

Effectiveness of Artificial Intelligence in Resource Management and Nursing Workflow: A Scoping Review

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Abstract

Background:Artificial intelligence (AI) has become a game-changer in healthcare, particularly in two key areas: improving resource management and streamlining nursing processes. Integrating AI-driven solutions to enhance productivity and patient outcomes is becoming increasingly attractive as healthcare systems become more complicated.This Scoping review aims to evaluate the effectiveness of artificial intelligence (AI) in optimizing resource management and enhancing nursing workflow within healthcare settings

Methods:PubMed and CINAHL databases were searched, and research meeting criteria were included. Data were identified from all included articles, and themes were developed based on these data.

Results:The review's main results revealed many significant findings about the function of AI in healthcare. To begin, there is some evidence that nursing workflow and resource management might benefit from AI integration, leading to increased efficiency, better allocation of resources, and better patient care. Improved healthcare delivery is possible because AI applications may help with staffing requirements prediction, administrative load reduction, and nurses' ability to spend more time providing direct patient care.

Conclusions:The results of this scoping study show that AI technologies, like as ML and NLP, may greatly improve nursing processes and the way resources are managed. These innovations provide better patient monitoring, better clinical decision-making, more efficient use of resources, and individualized treatment programs.

Keywords: Artificial Intelligence, Effectiveness, Management, Nursing,Resource, Workflow

1 | Introduction

The increasing importance of healthcare data ecosystems has led to a surge in the use of artificial intelligence as a healthcare support system in the last several decades (Lee and Yoon, 2021; Martinez-Ortigosa et al., 2023). With the help of AI-powered support systems, healthcare costs can be cut, services can be more efficiently provided, and patients and the healthcare industry as a whole can benefit from a highly valued support system that enhances clinical safety and patient satisfaction(Stokes, and Palmer,2020; Almagharbeh, 2024). Concerns and debates persist, however, over the use of AI-based support systems in nursing care. Many worry that these systems will one day replace human interactions, which would put care ethics at risk. Most importantly, they worry that AI will one day take over nurses' roles(von Gerich et al., 2022).

Patient outcomes, operational efficiency, and the long-term viability of healthcare practices are all profoundly affected by how well clinical processes are optimized in today's healthcare systems (Gadhiraju, 2021). Ensuring healthcare professionals can provide timely and effective care while minimizing redundancies and mitigating potential errors is the goal of efficient clinical workflows, which encompass a range of processes, from patient admission to treatment delivery and post-care follow-up (Wangpitipanit, Lininger, and Anderson, 2024). Simplified processes are of the utmost importance in today's healthcare system, which is changing rapidly to prioritize patient-centered treatment (Pavuluri et al., 2024).

There are several instances of AI applications in the nursing field that show how these technologies might change the profession. Using speech recognition technology, for instance, can improve and expedite nursing

documentation (Schaefer et al., 2020). Another application of machine learning is a tool that suggests the most relevant terms to use based on the nurse's written text, which aids in the use of standardized technologies (Moen et al., 2020).

By enhancing their ability to combine many forms of pertinent data, such as environmental, genetic, health, and socio-demographic information, nurses will be better able to offer comprehensive care. This will be made possible by AI technology. In addition, a recent scoping review brought attention to the fact that most AI healthcare research has concentrated on secondary and tertiary care, so there is still a lot of room to investigate how primary care nurses are utilizing AI (Abbasgholizadeh-Rahimi, Granikov, and Pluye, 2020).

2 | Background

Artificial intelligence (AI) has become a game-changer in healthcare, particularly in two key areas: improving resource management and streamlining nursing processes. Integrating AI-driven solutions to enhance productivity and patient outcomes is becoming increasingly attractive as healthcare systems become more complicated. Gaining a grasp of how AI has developed and been used in various areas will help us understand how it will affect nursing. We can improve the quality of care in varied healthcare settings, expedite nursing operations, and enhance evidence-based approaches by studying how AI works in resource management and workflow optimization. This research will also help shape future education and research.

2.1 | The Impact of AI on Patient Care Efficiency and Clinical Nursing Care

Nursing care has been constrained by several allocative and technological inefficiencies that affect patient outcomes and experiences due to rising healthcare demands (Pavuluri et al., 2024). One example is the correlation between insufficient nurse staffing and an increase in the occurrence of missed care. This occurs when nurses are unable to provide all of the necessary nursing care because they are overwhelmed with their workload and lack the necessary time (Easton-Garrett, Gephart, and Nickels, 2020). AI refers to "an intelligent set-up" that can carry out activities similar to humans but with more efficiency. Research, synthesis, education, prediction, and choice-making are all part of this (Cleveland Clinic, 2020).

Artificial intelligence has revolutionized healthcare delivery in the last decade. There is evidence that AI can improve healthcare workflows and procedures, which in turn reduces wait times for consultations and treatments, speeds up diagnosis, and makes risk and outcome forecasts more accurate (Ramdurai, 2020). Artificial intelligence (AI) can improve treatment efficiency by suggesting cheaper and more clinically relevant ways to diagnose and treat patients (Dalal et al., 2020). Artificial intelligence (AI) has the potential to improve nursing care by helping nurses make better clinical decisions, leading to more streamlined and personalized treatment programs. Regular nursing care tasks, including monitoring a patient's vital signs, can also be aided by AI (Ng et al., 2022).

