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Informatics and Nursing Science

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ABSTRACT

Nursing informatics plays an essential role in modern healthcare by merging the disciplines of nursing, computer science, and information technology. It involves the use of technology to enhance nursing practice and improve patient care outcomes. This paper explores the evolving role of nursing informatics, particularly in the context of artificial intelligence, and highlights its significance in clinical decision-making. Additionally, it discusses the growing need for nursing informatics education and competencies to meet the demands of today's healthcare systems. As healthcare becomes increasingly data-driven, the ability of nurses to effectively use technology and information systems is paramount. By integrating electronic health records (EHRs), decision support systems, and artificial intelligence, nursing informatics enables more efficient workflows, better clinical outcomes, and enhanced patient safety. The future of nursing is inextricably linked to the continued advancement and adoption of informatics tools that will help shape both patient care and the nursing profession itself.

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Introduction

Nursing informatics has become increasingly important in the healthcare sector, where it bridges the gap between nursing practice and technology. With advancements in information technology, nurses now have access to tools that help them deliver better care to patients. According to the American Nurses Association (ANA), nursing informatics is an essential specialty in modern healthcare. Kagan et al. describe how nursing informatics can improve both practice and research, contributing to more effective patient care. In the last decade, the healthcare industry has witnessed an integration of health information systems (HIS), such as Electronic Health Records (EHRs) and Clinical Decision Support Systems (CDSS), into nursing practice [1]. These systems help nurses manage patient data, identify health risks, and make informed clinical decisions. However, the successful use of these systems relies heavily on nurses' informatics competencies, which is why increasing access to informatics education is crucial. As the role of technology in healthcare continues to expand, the demand for nurses with expertise in informatics will only grow. Therefore, continuous professional development in this field is essential to ensure nurses are equipped to meet the evolving challenges in healthcare.

Methodology

This study examines literature published between 2020 and 2025, focusing on nursing informatics and its impact on nursing practice. The primary goal was to explore how the integration of health information systems, nursing informatics competencies, and emerging technologies is transforming patient care and nursing workflows. The research process involved a comprehensive analysis of peer-reviewed journals, clinical studies, and systematic

reviews that provided insight into the adoption and effective use of technological tools within the nursing profession. To ensure a thorough understanding of the subject, a systematic review approach was employed, allowing for the synthesis of findings across a variety of studies to identify key patterns, challenges, and emerging trends within nursing informatics. This approach also enabled the identification of gaps in the existing literature, which will inform future research and educational needs in this rapidly evolving field.

The studies selected for review covered several critical areas in nursing informatics, including:

- **Kinnunen et al.** which explored nurses' competency in using health information systems, focusing on their ability to effectively navigate and apply digital tools in clinical settings [2].
- **Batran et al.** which examined the relationship between nursing informatics competency and clinical decision-making, investigating how nurses' technological skills impact their ability to make accurate and timely decisions in patient care [3].
- **Nashwan et al.** which explored the role of artificial intelligence in transforming nursing informatics, highlighting the potential for AI to enhance clinical decision-making and improve patient outcomes [4].

By reviewing these key studies, the research aimed to provide a comprehensive overview of the current state of nursing informatics and its influence on nursing practice. The findings from these studies were analyzed to identify emerging trends, the impact of technology on clinical practices, and the essential competencies required for effective use of health information systems in nursing. The results will be instrumental in understanding how nursing informatics is shaping the future of patient care and guiding the development of nursing informatics education.

