

Systematic Literature Review: Health Technology in Nursing

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ABSTRACT

Digital health technologies such as telehealth, electronic health records (EHR), and artificial intelligence (AI) have transformed nursing by enhancing patient care, improving workflow efficiency, and expanding healthcare accessibility. This systematic literature review examines the current role of these technologies in nursing practice, focusing on their impact on patient outcomes, workflow optimization, and accessibility of healthcare services. Findings indicate that telehealth increases healthcare access for underserved populations, EHRs improve care coordination and documentation accuracy, and AI supports predictive care and clinical decision-making. However, challenges such as data security, usability, and ethical considerations remain. Addressing these issues through training, system improvements, and ethical guidelines is essential for optimizing the benefits of digital health technologies in nursing. This review provides insights for healthcare providers and policymakers, emphasizing the importance of technology integration and support in advancing nursing practices.

Keywords: *Digital Health Technologies, Telehealth, Nursing Practice*

1. INTRODUCTION

The swift advancement of digital health technologies has significantly transformed the healthcare sector, particularly in nursing, where patient-centered care and effective resource management are essential [1], [2]. Healthcare systems are confronting rising demands for accessible, high-quality treatment, prompting the emergence of digital tools like telemedicine, electronic health records (EHRs), and artificial intelligence (AI) as essential resources for better patient care outcomes, alleviating workload, and improving care coordination [3], [4]. These technologies are transforming conventional nursing practice, allowing healthcare providers to offer efficient and individualized care across diverse patient populations and environments [5], [6].

Telehealth, comprising various remote care technologies, has gained significance in mitigating healthcare disparities, particularly in rural and underserved regions with restricted access to medical institutions [7], [8]. Nurses can utilize telehealth to perform virtual consultations, monitor patients remotely, and educate patients and families on managing chronic diseases, thereby delivering treatment to those who may encounter substantial obstacles [9], [10]. These technologies are particularly crucial during crises like the COVID-19 epidemic, as they are vital in reducing physical contact while preserving essential healthcare services [7], [9], [11].

Electronic Health Records (EHR) constitute a fundamental component of digital health in nursing. By digitizing patient information, EHR systems optimize data administration, enhance timely and precise documentation, and bolster communication within the healthcare team [12], [13]. Nurses, frequently responsible for documentation, gain from EHRs through rapid access to extensive patient histories, facilitating improved decision-making and coordinated treatment [1], [4]. Moreover, EHR systems enhance data collection and analysis, aiding healthcare organizations in monitoring quality metrics, minimizing redundancies, and promoting public health initiatives [4], [12], [14].

Artificial Intelligence (AI) is at the forefront of digital health, providing novel solutions for predictive diagnostics, decision assistance, and personalized treatment plans. In nursing, AI systems may analyze extensive patient data, detect probable issues, and customize care recommendations (Guo et al., 2020; Murali1 & Sivakumaran, 2018). AI systems can notify nurses of indications of patient deterioration, facilitating prompt action and enhancing patient safety [16]. Although promising, the incorporation of AI in nursing practice presents hurdles, such as data security issues, ethical dilemmas, and the necessity for specialized training to employ these technologies proficiently [17], [18].

The revolutionary impact of this technology has generated extensive literature examining its application in nursing and its influence on patient care. Nevertheless, extensive analyses that integrate findings from multiple studies are scarce. This research seeks to address this gap by conducting a systematic assessment of the literature about the roles of telehealth, electronic health records (EHR), and artificial intelligence (AI) in nursing. This review aims to address critical inquiries: What is the effect of these technologies on patient outcomes, nursing workflow, and care coordination? What obstacles are linked to their implementation, and how might these be surmounted to enhance their efficacy in nursing practice?

2. LITERATURE REVIEW

2.1 *Telehealth in Nursing*

Telehealth is becoming vital in nursing, facilitating healthcare delivery beyond conventional hospital or clinic settings. These technologies, encompassing video consultations, remote patient monitoring, and mobile health applications, assist nurses in administering remote care, hence enhancing access for patients in isolated regions. Studies indicate the beneficial effects of telemedicine on the management of chronic conditions, including diabetes and hypertension. [19], [20] shown that telemedicine enhanced glycaemic control and medication compliance in diabetic patients, whereas [21], [22] indicated a 20% decrease in hospital readmissions due to telehealth interventions. Nonetheless, challenges such as patient computer literacy, internet accessibility, and privacy concerns continue to impede the extensive use of telehealth.