Artificial Intelligence (AI) is a rapidly evolving field of computer science that aims to create machines that can perform tasks that typically require human intelligence. AI includes various techniques such as machine learning (ML), deep learning (DL), and natural language processing (NLP) (Suleimenov et al., 2020; Ronquillo et al., 2021). An artificial intelligence program known as a huge Language Model (LLM) can comprehend, summarize, create, and forecast new text-based material by utilizing deep learning techniques and extremely huge data sets (Johnsen, 2024). The fast development of AI opens up possibilities for its use in healthcare, which might lead to a paradigm shift in the industry (Alowais et al., 2023). To provide healthcare practitioners with the information they need to effectively deploy AI in patient care, it is crucial to document and share data about AI's involvement in clinical practice (Chintala, 2022).

2.2 | Ethical Considerations in AI for Workflow and Resource Management

Artificial intelligence (AI) is having a significant impact on healthcare, which is one industry going through a period of tremendous transformation. Clinical decision-making, administrative chores, and patient care may all be improved with the use of these tools, which cover a wide spectrum of artificial intelligence technologies like deep learning, robots, machine learning, and natural language processing (Amann et al., 2020).

Diagnostic imaging, predictive analytics, individualized treatment planning, and patient monitoring are just a few of the many medical uses of artificial intelligence. Improved healthcare delivery, less room for human mistakes, and stronger healthcare professionals are the results of these changes (Benjamins, Dhunnoo, and Mesko, 2020). Artificial intelligence (AI) is more than just a new piece of technology; it represents a sea change in healthcare philosophy and practice and a hopeful sign for the industry's long-term prospects (Ahmad et al., 2024).

Responsible and fair deployment of artificial intelligence (AI) for workflow and resource management in nursing requires careful evaluation of ethical issues (Rony et al., 2024). The processing of sensitive health information by AI systems raises serious privacy concerns and calls for strong data protection measures to ensure compliance with privacy regulations like GDPR and HIPAA (Frank and Olaoye, 2024). It is also crucial to be

transparent; to establish confidence and guarantee responsibility, healthcare providers, including nurses, must know how AI systems make judgments (Hassan, and El-Ashry, 2024).

To avoid inequalities in healthcare settings whether it comes to resource allocation or workflow improvements, it is crucial to address fairness in access to AI technology. There should be explicit regulations to strike a balance between machine aid and professional autonomy since ethical concerns may emerge when AI is used to substitute human judgment (Clark et al., 2021). To make the most of AI while limiting its hazards in nursing practice, policies must be developed and ethical considerations must be maintained as the technology develops further (Dunlap, and Michalowski, 2024).

2.3 | AI Applications in Continuous Nursing Education and Training

There is a surge in the use of artificial intelligence health technologies (AIHTs) in healthcare systems, thanks to their ability to sift through mountains of research evidence, clinical data, and patient records in search of patterns that improve decision-making and knowledge creation (Mbunge, Muchemwa, and Batani, 2021; Ye, 2020). It is anticipated that Artificial Intelligence in Healthcare Technologies (AIHTs) will revolutionize many parts of healthcare systems in the next ten years because of their capabilities. About half of Canada's healthcare workers are registered nurses, making them the biggest category of regulated healthcare providers (Buchanan et al., 2021). Nurses in Canada may expect to see a dramatic shift in their responsibilities and the way they provide care as AIHTs spread across the country's healthcare system. Core competencies and educational requirements for nurses will need to adapt to accommodate these new models and roles (Buchanan et al., 2020).

However, a taxonomy of health-related artificial intelligence (AI) subfields does not yet exist. Artificial intelligence (AI) in healthcare could use this classification as its basis. Some of the most well-known methods in artificial intelligence include machine learning and hybrid systems. Data analysis tools like ML use algorithms to discover patterns and then learn from those patterns in different ways (Rahmani et al., 2021). These find use in the field of medical diagnostics, among others. Expert systems mimic human problem-solving abilities by combining a knowledge base with a rule-based reasoning engine. This allows them to apply a predetermined set of if-then rules derived from the knowledge base, much like a human expert might (Matsuzaka, and Yashiro, 2023).

Such systems are seen in devices that help with clinical judgment and case-based reasoning (Seibert et al., 2021). Hybrid systems can include many AI talents since they combine ML with expert systems. The field of artificial intelligence known as natural language processing (NLP) aims to develop systems that can understand and interpret written documents, such as medical notes. Applications that automate scheduling and planning that are driven by AI have the potential to simplify human tasks like making decisions regarding care scheduling or building nursing staff rosters (Kumar et al., 2023).

Several important aspects of nursing practice can be significantly improved by embracing AI. According to Van Bulck et al. (2023), clinical decision support systems driven by AI can aid nurses in making educated decisions on patient care by providing them with relevant insights and recommendations based on evidence. By sifting through mountains of data in search of patterns, AI can assist nurses in making more accurate diagnoses and providing more targeted treatment to their patients (Rony, Parvin, and Ferdousi, 2024). Secondly, AI has the potential to improve predictive analytics and patient monitoring. In addition, notifications may be received in real-time, patients' vital signs can be continually monitored, and early warning signals of deterioration can be detected by nurses using AI-enabled technology (Alazzam et al., 2022).

3 | Aim

This Review aims to evaluate the effectiveness of artificial intelligence (AI) in optimizing resource management and enhancing nursing workflow within healthcare settings. The study aims to find real advantages like better time management, less operational expenses, and better patient care delivery by investigating how AI-driven solutions make administrative procedures, job prioritization, and resource allocation more efficient. Furthermore, it seeks to investigate how AI may help nursing staff deal with issues like burnout and inefficient workflow, all while encouraging a more team-based and evidence-based approach to decision-making.