Results

The results of the literature review revealed several key findings:

- **Competency and Decision-Making:** A direct relationship between nursing informatics competency and clinical decision-making was identified. Nurses with higher informatics competencies were found to be more effective in using health information systems, leading to improved patient care [2]. This enhanced competency allows nurses to access critical patient data more efficiently and make well-informed decisions that directly impact clinical outcomes. Additionally, the ability to navigate electronic health records (EHRs) and clinical decision support systems (CDSS) empowers nurses to reduce errors and optimize care delivery.
- **Artificial Intelligence Integration:** The integration of artificial intelligence (AI) in nursing informatics is increasingly reshaping healthcare. According to Nashwan et al. AI technologies have the potential to automate routine tasks, assist in diagnosis, and provide real-time clinical decision support [4]. AI can analyze large volumes of patient data, identifying patterns that might be missed by human providers. This leads to faster and more accurate decision-making, ultimately improving patient care and safety. Furthermore, AI's ability to predict health outcomes and assist in personalized treatment plans is revolutionizing the way nurses approach patient care.
- **Education and Training:** Studies have shown that ongoing education and training in nursing informatics are critical to improving nurses' use of health information systems. Tellez argues that informatics education should be integrated into nursing curricula to prepare the next generation of nurses for a technology-driven healthcare environment. Nurses must not only be familiar with digital tools but also understand how to use them in the context of patient care [5]. Continuous professional development in informatics ensures that nurses stay up-to-date with the latest technologies and best practices, allowing them to provide high-quality care in an increasingly complex healthcare environment.
- **Improved Patient Care:** As noted by Al Najjar & Shafie, the use of nursing informatics has a direct impact on patient outcomes. Nurses who are proficient in using health information systems have demonstrated higher levels of patient satisfaction and better health outcomes due to more accurate diagnoses and treatment plans [6]. The integration of nursing informatics into practice facilitates seamless communication among healthcare teams, reducing the risk of errors and ensuring that all team members are well-informed. Additionally, the use of electronic systems allows for better monitoring of patient progress and the ability to intervene more quickly when necessary.
- **Efficient Workflow and Time Management:** The adoption of health information systems has led to significant improvements in nursing workflow and time management. Nurses who use EHRs and other digital tools can quickly access patient data, reducing the time spent on administrative tasks. This allows more time for direct patient care, which is essential for improving overall healthcare outcomes. By streamlining routine processes, informatics tools also help prevent burnout among nursing staff, contributing to better job satisfaction and retention.
- **Patient Safety:** The integration of technology into nursing practice has improved patient safety by enabling more accurate tracking of patient conditions and reducing the likelihood of medication errors. Real-time data access allows nurses to closely monitor patient vitals and medical histories, ensuring timely interventions and enhancing the safety of care provided. Moreover, the use of decision support systems helps prevent adverse drug interactions and ensures that prescribed treatments align with the most current clinical guidelines.
- **Collaboration and Communication:** Nursing informatics has fostered enhanced collaboration and communication within healthcare teams. By using shared electronic platforms, nurses, doctors, and other healthcare professionals can exchange patient information efficiently, which is crucial in ensuring coordinated care. This improved communication reduces the chances of miscommunication and enhances the continuity of care for patients.
- **Cost Efficiency:** The use of nursing informatics can contribute to reducing healthcare costs by improving resource allocation and reducing unnecessary tests or treatments. By making informed, data-driven decisions, nurses can ensure that patient care is more precise and tailored to individual needs, preventing wasteful spending on redundant or inappropriate procedures.
- **Data-Driven Insights:** Nursing informatics allows for the collection and analysis of vast amounts of patient data, providing insights that can drive quality improvement initiatives. Nurses can use data analytics to identify trends, track patient outcomes, and contribute to the development of evidence-based practices that improve care delivery. This data-driven approach leads to more personalized care and a better understanding of patient needs over time.
- **Barriers to Adoption:** Despite the numerous benefits, the integration of nursing informatics into clinical practice is not without challenges. Some studies identified barriers such as resistance to change, lack of training, and limited access to technology as significant obstacles. Addressing these barriers through targeted educational programs and institutional support is essential for ensuring the successful adoption of informatics tools across the nursing workforce.