2.2 *Electronic Health Records*

Electronic Health Records (EHRs) have emerged as a crucial component in healthcare, serving as digital repositories accessible to providers. Electronic Health Records assist caregivers in documenting patient contacts, monitoring treatment history, and facilitating communication with the medical team. Studies indicate that electronic health records enhance data accessibility, minimize documentation errors, and facilitate care coordination [23], [24]. Furthermore, [25], [26] observed enhanced work efficiency and data precision with electronic health records featuring clinical decision support. Electronic Health Records (EHRs) diminish drug mistakes and facilitate personalized care. Nonetheless, implementation encounters obstacles like intricate interfaces, heightened effort, and substantial expenses, particularly for smaller hospitals, underscoring the necessity for more intuitive EHR systems and enhanced nurse training.

2.3 *The Role of Artificial Intelligence*

Artificial intelligence has emerged as a disruptive influence in healthcare, offering instruments for predictive analytics, diagnostics, and personalized care. In nursing, AI-driven applications facilitate clinical decision-making, patient surveillance, and the early identification of health issues. Predictive algorithms can detect patients in danger of deterioration through vital signs, facilitating nurse intervention before condition exacerbation. The research conducted by [27], [28] showed that an AI-driven monitoring system in a critical care unit decreased patient mortality by 15% by early identification of sepsis. NLP alleviates administrative burdens by transcribing nurse-patient interactions and automatically updating records [17], so providing nurses with additional time for direct patient care. AI integration, despite its potential, poses ethical and practical problems such as data protection, decision-making openness, and possible algorithmic prejudice. Numerous nurses exhibit a deficiency in confidence regarding the utilization of AI, attributed to insufficient training and apprehensions about work displacement [18], [29]. Consequently, the effective integration of AI in nursing will rely on ongoing training, explicit ethical standards, and regulations that guarantee the safe and responsible application of AI.

3. METHODS

A systematic literature review methodology was selected to synthesize and evaluate the current body of knowledge on digital health technologies in nursing. This approach ensures that the review is methodical, transparent, and replicable, thereby enabling a reliable overview of existing research. Systematic reviews are widely used to gather insights into health-related topics by rigorously analyzing multiple studies, allowing for the identification of trends, gaps, and emerging themes in the literature. This research design was deemed appropriate for exploring how telehealth, EHR, and AI are integrated into nursing practice and their impact on patient care, nursing workflows, and healthcare accessibility.

To ensure a focused and relevant review, specific inclusion and exclusion criteria were applied:

Table 1. Inclusion and Exclusion

Inclusion Criteria	Description
Publication Type	Peer-reviewed journal articles, conference papers, and systematic reviews published between 2000 and 2024.
Study Focus	Studies focused on using telehealth, EHR, and AI specifically in nursing contexts.
Language	Articles written in English.
Study Content	Studies that provided empirical evidence or in-depth qualitative analysis on the effects of digital health technologies on nursing practices, patient outcomes, or healthcare accessibility.
Exclusion Criteria	
General Healthcare Focus	Articles that focused on general healthcare without specific emphasis on nursing.
Lack of Empirical Evidence	Studies discussing digital health technologies without empirical evidence (e.g., opinion pieces, editorials, and commentaries).
Other Professions	Research focused solely on other healthcare professions (e.g., physicians) without including nurses as primary subjects.

These criteria ensured that only studies directly relevant to the role of digital health technologies in nursing were included, thereby maintaining the focus and quality of the literature review. Data for this review were gathered from four database Scopus.