4 | Method

Researchers performed a thorough scoping study to investigate the efficacy of artificial intelligence (AI) in nursing workflow and resource management. To pick a sample of papers that was typical of the field, the review used strict inclusion and exclusion criteria to make sure everything was accurate and reliable (Perkins et al., 2024). Perkins et al. (2024) conducted a systematic search of numerous databases using predetermined keywords and criteria to find publications about artificial intelligence (AI) applications in healthcare, optimization of resources, and enhancement of the nursing workflow. To bring the results together, the researchers employed thematic analysis, which drew attention to themes and patterns that demonstrated how AI helped with things like work efficiency,

resource allocation, and patient outcomes. Discrepancies were resolved, reoccurring themes were identified, and all key insights were included after each article was examined many times (Perkins et al., 2024). This method seeks to add to the expanding nursing and healthcare knowledge base by showing how AI may improve healthcare delivery by transforming nursing practices, optimizing resources, and streamlining processes.

4.1 | Search strategy

The writers of this scoping study developed a thorough set of keywords to evaluate the efficacy of AI in nursing workflow and resource management. To include all papers that met the review's criteria, these keywords were intentionally wide. We searched many relevant databases with the help of a research librarian. The PubMed database was searched using terms such as “Artificial Intelligence,” “Resource Management in Healthcare,” and “Nursing Workflow.” Similarly, the Cumulative Index to Nursing and Allied Health (CINAHL) database was explored using terms like “AI in Nursing” and “Healthcare Resource Optimization.” The purpose of this search was to identify studies that discussed the application of AI in enhancing nursing practices and improving healthcare efficiency. The search, conducted in 2024, did not include restrictions on publication dates to ensure a comprehensive review. A total of 15 articles were retrieved from this systematic search spanning studies published between 2018 and 2024.

4.2 | Search outcome

A total of 2650 studies underwent screening utilizing full-text approaches. Subsequently, 2480 studies were eliminated for a variety of reasons: A total of 62 studies did not fulfill the intended research objective, 80 studies did not satisfy the criteria for study design, and 13 reviews did not meet the criterion for results. Ultimately, the research incorporated a total of fifteen papers (as seen in Figure 1) that satisfied the criteria for inclusion.

4.3 | Quality appraisal

The articles that were part of this Scoping review were evaluated for their dependability and rigor using a quality evaluation technique. Some groups have developed checklists to evaluate various types of research, including mixed-methods studies, quantitative studies, and qualitative studies. These include the Critical Appraisal Skills Program (CASP) and the Joanna Briggs Institute (JBI). Long, French, and Brooks (2020) described an assessment method that utilized such checklists. While assessing each article, we looked at how well they addressed our research questions, how reliable their methodology was, how large their samples were, how they gathered and analyzed their data, and how applicable their findings were to healthy aging and fall prevention nursing practice (Long, French, and Brooks, 2020).

Two separate reviewers managed the quality evaluation to make sure it was reliable and free of prejudice. During our meeting, we were able to settle any disagreements on the ratings. The final analysis did not include research that did not have proper methods or had poorly characterized participants (Long, French, and Brooks, 2020). According to Long, French, and Brooks (2020), the review was able to synthesize high-quality data thanks to its rigorous quality evaluation approach. This increased our understanding of how nursing theories promote healthy aging and reduce the risk of falls among the elderly.

4.4 | Data abstraction and synthesis

For this assessment, matrices were generated to facilitate planning, data analysis, and subject generation (Nibbelink, and Brewer, 2018). Early classification of the articles was based on the databases from which they were retrieved. At this stage, the matrices utilized described the samples, settings, methods, and results in great detail. Nibbelink and Brewer (2018) synthesized the included literature and constructed these matrices to compare various elements including locations, samples, and procedures. The second stage involved creating source-containing matrices that were organized based on data patterns and similarities (Nibbelink, and Brewer, 2018). According to Nibbelink and Brewer (2018), the second matrix was used as a foundation for developing themes. A final matrix was devised to capture the articles' recurring themes. This matrix also contained details from the research papers that provided context for the themes and the review's findings. The final table was useful for identifying shared characteristics and supporting the growth of writers' topics (Nibbelink, and Brewer, 2018). Last but not least, we synthesized the material's themes into a new data form (Nibbelink, and Brewer, 2018).

