

# Role Of Nursing Informatics In Improving Quality Of Patient Care And Associated Patient Outcomes

Damaris Moraa\*, Joseph Ndovoyo<sup>1</sup>, Sarah Makong'o<sup>2</sup> Wilfrida Bore<sup>3</sup> , Brian Barasa Masaba<sup>4</sup>

\* School of Nursing department of midwifery, Kaimosi Friends University Kenya. Email: dmoraa@kafu.ac.ke

<sup>1</sup>.School of Nursing, department of Community Health,Kaimosi Friends University, Kaimosi, Kenya

<sup>2</sup> School of Nursing, Department of Medical Surgical Nursing Kaimosi Friends University, Kaimosi, Kenya

<sup>3</sup>. School of Nursing department of midwifery, Masinde Muliro University of Science and Technology Kenya.

<sup>4</sup>. Department of Health Studies, University of South Africa (UNISA), College of Human Sciences, School of Social Sciences, Pretoria, South Africa.

---

## ABSTRACT

*Nursing Informatics (NI) a sub-set of HIS, specific to the field and the role of the nurse in the healthcare setting is a specialty that integrates nursing science with multiple information and analytical sciences to identify, define, manage and communicate data, information, knowledge and wisdom in nursing practice. The goal of nursing informatics is to facilitate progression of patient data to information and wisdom to improve the patient condition. While the benefits of health informatics are clear, there has been little focus on the role nursing informatics plays in improving quality of patient care. A desk review to determine the role nursing informatics plays in improving the quality of patient care was. Articles on Nursing informatics and patient care quality were selected. Informatics use reduces medical and drug errors,increases productivity, increase patient safety and reduces health care costs. Use of information technology in the workplace enables nurses to spend less time documenting patient care and spend more time delivering quality care to patients. It is therefore imperative that to become and remain an integrated profession, leaders at the forefront of nursing must adopt and embrace informatics.*

**Key words:** Nursing informatics, patient safety, patient outcomes, health technology

---

Date of Submission: 08-05-2023

Date of Acceptance: 18-05-2023

---

## I. Introduction

Healthcare systems are assimilating technology into daily practice at a quick pace. Evidence from literature Farokhzadian et al., 2020) shows that health care experts, policymakers, payers, and consumers consider health information technologies(HIS), such as electronic health records and computerized provider order entry, to be critical to transforming the health care industry. If successfully developed and implemented HIS leads to improved health care efficiency and effectiveness.

Nurses are directly engaged with information systems and technologies as the foundation for evidence-based practice, clinical-decision support tools, and the electronic health record. Much of what nurses do involves information collection from assessing the health care needs of patients, developing care plans, communicating patient information to other health professionals, analysing staffing and budget reports. This

role requires documenting and managing patient information through coordinating care and communicating with other healthcare professionals.

Nursing Informatics (NI) a sub-set of HIS, specific to the field and the role of the nurse in the healthcare setting is a specialty that integrates nursing science with multiple information and analytical sciences to identify, define, manage and communicate data, information, knowledge and wisdom in nursing practice (ANA, 2019). The goal of nursing informatics is to facilitate progression of patient data to information and wisdom to improve the patient condition. Nursing informatics focuses on three main areas. These include Computer skills, informatics knowledge and informatics skills application (Moore et al., 2020). Professionals therefore need to be technologically adept, have significant foundational knowledge about how their field benefits care, and then be able to practice and apply it for better outcomes. Nurses must be educated and competent in nursing informatics in order to exhibit safe and effective nursing practice.

Nurses play a crucial role in patient care and performance improvement in the healthcare system since they are the main stakeholders and frontline users of HIS (Luo et al., 2020). However, while studies have been done on the acceptance and use of information technology in the field of health reveal the benefits of health informatics, there has been little focus on the role nursing informatics plays in improving quality of patient care. In addition studies have shown that nurses are in an ideal position to make an impact as specialized experts at the intersection of healthcare and technology since they make up the majority of direct care practitioners, they (Moore et al., 2020). By leveraging existing databases, the study will address these important gaps in the empirical literature by exploring the role of nursing informatics in improving quality of patient care outcomes

## **II. Methods and materials**

A desk review accompanied by an extensive literature search in databases and a library search focused on the key words was done between March and April 2023. Cochrane, PubMed, Elsevier and Google Scholar were systematically searched. The criteria used for selecting studies focused on nursing informatics, health technology and patient quality of care. Studies which recorded the time taken to carry out documentation or medication administration, and documented quantitative estimates of the time differences were also included. Articles were included if they examined effects HIT on the nursing profession in patient care. Articles not printed in English were excluded.

## **III. Results**

The search retrieved up 100 articles. Applying a critical point of view, 25 articles in English were selected that specifically focused on nursing informatics and its influence on nursing outcomes and the quality of health care. A total of 26 studies describing nursing informatics (n=4), patient safety (n=4), automated drug dispensing cabinets (n=4), impact of informatics and quality of patient care (n=4), role of technology during pandemics (n=2), HIT (n=3) were identified.