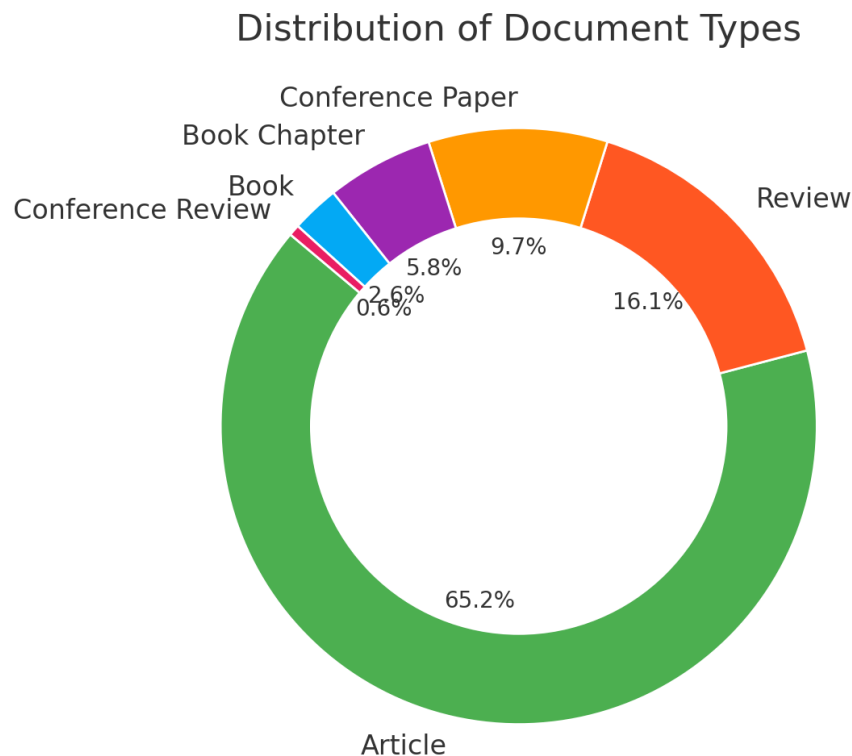


Figure 1. Data Sources

Publications in digital health and nursing were dominated by articles (65.2%), reflecting the academic preference to disseminate research through peer-reviewed journals. Literature reviews (16.1%) became the second largest category, important for synthesising research and identifying trends. Conference papers (9.7%) indicate active engagement in academic conferences to share preliminary findings. Book chapters (5.8%) offer more in-depth thematic insights, while books (2.6%) are more frequently used as a broad reference source. Conference reviews (0.6%) serve as summaries of key topics at conferences but are not the primary medium for research publication.

A structured search strategy was employed to identify relevant articles. Boolean operators and keywords were used to maximize search efficiency and precision. The primary search terms included:

1. "Telehealth in nursing" OR "Telemedicine and nursing" AND "patient care"
2. "Electronic Health Records (EHR) in nursing" AND "workflow" OR "patient outcomes"
3. "Artificial Intelligence in nursing" AND "clinical decision support" OR "predictive analytics"
4. "Digital health technologies in nursing" OR "Impact of digital health on nursing care"

Each search term was modified as needed to fit the search requirements of individual databases, and filters were applied to limit the results to peer-reviewed articles published between 2000 and 2023. Duplicate articles were identified and removed manually to ensure unique entries.

The initial search yielded approximately 150 articles from four databases. The screening process was conducted in two stages: first, title and abstract screening based on inclusion and exclusion criteria to ensure relevance to the research topic, resulting in 120 selected articles. Second, full-text screening was conducted to assess methodological relevance and appropriateness, including only articles that provided strong evidence and specifically addressed the use of telehealth, EHR, or AI in nursing. This process left 65 articles for in-depth analysis.