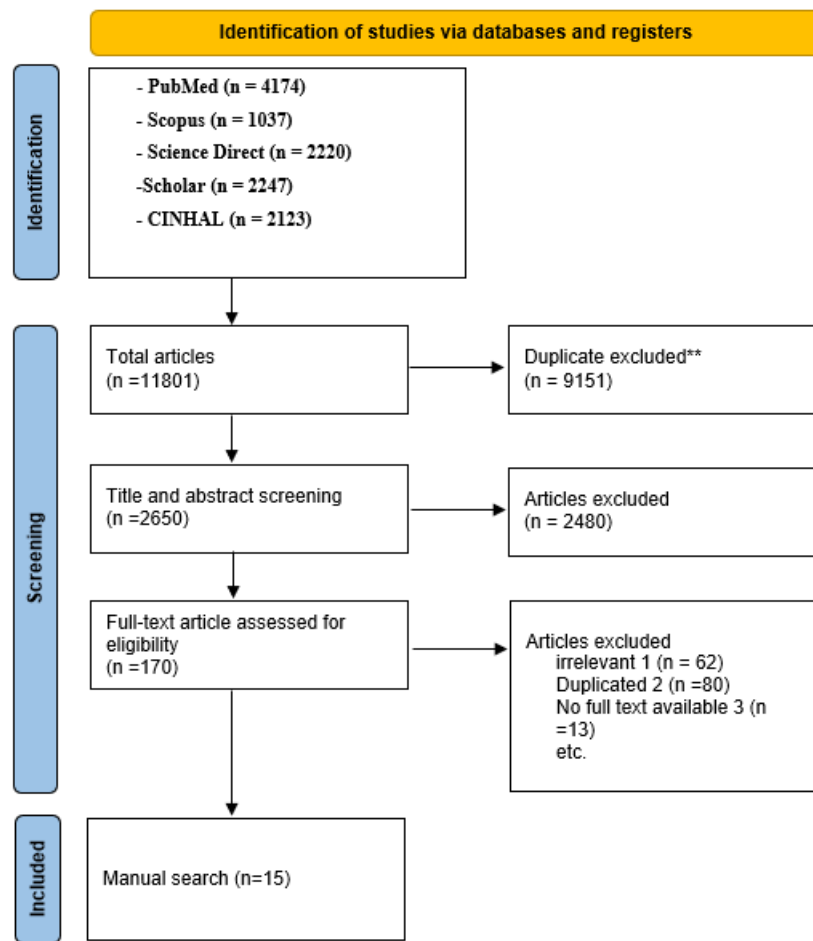


Figure 1 PRISMA Flow Diagram (PRISMA, 2020).

5 | Results

5.1 | Samples, settings and methods

The number of participants in the included studies ranged from 20– 3928. Research in this review included two qualitative studies, ten quantitative studies, and three systematic literature reviews (Tables 1–3 provide specific information on methods and other details of the included studies). The countries associated with the articles in this review were the USA (8), India (2), Spain (1), Canada (2), Sri Lanka (1), Bulgaria (1).

5.1.1 | Key findings

This study aimed to assess how well artificial intelligence (AI) has improved hospital resource management and how it has optimized the workflow of nurses in different facilities. An important discovery is that AI may simplify administrative tasks, which in turn improves resource allocation and makes patient care more efficient. The assessment demonstrated how AI-powered solutions, such as machine learning algorithms and predictive analytics, might ease the decision-making process for nurses, cutting down on both their burden and the likelihood of human mistakes. Improved patient outcomes and nurse satisfaction were the results of this strategy's increased emphasis on direct patient care.

In addition, the analysis showed that AI applications have led to major advancements in other important domains, such as scheduling efficiency, prescription management, and patient triage. Improved healthcare delivery was a result of AI systems' successful reduction of wait times and increase in patient throughput (Shiwlani et al., 2024). In addition, AI has improved data management and enabled real-time monitoring of patient status in nursing processes, allowing for faster interventions (Almagharbeh, 2024). In sum, the results highlight the potential for

artificial intelligence to transform the healthcare system and the necessity for more studies to determine its effects on nursing practice and resource management(Rony et al., 2024).

Table 1 Quantitative articles

Publication/date/authors	Aims/purpose	Design/methods	Context/setting/sample	Findings
Almagharbeh, 2024	examined how AI-based decision support systems (DSS) affect nurses' operational procedures in Amman, Jordan's critical care units (CCU).	a cross-sectional study	A study group of 112 registered nurses Setting: USA	The study emphasizes the importance of extensive training and supportive procedures to increase nurses' AI technology adoption in critical care.
Gadhiraju, 2021	analyzes how AI-driven technologies, such as machine learning (ML) and process automation, might improve dialysis center clinical workflow to meet these difficulties.	Mixed method study	N/A Setting: USA	AI and automation in dialysis treatment are major advances in nephrology, offering prospects to improve patient outcomes and operational efficiency.
Jayakumar et al., 2021	To evaluate the impact of an AI-enabled patient decision aid with education, preference assessment, and individualized outcome predictions (using patient-reported outcome measures) on decision quality, patient experience, and functional results.	A randomized clinical trial	129 new adult patients Setting: USA	
Shiwlani et al., 2024	A thorough investigation into the far-reaching effects of AI on medical practice.	cross-sectional study	175 Setting: USA	While noting obstacles including data privacy and ethical considerations, the study emphasizes the game-changing possibilities of AI in healthcare.

Esmaeilzadeh, Mirzaei, and Dharanikota, 2021	Specifically, we want to look at three distinct healthcare service encounter situations to see how potential users' (patients') perspectives on the pros, cons, and usage of AI clinical applications for healthcare vary.	A randomized clinical trial	634 individuals Setting: USA	The findings suggest that there are valid reasons to reject AI applications in healthcare if they do not align with instrumental, technological, ethical, or regulatory goals.
Singh et al., 2024	looks at ways to improve healthcare accessibility and efficiency through the use of IoT devices that incorporate artificial intelligence (AI) solutions for remote patient monitoring.	Cross-sectional study	150 individuals Setting: India	With the use of artificial intelligence (AI), this study expands our understanding of remote healthcare monitoring and provides the groundwork for a promising new paradigm for the Internet of Things (IoT) that may lead to improved healthcare efficiency, better patient outcomes, and widespread use of remote monitoring in the future.

Table2 Systematic Review Articles

Publication/date/authors	Aims/purpose	Design/methods	Context/setting/sample	Findings
Martinez-Ortigosa et al., 2023	The goal is to compile all of the research on the potential uses of AI in nursing care and draw conclusions.	A systematic review	A total of 21 articles Setting: Spain	Systems powered by AI have been shown to enhance workflows, save time, materials, and human resources, and provide patients and professionals more autonomy in care procedures like wound maintenance through guided directions.
Elhaddad, andHamam, 2024	This article discusses how artificial intelligence (AI) is revolutionizing clinical decision	A systematic review	N/A Setting: Canada	highlighting the revolutionary possibilities of AI in CDSS and promoting the need for further

