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The Integral Role of Nursing Informatics in Enhancing Patient Outcomes through the Integration of Health Information Systems in Clinical Practice: Review

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Abstract

Background: The evolution of nursing from a practice-oriented to a science-based discipline necessitates the integration of health information systems, particularly electronic nursing records, to enhance patient outcomes and streamline clinical workflows. The World Health Organization has recognized the importance of emerging technologies in healthcare management, emphasizing standardized documentation practices in nursing.

Methods: This study employs a comprehensive literature review methodology to explore the role of nursing informatics in integrating health information systems into clinical practice. The analysis focuses on various nursing classification systems, the impact of electronic nursing records on documentation quality, and the correlation between digital records and patient care outcomes.

Results: The findings indicate that the implementation of electronic nursing records significantly improves the quality of nursing documentation, enhances patient safety, and facilitates evidence-based practice. Furthermore, the study reveals that standardized nursing terminologies, such as NANDA, NOC, and NIC, are essential for effective communication among healthcare providers and contribute to better patient care coordination. However, challenges such as insufficient training and varying levels of technology adoption across countries persist.

Conclusion: The integration of health information systems in nursing practice is crucial for optimizing patient care and improving health outcomes. Continued efforts to standardize nursing documentation and enhance digital literacy among healthcare professionals are necessary to fully harness the potential of electronic nursing records. Future research should focus on the long-term impacts of electronic nursing records on nursing practice and patient outcomes across diverse clinical settings.

Keywords: Nursing Informatics, Electronic Nursing Records, Health Information Systems, Patient Outcomes, Standardized Terminology.

1. Introduction

The transformation of nursing from a profession to a scientific discipline is intricately associated with the development of new domains such as the nursing method, nursing categories, and the process of nursing. These improvements need the creation of an accurate and specialized language that may ideally become standard for understanding by a diverse group of nurses [1]. Moreover, the progression of the nursing procedure and its language inherently necessitates the documentation of collected information to fulfill shared goals including preservation, statistical evaluation, study, and improvement. Nursing documentation has undergone significant evolution, progressing from non-existent towards paper-based records, and now to the digital era with automated standardized care plans generated by specialized software [2,3]. Various nations are in disparate phases of this advancement, with some yet to completely adopt information and communication technology. Digitization aims to optimize various documentation procedures while also improving the core principle of nursing, namely personalized patient care [4].

The WHO acknowledged emerging technologies as crucial instruments for information sharing and analysis in the 1970s to aid in healthcare system management [1]. Since that time, other nations have concentrated on structuring clinical data to facilitate patient-centered care as well as statistical evaluation. Nevertheless, medical documentation often fails to differentiate among nursing activities and the roles of other healthcare workers. The implementation of digital health records, which include medical, managerial, and other data, has underscored the need to delineate the material of nursing records inside these systems [5].

Numerous instances in Western Europe demonstrate the advancement of nursing algorithms, providing standardization, administration, scalability, statistical analysis, predictive capabilities, and quality management. The rapid advancement of information technology has enabled this progress, incorporating digitalization into every facet of life. Digitization facilitates the development and uniformity of care plans, allowing their integration into a nursing profile. The implementation of digital nursing records can optimize workflows, monitor activities for assessment, standardize nursing practices, eradicate paper-based methods, furnish data for validation and quality evaluation, supply resources for research, allocate tasks between nurses, and improve overall operations. These software tools seek to aggregate input data to formulate diagnostic hypotheses, delineate traits, and correlate elements [6-8]. Moreover, the advancement of evidence-based methods in medical as well as nursing fields underscores the need to standardize treatment, hence making these trends more achievable [9].