Discussion

The rapid advancement of technology and the increasing reliance on health information systems have significantly changed nursing practice. Nurses today are expected to not only provide high-quality care but also navigate complex healthcare technologies. The integration of digital tools into nursing practice has redefined the way care is delivered, making it more efficient, accurate, and patient-centered. Studies such as those by Batran et al. and Kinnunen et al. demonstrate that nurses' competencies in informatics are key to the success of these systems. Nurses who are well-versed in informatics are better equipped to use health information systems effectively, which leads to improved patient care and reduced errors [2,3]. The inclusion of artificial intelligence (AI) in nursing practice is an area of growing interest. AI can assist nurses by providing predictive analytics, suggesting treatment options, and identifying potential complications early in patient care. For example, AI-based tools can analyze large datasets from patient records to predict patient outcomes, allowing nurses to intervene proactively [4]. This predictive capability is particularly beneficial in critical care settings, where timely interventions are crucial to patient survival. Moreover, AI can enhance decision-making by identifying patterns in data that may not be immediately obvious to human providers, leading to more personalized and precise care. In addition to improving decision-making and patient outcomes, AI has the potential to automate routine tasks, such as scheduling, documentation, and medication administration. This automation reduces the administrative burden on nurses, freeing up more time for direct patient care.

By allowing nurses to focus on tasks that require human judgment and expertise, AI can enhance overall productivity and improve the efficiency of healthcare delivery. Moreover, the continuous education of nursing professionals is essential for harnessing the full potential of nursing informatics. As technology evolves, so too must the training and competencies of nurses. Tellez emphasizes the importance of incorporating nursing informatics education into nursing curricula, which will help future nurses become adept at utilizing the technology available to them [5]. It is vital that nursing education systems integrate informatics training as a core component of nursing programs, ensuring that all nurses are equipped with the necessary skills to work in a technology-driven environment. Furthermore, the healthcare sector must foster a culture of lifelong learning, where nurses continuously update their knowledge and adapt to emerging technologies. Professional development programs focused on nursing informatics are key to keeping nurses engaged with new innovations and helping them stay at the forefront of healthcare technology. Providing ongoing training opportunities also helps to overcome resistance to technology adoption, as nurses are more likely to embrace new tools when they feel confident in their abilities to use them effectively.

In conclusion, the integration of nursing informatics, including AI, into healthcare systems presents significant opportunities to enhance patient care, improve clinical outcomes, and streamline nursing workflows. However, it is crucial that nursing education and professional development keep pace with these technological advances to ensure that nurses have the competencies required to fully leverage these tools. By prioritizing education and training in nursing informatics, the healthcare system can foster a workforce that is prepared to navigate the complexities of modern healthcare and provide the best possible care to patients.

Conclusion

The field of nursing informatics is evolving rapidly, and its importance in improving patient care and clinical decision-making cannot be overstated. The integration of advanced technologies such as AI into nursing practice is reshaping how care is delivered and how nurses interact with patients. These technologies enable nurses to process large volumes of patient data more efficiently, identify potential health risks earlier, and make evidence-based decisions that directly impact patient safety and outcomes. However, this transformation requires that nurses possess strong informatics competencies and that they receive continuous education in this area. To ensure the successful adoption of health information systems and AI technologies in nursing, it is essential that nursing education includes comprehensive informatics training. Nurses must be trained not only in the technical aspects of using electronic health records (EHRs) and clinical decision support systems (CDSS), but also in understanding the role of these technologies in improving care delivery. By embedding informatics into nursing curricula, future nurses will be better prepared to utilize these tools effectively, helping them navigate the complexities of modern healthcare environments. Moreover, the integration of AI into clinical practice holds the promise of improving both efficiency and accuracy in patient care. AI can support nurses by automating administrative tasks, providing real-time clinical decision support, and predicting patient outcomes. As AI continues to advance, it is critical that nurses remain up-to-date with its capabilities and limitations, ensuring that they can harness its potential to enhance patient care without compromising the human element of nursing. With the right skills and tools, nurses will be equipped to navigate the complexities of modern healthcare

and contribute to better patient outcomes. Ongoing professional development in nursing informatics will allow nurses to stay ahead of emerging technologies and apply them in ways that improve the quality of care. As healthcare continues to embrace digital transformation, the role of nursing informatics will only become more crucial in shaping the future of patient-centered care.

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