4. RESULTS AND DISCUSSION

4.1 Trend and Contribution

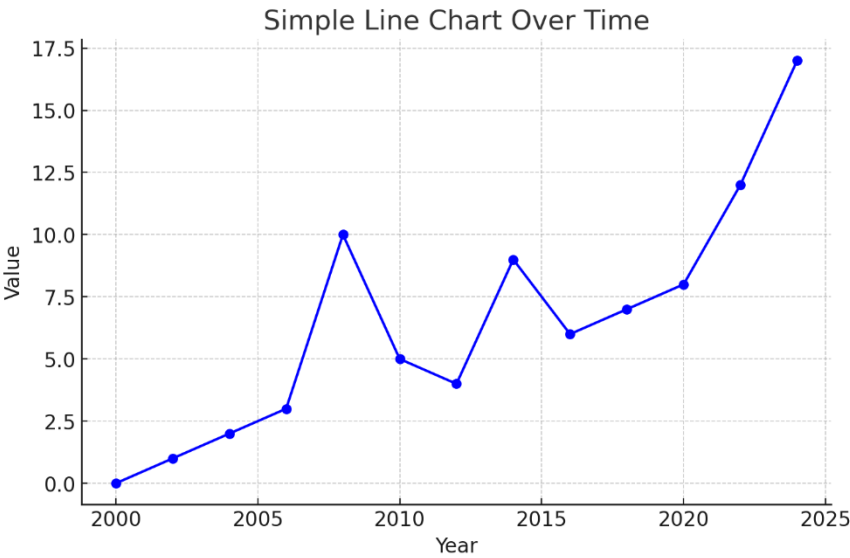


Figure 2. Trend Published

From 2000 to 2007, values remained low and stable, close to zero, suggesting minimal activity or growth in this early period. In 2008, there was a sharp spike that may have reflected a major change, such as a significant event, new policy or technological advancement, although it was short-lived. After a post-2008 dip, there was gradual growth from 2009 to 2014, indicating a sustained increase in interest. From 2014 to 2020, the trend shows fluctuations with peaks in 2014 and 2016, and a decline in 2017-2018, which may be influenced by external factors such as regulatory changes or funding cycles. From 2020 to 2024, there is an upward trend that peaks in 2024, signalling increased relevance or adoption, possibly driven by recent advancements or increased investment. Overall, the graph shows a positive trend from 2000 to 2024, reflecting significant growth, especially in recent years.

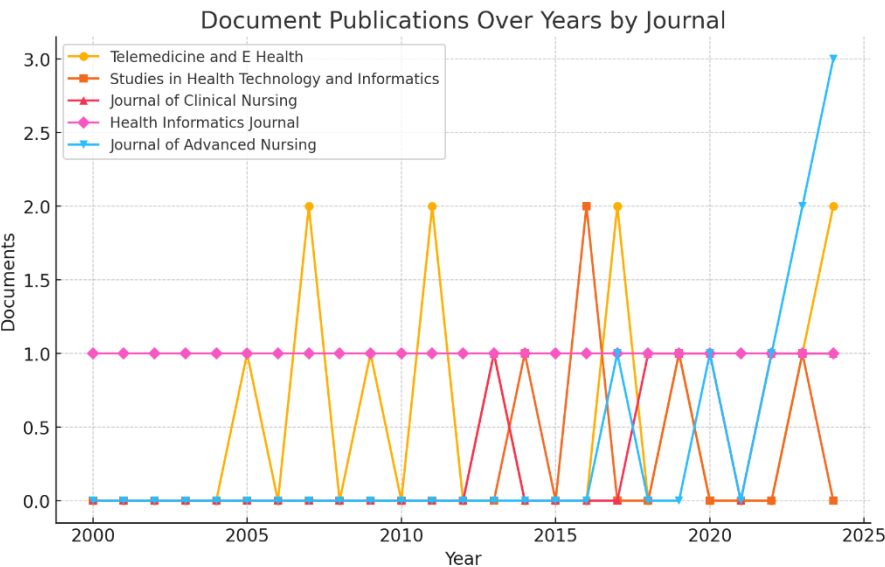


Figure 3. Journal Contributions

Some journals show consistent output, such as the Health Informatics Journal, which is stable with one publication per year, and Studies in Health Technology and Informatics, which has limited but consistent contributions throughout the year. Telemedicine and E-Health shows a fluctuating pattern with a peak around 2008-2012 followed by a decline, reflecting increased interest or funding in telemedicine in that period. Journal of Advanced Nursing had a sharp peak in 2016 with three publications, signalling a particular interest in digital health topics in nursing practice at that time, but declined again thereafter. The Journal of Clinical Nursing showed activity beginning in 2021 and continuing to increase through 2024, most likely due to the adoption of digital health technologies accelerated by the COVID-19 pandemic. Overall, there is a disjointed focus on digital health topics across several journals, with a recent uptick in publications signalling a wider acceptance and integration of digital health technologies in nursing research.