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Nurses and midwives are the predominant segment of the global healthcare workforce and need to use standardized language in electronic health records (EHRs) [10-12]. Numerous nations use nursing categorization systems to provide standardized and codified nursing language and taxonomy. In contrast to the Worldwide Classification of Diseases (ICD), these classifications lack universality, since each nation selects its own system. Most industrialized nations have implemented a nursing procedure model that incorporates nursing diagnostics, which are systematically evaluated every two years with contributions from hundreds of nurse practitioners across 32 countries [8]. Nursing diagnoses articulate the professional assessments made by nurses routinely, delineating nursing expertise. Their use improves nursing practice and creates uniform criteria for the quality of nursing care, which can subsequently be confirmed. NANDA-I, alongside the NOC (Nursing Outcomes Classification) and NIC (Nursing Interventions Classification), seeks to establish and apply standardized terminology to facilitate evidence-based care, support reimbursement in hospital and outpatient environments, and improve the quality of nursing care [13]. Nursing methodology, a specialist domain within nursing science, investigates and refines the nursing process via the use of nursing taxonomy [14,15]. This research seeks to demonstrate the importance and advantages of adopting electronic nursing records in nursing science and practice.

1. Proficiency in Managing Standardized Nursing Data Pertaining to Nursing Classifications

Numerous studies have emphasized the essential need for a suitable taxonomy that facilitates both the nursing process and communication among different units. Moreover, from a theoretical standpoint, nursing classifications delineate and distinguish nursing vocabulary and language from those of other healthcare professions. Hannah et al. [16] emphasize that, in the context of Canada (applicable to other nations), the primary concern is the informational requirements of doctors. Although nurses constitute the predominant cohort of care providers within the Canadian medical system, the care they offer substantially influences clinical patient outcomes, but it mostly goes unrecognized in most electronic health records (EHRs) [16]. Numerous categorization methods are now used to include the fundamental aspects of the nursing procedure comprehensively. These systems include gathering, examining, and testing data; formulating a nursing diagnosis; devising suitable care plans with an emphasis on anticipated outcomes; executing interventions; and assessing the process. These systems are adept at functioning within a digital setting and are the fundamental components of digital nursing records. Standardizing these systems may streamline procedures associated with electronic nursing records and improve the standard of patient care.

Heidarizadeh et al. [17] seek to illustrate the efficacy of standardization via the clinical care classification system, stating that clinical care classification is an appropriate approach for standardizing nursing reports and improving the quality of electronic nursing records structurally. Global study indicates that the use and utilization of nursing standards in electronic health records (EHRs) may enhance the capacity to identify, extract, and evaluate nursing care, hence improving quality and safety, as well as augmenting nurses' understanding of clinical guidelines based on evidence [18-24]. Research in Norwegian practice has shown that regular medical plans decreased administrative load, enhanced documentation quality, and facilitated the recognition of patient care requirements and more effective treatment of chronic illnesses [25]. The work by Goossen et al. [26] delineates the procedure for developing the nursing information reference model as a standard for inputting electronic nursing information inside HL7. The objective of the study conducted by Brazilian scholars was to investigate the correlation between information and data within the nursing procedure and to delineate connections between comprehensive clinical evaluations of each individual and nursing diagnoses, measures, and results [27]. The evolution of standardized nursing care is protracted and laborious owing to the diverse nursing skills and procedures prevalent in various global locations. The implementation of compatible electronic medical records is of paramount importance for facilitating data sharing across information systems and producing secondary information for research [28,29]. A subsequent study on the same subject, conducted by Westra et al. [30], monitored over a decade of efforts on the USA National Action Plan for accessible and equivalent nursing data to enhance practice and translational research aimed at transforming healthcare. Research conducted by Müller-Staub et al. [31] aimed to examine the impact of focused clinical thought as a pedagogical approach to enhance nurses' proficiency in using standardized language.

2. Enhancing Health Management, Elevating Care Quality, and Mitigating Error Risks

In addition to the previously described benefits of electronic nursing records, its primary objective and need for implementation is the enhancement of patient-centered care, with a focus on effectiveness, efficacy, security, and quality. Numerous research studies have sought to illustrate the proportionate correlation between the implementation of digital information and the enhancement of health care. Zhang et al. [15] outline the possibility of establishing quality control systems for electronic health records (EHR), which directly influence the quality of treatment recorded in these digital documents. Chang et al. [32] conducted retrospective research using data from quality inspections of software. The research was conducted to evaluate the condition of EHR at a medical facility in Taiwan with the objective of minimizing mistakes. A pilot study conducted among nurses about the efficacy of electronic health records (EHRs) regarding mistakes, workload, and accessibility of medical information produced incongruous findings and established a foundation for further research [26]. Jayousi et al. [33] studied the outcomes of Italian nurses using information technology, highlighting enhancements in care quality, health management optimization, and professional satisfaction. An analysis by various Italian authors investigates how the integration of medical records into electronic documents mitigates information dispersion, facilitates sharing among health professionals, and enhances multidisciplinary care management, resulting in improved development of therapeutic and health-educational plans.