	support systems (CDSS), how AI is being used in healthcare decision-making, the challenges it has caused, and the future of AI-CDSS.			exploration and development
Ronquillo et al., 2020	The purpose of this worldwide invitational think tank is to convene nursing experts and AI researchers to write a consensus paper outlining the conference's key issues.	A systematic review	N/A Setting: Canada	There is an immediate need for nurses to take the lead in discussions about artificial intelligence (AI) in healthcare systems and fill many holes in the current discourse.
Yelne et al., 2023	To delve into the effects and difficulties of AI on healthcare and nursing research.	A systematic review	N/A Setting: India	an impassioned plea for further study and concerted effort to guarantee that AI enhances healthcare results in a way that is both ethical and focused on the needs of individual patients.
Adeyemi, Adegoke, and Odugbose, 2024	investigates how health information technology (HIT) has contributed to the decrease of pharmaceutical mistakes, taking into account the most up-to-date developments in EHRs, CDSS, bar-coding technology, telemedicine, and mobile health apps.	A systematic review	N/A Setting: USA	Medication mistakes are a major issue in modern healthcare because they can compromise patient safety, treatment quality, and healthcare spending as a whole. New healthcare information technology (HIT) developments, however, provide encouraging ways to lessen the impact of these mistakes.
Ouanes, and Farhah, 2024	to determine how well CDSSs powered by AI affect clinical procedures and patient outcomes.	A systematic review	26 articles Setting: USA	Better patient outcomes may be possible with the use of AI in Clinical Decision Support Systems(CDSSs) due to increased diagnostic precision, optimized

				therapy selection, and fewer medical mistakes.
Huotari, 2023	to give a picture of the current state of perioperative care-related artificial intelligence (AI) applications in secondary healthcare	A systematic review	33 articles Setting: USA	There has been some encouraging progress in improving perioperative patient flow using artificial intelligence (AI) technology, like as predictive analytics tools and machine learning (ML) algorithms.

Table3 Qualitative Articles

Publication/date/authors	Aims/purpose	Design/methods	Context/setting/sample	Findings
Peiris, 2023	Delves into the construction of smart systems that optimize personnel, equipment use, and patient flow by utilizing computer vision and AI algorithms.	Qualitative Study	36 individuals Setting: Sri Lanka	Healthcare institutions throughout the world face the essential problem of efficiently allocating resources and managing workflows.
Tsvetanov, 2024	examined with an emphasis on revolutions per minute.	Qualitative Study	N/A Setting: Bulgaria	Making a well-informed judgment on the necessity, merits, and efficacy of creating a customized AI-based RPM and designing its architecture with the essential applications for that particular healthcare organization is the goal of this research.

5.2 | Synthesis of findings

5.2.1 | The Role of AI in improving nursing workflows and improving resource management in healthcare settings.

The use of artificial intelligence (AI) in healthcare has the potential to revolutionize patient care, especially in the nursing profession. To enhance nurses' engagement with AI technologies and make the most of their application in critical care settings, comprehensive training programs and supporting mechanisms are crucial. Everyone agrees that current AI systems need constant improvement and tweaking to maximize their effectiveness in improving patient care outcomes, even though opinions on this matter vary (Almagharbeh, 2024). The report provides a summary of the research on the various ways in which nursing practice might benefit from AI-based support systems. Machine learning and natural language processing-based solutions have shown to be the most effective in many healthcare operations, and they are also the most popular. Different forms of AI have shown encouraging outcomes, even though this sort of technology still has its limits. Systems powered by artificial

intelligence can improve workflow, patient monitoring, clinical decision-making, and early diagnosis. But we must take privacy and ethics into account and make sure that AI helps nurses out rather than takes their jobs (Martinez-Ortigosa et al., 2023).

According to the research, artificial intelligence (AI) tools like NLP and ML algorithms can sift through mountains of data to find meaningful patterns that improve clinical decision-making. Healthcare professionals may improve resource allocation, personalize treatment regimens, and foresee difficulties with the use of these systems' predictive analytics capabilities. In the context of dialysis treatment, these preventative actions are vital since prompt interventions can greatly reduce the likelihood of negative outcomes, which in turn improves patient safety and quality of life (Gadhiraju, 2021). Artificial intelligence is going to revolutionize the nursing profession. Advancements in artificial intelligence (AI) have the potential to greatly enhance the role of nurses in advancing the nursing profession and enhancing the health of populations worldwide. Artificial intelligence (AI) may improve and expand nursing's capabilities if the profession actively works to overcome the aforementioned concerns. On the other hand, nurses can teach AI a lot about patient advocacy and relational practice, which will help the field create AI that takes a more comprehensive picture of patients (Ronquillo et al., 2020; Yelne et al., 2023).

5.2.2 | The effects of AI on patient outcomes, including satisfaction, safety, and care quality.

In patients considering total knee replacement (TKR), an AI-enabled decision aid greatly improved decision quality, satisfaction, level of shared decision-making (SDM), and physical limitations. It had no discernible effect on consultation times, TKR rates, or treatment concordance. Improving SDM for knee OA care is possible with decision aids that use a tailored, data-driven approach (Jayakumar et al., 2021). Thanks to advancements in healthcare IT, the combination of AI, ML, and blockchain technology has revolutionized medication management, leading to better patient outcomes in terms of safety, adherence, and the use of medications. Harmonization and Interoperability Improved care coordination and continuity have resulted from efforts to standardize and increase interoperability, which has allowed for smooth data transmission across healthcare systems. Patient education, collaborative decision-making, and remote monitoring are just a few examples of patient engagement initiatives that have given patients more agency in their own healthcare and drug management (Esmailzadeh, Mirzaei, and Dharanikota, 2021; Ouanes, and Farhah, 2024). Possible Consequences for Policy and Legislation, when it comes to medication management, regulatory frameworks, and rules are really important for patient privacy, data security, and regulatory compliance, as well as for the acceptance, implementation, and ethical use of Healthcare Information Technology (HIT) solutions. Policy and Practice Consequences, Practical Consequences, To maximize treatment efficacy, care quality, and patient safety, healthcare companies should make the adoption and deployment of HIT solutions, such as artificial intelligence (AI), machine learning (ML), and blockchain technology, a top priority. The effective implementation and acceptance of HIT rely on interdisciplinary collaboration, stakeholder participation, and user-centered design (Adeyemi, Adegoke, and Odugbose, 2024; Shiwani et al., 2024).