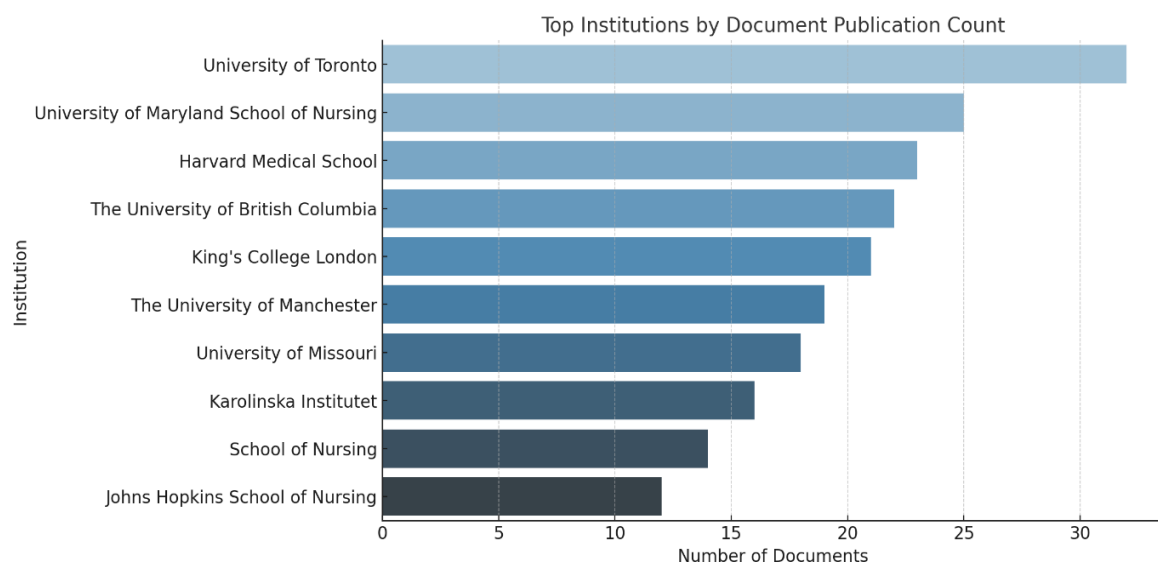


Figure 4. Affiliation Contributions

The University of Toronto stands out with the highest number of publications, indicating a strong focus on digital health and nursing research that may be supported by dedicated research centres and funding. The University of Maryland School of Nursing and Harvard Medical School also had large contributions indicating high engagement in clinical and nursing education innovation. At the middle level, the University of British Columbia, King's College London, The University of Manchester, and the University of Missouri are active in research but fall slightly below the top three. Karolinska Institutet and Johns Hopkins School of Nursing also contribute to health research, although the lower number of documents suggests a digital health focus that may be more specific or emerging. This distribution of contributions reflects a varied commitment to digital health and nursing research, which may be influenced by institutional priorities, funding and collaboration opportunities. More prominent institutions, such as the University of Toronto, show leadership in developing digital health in nursing, which may offer valuable resources, expertise and networks for students, researchers or professionals in this field.

4.2 Impact on Patient Care

The analysis of studies revealed that digital health technologies significantly enhance patient care by enabling timely, personalized, and efficient healthcare services. Each technology contributes uniquely to improving patient outcomes: Telehealth has demonstrated considerable effectiveness in expanding access to care, particularly in remote and underserved areas. Studies show that telehealth interventions led by nurses improve chronic disease management, reduce emergency visits, and

enhance patient adherence to treatment plans. For example, a study by [9], [20], [22] found that diabetic patients who engaged in nurse-led telehealth programs experienced a marked improvement in glycemic control. Telehealth also facilitates remote patient monitoring, which allows nurses to track patients' health in real time and respond promptly to any changes [8], [21].