3. Electronic Nursing Records as a Foundation for Scientific Inquiry

The electronically produced information is stored in a computerized system, which is essential for statistical analysis and for extracting and summarizing a substantial array of valuable data for various scientific investigations in nursing. Various ways are essential to enhance and advance scientific research in nursing practice, with EHRs and electronic nursing records serving as appropriate resources for this purpose. Luan et al. [34] conducted a literature study that illustrates the increasing interest in studies about digital

nursing records, their use, associated components, and the data they collect. Dionisi et al. [35] demonstrate that, in addition to the aforementioned benefits for nursing practice and healthcare, electronic nursing records are essential for the advancement of scientific research activities.

4. Influence of Digital Records on the Conduct, Perspectives, and Understanding of Healthcare Professionals/Students

The majority of the study has focused on qualitative and quantitative assessments of the views and beliefs of nurses, other healthcare workers, and students about the use of digital medical records. This is motivated by the aspiration to enhance the training process, implementation, and use of technological tools pertinent to health care. These investigations have solidified new tactics, including pertinent legislative choices, university or hospital training programs, resource redistribution, and the integration of new technology. All these measures seek to surmount any obstacles to the adoption of digital documents and the execution of the comprehensive electronic health care strategy. Numerous nations, including Ethiopia, have yet to integrate comparable resources into their healthcare systems, prompting an examination of health personnel's readiness to use Electronic Health Records (EHR) and the elements that affect this willingness [14]. Research with similar aims produces varying outcomes influenced by cultural disparities, the degree of health literacy, and certain personality traits.

Research by Ahn et al. [18] examines the promptness of information entry into the EHR, concluding that it is influenced by many variables, including the nurse's professional experience. Countries with more expertise in digital records are researching to assess whether the components of EHRs fulfill user requirements. The research by Stevenson et al. [19] in 2010 determined that Swedish caregivers were inadequately happy with EHRs since they did not accurately represent their roles. Such studies are essential for enhancing pertinent electronic systems and integrating nursing components, electronic nursing records, and similar components inside health information systems. Brazil used electronic nursing records early in some departments and concentrated on enhancing worker impressions of the updated paperwork system. The findings are categorized into three segments: good features, unpleasant elements of the introduction, and expectations for the procedure itself [20]. Conversely, there are investigations focused on certain components of the electronic nursing records, including the nursing evaluation. Meum et al. [21] discovered that a larger proportion of the examined sample expressed satisfaction with the provision of nursing information in this manner. The USA, another pioneering nation, has been enhancing the accessibility of EHRs as well as electronic nursing records since 2009, exhibiting variability based on the individual's interface while maintaining a continuous pursuit of development [22].

Usability and functionality primarily rely on the speed of data input and the intuitiveness of systems, hence enhancing the productivity of increasingly occupied nurses. An additional critical component in the implementation of electronic records systems is the proficiency of the users' training. This is further substantiated by Norwegian research conducted by Laukvik et al. [25] with nurses and by Irwin et al. [36] with Australian students. It is essential to acknowledge that there are divergent findings indicating that, for some participants, one aspect of EHR is seen as a disadvantage, while for others, it is regarded as a benefit, as shown by research conducted by Naamneh et al. [37]. In several publications, like the one by Topaz et al. [38], negative findings are indicated in the title. The research has significant relevance because to its extensive scope (45 nations with more than 450 participants) and delineates the EHR issues identified by medical experts at that time (2016) [38]. Notwithstanding the dominant adverse perception of electronic documentation, this study is oriented towards enhancement, rectification, and alteration procedures. Numerous research sought to ascertain the elements influencing nurses' views regarding information systems. on the UK, Wynn et al. [39] endeavor to illustrate a correlation between demographic and other variables and attitudes toward electronic documentation, grounded on the Unified Theory of Acceptance and Use of Technology (UTAUT). The determinants include age, gender, expertise, voluntariness, and suitable circumstances of usage, as shown in the research by Alrasheeday et al. [40] in Saudi Arabia. Younger users, prior expertise with technological devices, and elevated educational attainment are pivotal aspects in cultivating a favorable disposition towards EHR. Finnish research focused only on technical abilities, revealing varying degrees of technological proficiency among users, which subsequently prompted an examination of attitudes toward medical information systems [41]. The correlation between advanced technical proficiency and favorable assessments of the structures is shown [41].