5.2.3 | AI-Based Support Systems in Nursing for Patient Monitoring and Workflow Optimization

Healthcare workflow efficiency and resource allocation might be greatly improved with the development of smart systems that use AI algorithms and computer vision for patient flow management, personnel optimization, and equipment use. Healthcare providers may save money, enhance patient outcomes, and simplify operations by using these technologies. It is critical to tackle the issues and concerns related to AI-driven resource allocation systems as this area of study advances, so that they may be responsibly and helpfully integrated into healthcare procedures. In the end, we want to build an AI-powered healthcare system that is patient-centered, quick to respond, and able to provide top-notch service by combining human knowledge with AI (Peiris, 2023; Elhaddad, and Hamam, 2024; Singh et al., 2024).

the revolutions per minute rely heavily on AI, which is changing the game when it comes to remote patient monitoring and management. Within certain hospital settings and among nursing personnel, AI is transforming patient care and making a clinical effect. With an emphasis on RPM, this study investigates the effects and function of AI. According to the study's findings, RPM has been greatly improved and expanded thanks to AI-supported architectural designs, which have opened up new avenues for use and advantages in remote health monitoring. We identify, analyze, and debate nine major AI applications that are changing remote patient care. Also covered are some of the difficulties encountered by remote patient monitoring devices. To overcome these obstacles and make remote patient monitoring widely used, healthcare practitioners, software developers, lawmakers, and patients must work together (Tsvetanov, 2024; Huotari, 2023).

5.3 | Strengths and Limitations

An intensive search approach spanning various databases was employed to ensure substantial coverage of relevant material, which is one of the strengths of the study. Expert participation, such talking to a research librarian, improved the search process, and strict inclusion and exclusion criteria increased the trustworthiness of results.

Thematic analysis also allowed for a well-organized synthesis of results. The inclusion of only peer-reviewed publications introduced the possibility of publication bias, and the limited sample size of fifteen research limits the study's generalizability. It is possible that the breadth of insights was also restricted by the removal of non-English research.

5.4 | Implications for Practice, Education, And Research

Important implications for research, teaching, and practice are highlighted in the review. Healthcare organizations are being urged to embrace AI-driven solutions because of the positive effects AI integration may have on resource management, workflow efficiency, and patient outcomes. To better educate nurses about care settings that integrate technology, nursing programs should include AI training in their curricula. Additional study is necessary to determine the long-term effects of AI on nursing workflows, resource allocation, and patient care, and to identify and remove obstacles to its widespread use.

6 | Conclusion and Recommendations

The results of this scoping study show that AI technologies, like as ML and NLP, may greatly improve nursing processes and the way resources are managed. These innovations provide better patient monitoring, better clinical decision-making, more efficient use of resources, and individualized treatment programs. Nevertheless, there are still significant obstacles to overcome in order to successfully incorporate AI into nursing practice, including concerns about data privacy and ethics. Prioritizing AI system design with users in mind, multidisciplinary cooperation, and nurse training programs can help healthcare companies reap the most benefits of AI.

Research in the future should look at how AI affects patients in the long run, how to address privacy and ethical concerns, and how to make sure AI helps nurses out instead of taking their job. Patient safety, equity, and improved care quality may all be achieved through the appropriate use of AI, which requires policy frameworks to direct its implementation. Nursing practice and the healthcare system as a whole can benefit from AI's incorporation if it focuses on these areas.

Conflicts of Interest

The authors declare that they have no conflict of interest associated with this article.

References

- Abbasgholizadeh-Rahimi, S., Granikov, V., & Pluye, P. (2020). Current works and future directions on the application of machine learning in primary care. In *Proceedings of the 11th Augmented Human International Conference* (pp. 1–2).
- Adeyemi, C., Adegoke, B. O., & Odugbo, T. (2024). The impact of healthcare information technology on reducing medication errors: A review of recent advances. *International Journal of Frontiers in Medicine and Surgery Research* [online], 5(2), 20-29.
- Ahmad, A., Husnain, A., Shiwlani, A., Hussain, A., Gondal, M. N., & Saeed, A. (2024). Ethical and clinical implications of AI integration in cardiovascular healthcare. *World Journal of Advanced Research and Reviews*, 23(3), 2479-2501.
- Alazzam, M. B., Tayyib, N., Alshawwa, S. Z., & Ahmed, M. K. (2022). Nursing care systematization with case-based reasoning and artificial intelligence. *Journal of Healthcare Engineering*, 2022, 1–9. 10.1155/2022/1959371
- Almagharbeh, W. T. (2024). The impact of AI-based decision support systems on nursing workflows in critical care units. *International Nursing Review*.
- Alowais, S. A., Alghamdi, S. S., Alsuhebany, N., Alqahtani, T., Alshaya, A. I., Almohareb, S. N., ... & Albekairy, A. M. (2023). Revolutionizing healthcare: the role of artificial intelligence in clinical practice. *BMC Medical Education*, 23(1), 689.
- Amann, J., Blasimme, A., Vayena, E., Frey, D., & Madai, V. I. (2020). Explainability for artificial intelligence in healthcare: a multidisciplinary perspective. *BMC Medical Informatics and Decision Making*, 20(1), 1-9.
- Benjamins, S., Dhunoo, P., & Mesko, B. (2020). The state of artificial intelligence-based FDA-approved medical devices and algorithms: an online database. *NPJ Digital Medicine*, 3(1), 118.
- Buchanan, C., Howitt, M. L., Wilson, R., Booth, R. G., Risling, T., & Bamford, M. (2020). Predicted influences of artificial intelligence on the domains of nursing: a scoping review. *JMIR nursing*, 3(1), e23939.
- Buchanan, C., Howitt, M. L., Wilson, R., Booth, R. G., Risling, T., & Bamford, M. (2021). Predicted influences of artificial intelligence on nursing education: A scoping review. *JMIR nursing*, 4(1), e23933.
- Clark, C. R., Wilkins, C. H., Rodriguez, J. A., Preininger, A. M., Harris, J., DesAutels, S., ... & Dankwa-Mullan, I. (2021). Healthcare equity in the use of advanced analytics and artificial intelligence technologies in primary care. *Journal of General Internal Medicine*, 36, 3188-3193.