In addition to improving access, telehealth contributes to higher patient satisfaction, especially for patients who prefer the convenience of remote consultations. However, some patients, particularly older adults, face challenges in using telehealth platforms due to limited digital literacy. Therefore, while telehealth improves care access and outcomes, its success depends on patient ability to navigate these technologies. EHR systems have had a profound impact on the quality of care provided by nurses. By digitizing patient information, EHR enables faster and more accurate data access, thus enhancing decision-making and reducing errors. The study by [4], [23] reported that nurses who used EHRs with integrated clinical decision support experienced improvements in both workflow efficiency and patient safety. EHRs also facilitate care coordination, allowing nurses to share vital information seamlessly with other healthcare providers, thus improving care continuity and reducing redundancies.

While EHR systems contribute significantly to care quality, challenges remain. Some nurses report that complex EHR interfaces increase their documentation workload, taking time away from direct patient care [1], [30]. Therefore, optimizing EHR usability and providing training are critical to fully realizing their potential in nursing. Artificial Intelligence has introduced predictive and personalized care capabilities, assisting nurses in clinical decision-making and early intervention. AI algorithms can detect patterns in patient data, providing predictive insights that help nurses manage risk and prioritize high-need patients. For instance, [3], [16] reported that an AI-based monitoring system in intensive care units reduced patient mortality rates by enabling early detection of sepsis.

AI applications have also contributed to personalized care. For example, AI tools can analyze patient data and suggest tailored treatment plans, enabling nurses to provide individualized care (Ajegbile et al., 2024; Chowdhury, 2024; Murali & Sivakumaran, 2018). However, the reliability of AI-driven recommendations depends on data quality and algorithm transparency. Nurses need to understand how AI decisions are made to ensure informed patient care, highlighting the importance of training and ethical considerations in AI implementation.

4.3 Effect on Nursing Workflows

Digital health technologies have reshaped nursing workflows, enhancing efficiency but also introducing new complexities. Telehealth has streamlined nursing workflows by reducing the need for in-person visits and enabling remote monitoring. This is particularly beneficial in managing chronic conditions, where frequent check-ins are essential. Through telehealth, nurses can conduct virtual consultations, reducing patient waiting times and the logistical demands of in-person care [32]. However, nurses must adapt to managing digital interactions, which requires skill in using telehealth platforms effectively. Some studies indicate that nurses experience initial challenges with technology adoption, but proficiency improves with experience and training.

EHR has addressed one of the most time-consuming aspects of nursing: documentation. Studies show that EHRs reduce time spent on manual charting, freeing nurses to focus more on patient-centered tasks [32]. The introduction of automated alerts and clinical decision support further streamlines workflows by helping nurses manage patient medications, care plans, and lab results more effectively. Nevertheless, the time saved on documentation can be offset if EHR systems are not user-friendly, leading to increased frustration and burnout among nurses [33]. Therefore, developing EHR systems that align closely with nursing workflows and minimizing complexity is essential for maximizing their effectiveness.

AI has the potential to transform nursing workflows through automation and predictive analytics. AI applications such as natural language processing (NLP) can assist in transcribing patient interactions and automatically updating patient records, significantly reducing

administrative workload [4], [20]. Additionally, predictive models help nurses anticipate patient needs, enabling better resource allocation and prioritization of care. However, the adoption of AI requires a shift in traditional nursing roles, as nurses must develop new skills to understand and interpret AI-generated insights. Training and a supportive implementation framework are therefore necessary to ease AI integration into nursing practice.

4.4 Enhancing Healthcare Accessibility

Digital health technologies play a crucial role in improving healthcare accessibility, especially in underserved regions and for patients with limited mobility. Telehealth's ability to reach patients in remote or underserved areas has significantly improved healthcare accessibility. Studies consistently show that telehealth expands care access, especially in rural communities, by reducing travel barriers and offering patients timely consultations. Telehealth has been instrumental during public health crises, such as the COVID-19 pandemic, where it helped maintain essential healthcare services without physical contact. However, accessibility can be hindered by disparities in digital literacy and internet access, particularly among older adults and low-income populations. Therefore, addressing these digital divides is essential to fully realizing telehealth's potential in expanding healthcare access.