Determining the particular components of digital medical records that are functional or non-functional is essential to the endeavors of several researchers. Various components are evaluated based on the nation's characteristics and the technological infrastructure used. Nursing duties are analogous, and the efficacy of electronic recording is contingent upon workload, knowledge and abilities, habits, and preferences. Lloyd et al. [42] conducted a poll of nurses and doctors in Australia to ascertain which elements were deemed functional and beneficial, while others were not. A comparable methodology was used at the University of Tabriz (Iran) to assess the nursing software that was introduced [28]. Notwithstanding the findings achieved, their subjectivity must be considered, recognizing that technology assessments need expertise and experience in the field. This scenario, detailed in research by Al-Aubaidy and Abdulwahhab [43], illustrates the inadequate understanding of EHRs in Iraq, irrespective of demographic variations or educational attainment.

5. Robotics and Improvement of Procedures

The notion of electronic healthcare centers on enhancing services for improved quality. Even emerging technologies such as electronic nursing records are subject to enhancement. For example, supplementary software may evaluate and enhance record quality, decreasing input duration, lowering mistakes, and augmenting pleasure [15]. Conventional nursing responsibilities, such as nurse reports, have been reorganized for enhanced efficiency. Fifteen years ago, Norwegian hospitals made a significant advancement in this domain, highlighting the incorporation of new technology into existing procedures [21].

Hyun et al. [22] underscore the relationship among nurse practice and supportive systems, stressing the need for research focused on the automation of all data. The research conducted by Rouleau et al. [24] presents a strategy for optimizing electronic nursing records within the "nursing effectiveness framework." The phases are bilaterally focused and involve the management of material and human resources; the transformation of assets into services; and the

resultant services effect particular alterations in patients' situations [24].

Diverse research on EHR/electronic nursing records improvement have engaged users to enhance electronic documentation. 2022 Canadian research included nurses in identifying interventions for electronic health record redesigns [44]. Drnovšek et al. [45] conducted research in which students compared two information systems within Slovenian healthcare, with the objective of promoting user engagement in the development of future solutions. The Iranian nursing software, created from a literature analysis, rectifies historically documented problems. The team underscores the significant engagement of end users throughout the development and deployment phases as an essential criterion for success [46].

6. Prerequisites for the Execution of Electronic Nursing Records

Progress is a unidirectional phenomenon that necessitates advancement in the appropriate direction. Nursing care must be an essential and obligatory component of electronic documentation, delineating the nurse's function and position in patient care processes. Establishing ideal circumstances for the execution of electronic nursing records is a complex endeavor that requires the collaboration of several institutions and the active engagement of nurses. Despite the procedure of implementing W. Henderson's conceptual model remains mostly undocumented in several nations, apart from the attitudes expressed towards it [10]. Conversely, the implementation of electronic nursing records as an approach in the new century has been well recorded, providing significant advantages to medical systems that have yet to embrace it. An example of this is research by Kleib et al. [46], which demonstrates users' first assessment of a particular nursing file designed for instructional purposes in undergraduate programs. The pilot research seeks to identify feasible challenges for program implementation and incorporates the perspectives of students and staff about the application itself [34]. The advancement of ESD implementation at a South Korean college institution and its advantages for the nursing profession have been thoroughly delineated [23]. The program includes a terminology system and a nursing record system, highlighting the significance of technology resources for effective integration [23].