- Cleveland Clinic. (2020). How artificial intelligence is partnering with nursing to provide care. <https://consultqd.clevelandclinic.org/how-artificial-intelligence-is-partnering-with-nursing-to-provide>.
- Dalal, R., Varahamurthy, R., & Talegaon, R. (2020). A tome of artificial intelligence. *International Research Journal of Engineering and Technology*, 7(7), 2437–2439.
- Dunlap, P. A. B., & Michalowski, M. (2024). Advancing AI Data Ethics in Nursing: Future Directions for Nursing Practice, Research, and Education. *JMIR nursing*, 7(1), e62678.
- Easton-Garrett, S., Gephart, S., & Nickels, S. (2020). Utilizing artificial intelligence for fall management in memory care. *Geriatric Nursing*, 41(2), 194–195. <https://doi.org/10.1016/j.gerinurse.2020.03.01>.
- Elhaddad, M., & Hamam, S. (2024). AI-Driven clinical decision support systems: an ongoing pursuit of potential. *Cureus*, 16(4).
- Esmacilzadeh, P., Mirzaei, T., & Dharanikota, S. (2021). Patients' perceptions toward human–artificial intelligence interaction in health care: experimental study. *Journal of medical Internet research*, 23(11), e25856.
- Frank, E., & Olaoye, G. (2024). Privacy and data protection in AI-enabled healthcare systems.
- Gadhiraju, A. (2021). AI-Driven Clinical Workflow Optimization in Dialysis Centers: Leveraging Machine Learning and Process Automation to Enhance Efficiency and Patient Care Delivery. *Journal of Bioinformatics and Artificial Intelligence*, 1(1), 471–509.
- Hassan, E. A., & El-Ashry, A. M. (2024). Leading with AI in critical care nursing: challenges, opportunities, and the human factor. *BMC nursing*, 23(1), 752.
- Huotari, A. (2023). Utilizing artificial intelligence in perioperative patient flow: systematic literature review.
- Jayakumar, P., Moore, M. G., Furlough, K. A., Uhler, L. M., Andrews, J. P., Koenig, K. M., ... & Bozic, K. J. (2021). Comparison of an artificial intelligence-enabled patient decision aid vs educational material on decision quality, shared decision-making, patient experience, and functional outcomes in adults with knee osteoarthritis: a randomized clinical trial. *JAMA Network open*, 4(2), e2037107–e2037107.
- Johnsen, M. (2024). Large Language Models (LLMs). Maria Johnsen.
- Kumar, D. E. E. P. A. K., Kumar, P. U. N. E. T., Ahmed, I. F. T. E. K. H. A. R., & Singh, S. A. N. G. A. M. (2023). Integrating artificial intelligence in disease diagnosis, treatment, and formulation development: a review. *Asian J Pharm Clin Res*, 16(3), 1–8.
- Lee, D., & Yoon, S. N. (2021). Application of artificial intelligence-based technologies in the healthcare industry: Opportunities and challenges. *International journal of environmental research and public health*, 18(1), 271.
- Long, H. A., French, D. P., & Brooks, J. M. (2020). Optimizing the value of the critical appraisal skills program (CASP) tool for quality appraisal in qualitative evidence synthesis. *Research Methods in Medicine & Health Sciences*, 1(1), 31–42.
- Martinez-Ortigosa, A., Martinez-Granados, A., Gil-Hernández, E., Rodriguez-Arrastia, M., Ropero-Padilla, C., & Roman, P. (2023). Applications of artificial intelligence in nursing care: a systematic review. *Journal of Nursing Management*, 2023(1), 3219127.
- Matsuzaka, Y., & Yashiro, R. (2023). AI-based computer vision techniques and expert systems. *AI*, 4(1), 289–302.
- Mbunge, E., Muchemwa, B., & Batani, J. (2021). Sensors and Healthcare 5.0: transformative shift in virtual care through emerging digital health technologies. *Global Health Journal*, 5(4), 169–177.
- Moen, H., Hakala, K., Peltonen, L.-M., Matinolli, H.-M., Suhonen, H., Terho, K., Danielsson-Ojala, R., Valta, M., Ginter, F., Salakoski, T., & Salanterä, S. (2020). Assisting nurses in care documentation: From automated sentence classification to coherent document structures with subject headings. *Journal of Biomedical Semantics*, 11(1), <https://doi.org/10.1186/s13326-020-00229-7>.
- Ng, Z. Q. P., Ling, L. Y. J., Chew, H. S. J., & Lau, Y. (2022). The role of artificial intelligence in enhancing clinical nursing care: A scoping review. *Journal of Nursing Management*, 30(8), 3654–3674.1
- Nibbelink, C. W., & Brewer, B. B. (2018). Decision-making in nursing practice: An integrative literature review. *Journal of Clinical Nursing*, 27(5–6), 917–928.
- Ouanes, K., & Farhah, N. (2024). Effectiveness of Artificial Intelligence (AI) in Clinical Decision Support Systems and Care Delivery. *Journal of Medical Systems*, 48(1), 74.
- Pavuluri, S., Sangal, R., Sather, J., & Taylor, R. A. (2024). Balancing act: the complex role of artificial intelligence in addressing burnout and healthcare workforce dynamics. *BMJ Health & Care Informatics*, 31(1), e101120.
- Peiris, T. R. (2023). Optimizing Resource Allocation and Workflow Efficiency in Healthcare with Computer Vision and AI: Developing Intelligent Systems for Patient Flow Management, Staffing, and Equipment Utilization. *Journal of Applied Smart HealthCare Informatics*, 13(12), 31–40.
- Perkins, S. W., Muste, J. C., Alam, T., & Singh, R. P. (2024). Improving Clinical Documentation with Artificial Intelligence: A Systematic Review. *Perspectives in Health Information Management*, 21(2), 1–25.