EHR systems also contribute to accessibility by providing healthcare providers with consistent access to patients' comprehensive health records, regardless of location. This continuity of care is essential for patients who frequently move between healthcare providers. EHRs facilitate smoother care transitions by allowing nurses and other clinicians to access complete patient histories, enabling more informed decision-making. However, interoperability challenges persist, as healthcare facilities often use incompatible EHR systems, which can limit cross-provider data sharing. Greater standardization and compatibility between EHR systems are needed to ensure that patient records remain accessible across different healthcare settings.

AI enhances accessibility by supporting proactive care for high-risk populations. Predictive analytics allow nurses to identify and prioritize patients based on their risk factors, which is particularly useful in large healthcare settings where resources are limited. This targeted approach to care ensures that high-risk patients receive timely interventions, potentially preventing complications and reducing hospital admissions. However, AI's effectiveness in promoting accessibility relies on access to high-quality data and trained staff to interpret AI-generated insights. Addressing these requirements is crucial for effective AI implementation in improving healthcare accessibility.

Challenges

While digital health technologies present numerous benefits, their integration into nursing practice poses challenges and ethical considerations. Data security is a significant concern as patient information is increasingly stored and shared digitally. EHR systems, in particular, contain sensitive patient data, making them vulnerable to cyber threats. Studies emphasize the importance of robust security measures, such as encryption and regular audits, to protect patient privacy [1], [34], [35], [36]. Telehealth and AI systems also raise privacy concerns, especially when collecting real-time patient data. Addressing these security risks is crucial to maintaining patient trust and compliance with regulations.

AI introduces ethical questions related to transparency and accountability. For instance, nurses may be hesitant to rely on AI-driven recommendations without understanding the underlying decision-making process. Additionally, there are concerns about potential bias in AI algorithms, which can affect patient care quality. Ensuring transparency in AI applications and implementing unbiased algorithms are essential to mitigating ethical risks. Furthermore, there is a need for clear guidelines on accountability when AI-driven recommendations influence clinical decisions, as nurses and healthcare providers must maintain ethical responsibility in patient care.

A recurring challenge in digital health implementation is the need for adequate training. Nurses report varying levels of confidence in using new technologies, with some expressing concerns about skill gaps and workload increases. Providing comprehensive training programs on telehealth platforms, EHR interfaces, and AI tools is essential for effective adoption. Furthermore, institutions must foster a supportive environment that allows nurses to adapt gradually, ensuring that technology enhances rather than disrupts their roles.

The systematic review reveals that telehealth, EHR, and AI each offer unique contributions to nursing practice by enhancing patient care, streamlining workflows, and improving healthcare accessibility. Telehealth increases access, particularly in underserved areas; EHR improves care coordination and documentation efficiency; and AI enables predictive and personalized care. However, integrating these technologies requires addressing challenges such as data privacy, ethical concerns, usability, and ongoing training.

Implications

These findings underscore the transformative potential of digital health technologies in nursing while highlighting the need for further research to overcome existing barriers. Future studies should focus on developing more user-friendly EHR systems, establishing ethical guidelines for AI use in nursing, and identifying best practices for telehealth training. Additionally, exploring ways to improve digital literacy among patients and nurses will be essential to fully realizing the benefits of these technologies.

CONCLUSION

The integration of digital health technologies-telehealth, EHR, and AI-has significantly improved nursing practice by enabling more accessible, efficient, and personalized patient care. Telehealth extends the reach of healthcare services, especially in remote areas, while EHRs improve data accessibility and coordination between providers. AI provides predictive capabilities that support proactive and personalized care, helping caregivers prioritize high-risk patients and improve overall health outcomes. Despite its many benefits, challenges such as data security, usability, ethics, and the need for intensive training still exist. To maximize the potential of this technology, healthcare institutions need to implement data protection measures, design user-friendly systems, and establish ethical guidelines for the responsible use of AI. Training programs that focus on digital literacy and technological competence are also essential to support nurses in adapting to new workflows and making the most of digital technologies.

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