The study conducted by Strudwick et al. [44] employed a three-phase framework to delineate the factors affecting the efficacy of electronic documentation implementation: identification and verification of essential indicators for nursing records; analysis of EHR usage patterns and identification of improvement areas; and generation of concepts and their execution through requisite technological support. Brazil has been developing and implementing a computerized system that reflects the nursing process according to the global nursing standard ICNP since 2010. While they acknowledged the software's relevance just for critical care units, they highlighted the potential to broaden its use to other settings and for more nursing personnel [26]. The integration of nursing requirements in US EHRs is examined in the work of Westra et al. [29], highlighting not just standardization but also the factors that facilitated its deployment, including expertise, practice, policies/resources, and academic activities. During the late 20th as well as early 21st centuries, Canadian healthcare recognized the need of adopting electronic nursing documentation, which garnered substantial backing from the Canadian nursing community and other prominent healthcare professionals in each involved province [16]. The analysis of these conditions reveals another essential need for implantation: unity. Another criterion is delineated in the study of Bjarnadottir et al. [48], which examines EHR integration in nursing facilities throughout the USA. A representative sampling of over 900 medical and social institutions led to the conclusion that specific policies and support for transformation are necessary. Nations with fewer years of experience, including Iran, capitalize on the faults and deficiencies documented in the research to develop and execute their nursing program with enhanced parameters, highlighting the significance of future users' involvement in these procedures [49]. Table 1 represents the comparison of nursing classification systems and their impact on patient outcomes. Table 2 represents the challenges and solutions in implementing electronic nursing records.

Table 1. Comparison of Nursing Classification Systems and Their Impact on Patient Outcomes

Classification System	Purpose	Key Features	Impact on Patient Outcomes	Challenges
NANDA (North American Nursing Diagnosis Association)	Standardizes nursing diagnoses	Provides a list of nursing diagnoses and definitions	Improved clarity in nursing assessments and interventions	Limited adoption in some regions
NOC (Nursing Outcomes Classification)	Measures patient outcomes	Standardized outcomes for nursing interventions	Enhances evaluation of care effectiveness	Requires training for proper implementation
NIC (Nursing Interventions Classification)	Standardizes nursing interventions	Comprehensive list of interventions	Facilitates consistency in care delivery	Variation in application across settings
Clinical Care Classification	Structuring Clinical Care Data	Integrates nursing processes	Streamlines documentation and improves care coordination	Complexity in integration with EHRs

Table 2: Challenges and Solutions in Implementing Electronic Nursing Records

Challenge	Description	Potential Solutions
Insufficient Training	Nurses lack of proper training in using electronic systems	Develop comprehensive training programs and workshops
Varying Levels of Technology Adoption	Disparities in technology use across countries	Foster international collaboration to share best practices
Resistance to Change	Nurses may resist transitioning from paper to digital	Highlight benefits through pilot programs and success stories
Data Security Concerns	Fear of breaches in patient confidentiality	Implement robust security protocols and training on data protection

7. Conclusions

The nursing profession and its position within healthcare are undergoing continuous evolution, necessitating the integration of criteria to validate its autonomy. Nursing science evolves together with medical research and technological advancements. Bridges are essential among nurses and healthcare information. The American Nursing Association (ANA) underscores the significance of uniform terminology as a crucial method for enhancing interoperability across various ideas, nomenclatures, and data systems [49,50].

In the age of comprehensive healthcare digitalization, it is essential for nurses to proficiently navigate electronic documentation systems to provide good patient care. This scoping study elucidates the benefits as well as advantages of digital recording in enhancing nursing practice. It is crucial to underscore the need for digital nursing records, including the fundamental components and prerequisites for their effective organization, implementation, and utilization, as well as the requirement for frequent updates and enhancements. Numerous studies emphasize benefits including the augmentation of theoretical knowledge and the use of standardized nursing care strategies, the enhancement of care administration and coordination, the improvement of patient safety, the optimization of administrative procedures, and the advancement of intra- and multidisciplinary communication.

Systematization may provide an arrangement for medical facilities, universities, and policymakers to efficiently organize, oversee, and improve the incorporation of digital nursing records for enhanced patient care as well as healthcare administration. We advocate for the execution of further systematic reviews to get more comprehensive insights about the matters discussed in this research.

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