020;3(1):e23939.
21. Rony MKK, Alrazeeni DM, Akter F, Nesa L, Chandra Das D, Uddin MJ, Begum J, Tahmina Khatun M, Noor MA, Ahmad S, et al. The role of artificial intelligence in enhancing nurses' work-life balance. J Med Surg Public Health. 2024;3:100135.
22. Ronquillo CE, Peltonen LM, Pruinelli L, Chu CH, Bakken S, Beduschi A, Cato K, Hardiker N, Junger A, Michalowski M, et al. Artificial intelligence in nursing: priorities and opportunities from an international invitational think-tank of the nursing and artificial intelligence leadership collaborative. J Adv Nurs. 2021;77(9):3707–17.
23. Huang K, Jiao Z, Cai Y, Zhong Z. Artificial intelligence-based intelligent surveillance for reducing nurses' working hours in nurse-patient interaction: a two-wave study. J Nurs Manag. 2022;30(8):3817–26.
24. Gallo RJ, Shieh L, Smith M, Marafino BJ, Geldsetzer P, Asch SM, Shum K, Lin S, Westphal J, Hong G, et al. Effectiveness of an artificial intelligence-enabled intervention for detecting clinical deterioration. JAMA Intern Med. 2024;184(5):557–62.
25. Ryu JI, Kim K. The influence of nursing care integration services on nurses' work satisfaction and quality of nursing care. J Nurs Manag. 2018;26(8):1024–32.
26. Buchanan C, Howitt ML, Wilson R, Booth RG, Risling T, Bamford M. Nursing in the age of artificial intelligence: protocol for a scoping review. JMIR Res protoc. 2020;9(4):e17490.
27. Dailah HG, Koriri M, Sabei A, Kriry T, Zakri M. Artificial intelligence in nursing: technological benefits to nurse's mental health and patient care quality. Healthcare (Basel). 2024;12(24).
28. Moazemi S, Vahdati S, Li J, Kalkhoff S, Castano LJV, Dewitz B, Bibo R, Sabouniaghdam P, Tootooni MS, Bundschuh RA, et al. Artificial intelligence for clinical decision support for monitoring patients in cardiovascular ICUs: a systematic review. Front Med (Lausanne). 2023;10:1109411.
29. Soori M, Arezoo B, Dastres R. Artificial intelligence, machine learning and deep learning in advanced robotics, a review. Cognit Rob. 2023;3:54–70.

30. What is nursing? https://www.nursingworld.org/practice-policy/workforce/what-is-nursing/.
31. Ventura-Silva J, Martins MM, Trindade LL, Faria A, Pereira S, Zuge SS, Ribeiro O. Artificial intelligence in the organization of nursing Care: a scoping review. Nurs Rep. 2024;14(4):2733–45.
32. Choudhury A, Asan O. Role of artificial intelligence in patient safety outcomes: systematic literature review. JMIR Med inform. 2020;8(7):e18599.
33. Yelne S, Chaudhary M, Dod K, Sayyad A, Sharma R. Harnessing the power of AI: a comprehensive review of its impact and challenges in nursing science and healthcare. Cureus. 2023;15(11):e49252.
34. Secinaro S, Calandra D, Secinaro A, Muthurangu V, Biancone P. The role of artificial intelligence in healthcare: a structured literature review. BMC Med Inf Decis. 2021;21(1):125.
35. Mehta N, Pandit A, Shukla S. Transforming healthcare with big data analytics and artificial intelligence: a systematic mapping study. J Retailing Biomed Inf. 2019;100:103311.
36. Rony MKK, Kayesh I, Bala SD, Akter F, Parvin MR. Artificial intelligence in future nursing care: Exploring perspectives of nursing professionals - a descriptive qualitative study. Heliyon. 2024;10(4).
37. Ethics and governance of artificial intelligence for health. https://www.who.int/publications/i/item/9789240029200.
38. Wei Q, Pan S, Liu X, Hong M, Nong C, Zhang W. The integration of AI in nursing: addressing current applications, challenges, and future directions. Front Med (Lausanne). 2025;12:1545420.
39. Elendu C, Amaechi DC, Elendu TC, Jingwa KA, Okoye OK, John Okah M, Ladele JA, Farah AH, Alimi HA. Ethical implications of AI and robotics in healthcare: a review. Medicine (Baltimore). 2023;102(50):e36671.
40. De Micco F, Di Palma G, Ferorelli D, De Benedictis A, Tomassini L, Tambone V, Cingolani M, Scendoni R. Artificial intelligence in healthcare: Transforming patient safety with intelligent systems-a systematic review. Front Med (Lausanne). 2024;11:1522554.
41. Alhutelh FAM, Alghubari HM, Alyami HHA, Alyami AMS, Alalhareth MHM, Alsaad KOK, Alghobari RMM, Al Yami NSA. The fear of artificial intelligence among healthcare workers: a narrative review. Adv Clin Exp Med. 2022;9(4).
42. Qaladi O, Alshammari M, Abdulrahim Almalki A. Artificial intelligence (AI) in nursing administration: challenges and opportunities. PLoS One. 2025;20(4):e0319588.

Publisher's Note