- Rahmani, A. M., Azhir, E., Ali, S., Mohammadi, M., Ahmed, O. H., Ghafour, M. Y., ... & Hosseinzadeh, M. (2021). Artificial intelligence approaches and mechanisms for big data analytics: a systematic study. *PeerJ Computer Science*, 7, e488.
- Ronquillo, C. E., Peltonen, L. M., Pruinelli, L., Chu, C. H., Bakken, S., Beduschi, A., ... & Topaz, M. (2021). Artificial intelligence in nursing: Priorities and opportunities from an international invitational think-tank of the Nursing and Artificial Intelligence Leadership Collaborative. *Journal of Advanced Nursing*, 77(9), 3707-3717.
- Rony, M. K. K., Kayesh, I., Bala, S. D., Akter, F., & Parvin, M. R. (2024). Artificial intelligence in future nursing care: Exploring perspectives of nursing professionals-A descriptive qualitative study. *Heliyon*, 10(4).
- Rony, M. K. K., Numan, S. M., Akter, K., Tushar, H., Debnath, M., tujJohra, F., ... & Parvin, M. R. (2024). Nurses' perspectives on privacy and ethical concerns regarding artificial intelligence adoption in healthcare. *Heliyon*, 10(17).
- Rony, M. K. K., Parvin, M. R., & Ferdousi, S. (2024). Advancing nursing practice with artificial intelligence: Enhancing preparedness for the future. *Nursing open*, 11(1), 10.1002/nop2.2070. <https://doi.org/10.1002/nop2.2070>
- Schaefer, J., Lehne, M., Schepers, J., Prasser, F., & Thun, S. (2020). The use of machine learning in rare diseases: a scoping review. *Orphanet Journal of Rare Diseases*, 15(1), <https://doi.org/10.1186/s13023-020-01424-6>
- Seibert, K., Domhoff, D., Bruch, D., Schulte-Althoff, M., Fürstenau, D., Biessmann, F., & Wolf-Ostermann, K. (2021). Application scenarios for artificial intelligence in nursing care: rapid review. *Journal of medical Internet research*, 23(11), e26522.
- Shiwlani, A., Khan, M., Sherani, A. M. K., Qayyum, M. U., & Hussain, H. K. (2024). REVOLUTIONIZING HEALTHCARE: THE IMPACT OF ARTIFICIAL INTELLIGENCE ON PATIENT CARE, DIAGNOSIS, AND TREATMENT. *JURIHUM: Jurnal Inovasi dan Humaniora*, 1(5), 779-790.
- Singh, J., Sahu, D. P., Kumar, A., Ahmad, S. K., Majumder, J., & Gangopadhyay, S. (2024, July). Optimizing Healthcare Accessibility and Effectiveness through the Implementation of AI Solutions for Remote Patient Monitoring. In *2024 IEEE 3rd World Conference on Applied Intelligence and Computing (AIC)* (pp. 197-201). IEEE.
- Stokes, F., & Palmer, A. (2020). Artificial intelligence and robotics in nursing: ethics of caring as a guide to dividing tasks between AI and humans. *Nursing Philosophy*, 21(4), e12306.
- Suleimenov, I. E., Vitulyova, Y. S., Bakirov, A. S., & Gabrielyan, O. A. (2020, April). Artificial Intelligence: what is it? In *Proceedings of the 2020 6th International Conference on Computer and Technology Applications* (pp. 22-25).
- Tsvetanov, F. (2024). Integrating AI Technologies into Remote Monitoring Patient Systems. *Engineering Proceedings*, 70(1), 54.
- Van Calster, B., Wynants, L., Timmerman, D., Steyerberg, E. W., & Collins, G. S. (2019). Predictive analytics in health care: How can we know it works? *Journal of the American Medical Informatics Association*, 26(12), 1651–1654. 10.1093/jamia/ocz130.
- von Gerich, H., Moen, H., Block, L. J., Chu, C. H., DeForest, H., Hobensack, M., ... & Peltonen, L. M. (2022). Artificial Intelligence-based technologies in nursing: A scoping literature review of the evidence. *International journal of nursing studies*, 127, 104153.
- Wangpitipanit, S., Lininger, J., & Anderson, N. (2024). Exploring the deep learning of artificial intelligence in nursing: a concept analysis with Walker and Avant's approach. *BMC nursing*, 23(1), 529.
- Ye, J. (2020). The role of health technology and informatics in a global public health emergency: practices and implications from the COVID-19 pandemic. *JMIR medical informatics*, 8(7), e19866.
- Yelne, S., Chaudhary, M., Dod, K., Sayyad, A., & Sharma, R. (2023). Harnessing the power of AI: a comprehensive review of its impact and challenges in nursing science and healthcare. *Cureus*, 15(11).