The study found the following key areas where NI has largely contributed in improving quality-of-patient care outcomes

### **Nursing Informatics**

Informatics competencies are essential for nursing practice, and are critical to providing safe and effective patient care. Despite some societal influencers sounding the alarm on the malevolence of big data, evidence shows that nursing informatics is one of the best hopes for healthcare in terms of keeping patients safe and minimizing harm (Webb, 2021). For decades, nursing informatics specialists have integrated nursing science with information and analytical sciences to identify, define, manage and communicate data, informatics, knowledge and wisdom (Schoenbaum and Anna., 2020). Several ways in which nursing informatics can have a positive impact on patient care exist. Technology brings nurses closer to the patient and helps them to perceive the patient holistically. Nurses use a wide range of health information technology (HIT), including electronic health records (EHRs), computerized provider order entry (CPOE), and barcode medication administration (BCMA) as part of their daily activities (KOPPEL et al., 2008). These systems have the potential to increase nurses' productivity, for example, by reducing the amount of time that they spend carrying out documentation. New technologies, including health information technologies, play an important role in effectiveness of management and nursing care services. Nursing informatics strives to facilitate the unique job responsibilities of nurses through optimized health IT methods and software tools. The advantages of applying information technology in all aspects of nursing, including clinical areas, management, education and research and its influence on health care have been reviewed.

### **Increased productivity**

Studies on the consequences of the use of nursing information technology suggest that countless positive effects on healthcare system have been realized (Moore et al., 2020; Karp et al., 2019). Nurses use a wide range of health information technology (HIT), including electronic health records (EHRs), computerized

provider order entry (CPOE), and barcode medication administration (BCMA) as part of their daily activities (Alotaibi & Federico, 2017). Use of information technology in the workplace reduces time spent documenting patient care and more time is spent delivering quality care to patients (Ibrahim et al., 2022). A systematic review done earlier Cheung et al (2015) to assess the clinical impact of Patient Data Management Systems (PDMS) reported increased the time spent on direct patient care by reducing the time spent on charting. Contrary findings were found in recent studies that examined impact of technology on patient time (Joukes et al., 2018; Moore et al., 2020). The studies revealed a significant decrease in time spent on patients due to more time required on documentation. Other findings include reduced occurrence of errors (medication errors, ventilator incidents, intravenous incidents, and other incidents) through the use of PDMS systems. These systems have the potential to increase nurses' productivity, for example, by reducing the amount of time that they spend carrying out documentation. Enhanced delivery of care, improved health outcomes, and advanced patient education are just a few aspects that have improved. Additional recent reviews (Sharma et al., 2021; Ibrahim et al., 2022) found that nurses time was redistributed to performing more value added activities such as direct patient care resulting to better outcomes.

### **Patient safety**

The National Patient Safety Foundation considers patient safety as a subset of healthcare. Patient safety is defined as the avoidance, prevention, and amelioration of adverse outcomes or injuries stemming from the processes of health care (Alotaibi & Federico, 2017). Preventable harms are an unpleasant and even deadly experience for patients and their families, and a significant burden on the healthcare system (Berry et al., 2020). Technology has advanced to the point where patients most likely to be at risk for harm can be identified early on in their hospital admissions (Webb, 2021). Patient risk assessment tools exist however, the existing tools are inadequate. Nursing informatics can be used to track and trend data associated with quality outcomes associated with Meaningful Use Requirements.

In 1999 the Institute of Medicine's (IOM) report "To err is human" called for developing and testing new technologies to reduce medical error, and the subsequent 2001 report "crossing the quality chiasm" called for using information technology as a key first step in transforming and changing the healthcare environment to achieve better and safer care (Yasser K. Alotaibi Frank Federico, 2017). Since the original IOM report was published, there has been an accelerated development and adoption of health information technology with varying degrees of evidence about the impact of health information technology on patient safety. Nursing informatics improves safety by utilizing technology to facilitate the collection, analysis and reporting of higher-quality data related to patient safety issues and health outcomes, as well as to prevent medical errors and allow for better monitoring and reporting of those that do occur. A recent study (Farokhzadian et al., 2020) done in Iraq reported improvement in the quality of care. In this study, use of IT was associated with reduced clinical risks and errors. Other benefits reported include, improved communication, improved work flow and data integrity.

In addition, nurse leaders who are trained and can demonstrate informatics competencies are in a position to track, trend, and prevent patient harm from occurring, which will not only benefit patient outcomes but also prevent reduced federal healthcare reimbursement penalties and reduce litigation exposure. According to the Locsin's framework, Informatics can allow nurse leaders to champion and support initiatives that reduce harm, keep patients safe, improve quality outcomes, and decrease the amount of time patients spend in a hospital (Locsin, 2017).

### **Operational efficiencies**

With their background and experience in patient care, nurse informaticists recognize the challenge and necessity of collecting meaningful data to properly deliver care. From evidence in literature (Schoenbaum, Anna. E., 2020), the specialty of nursing informatics has played a critical role in increasing operational efficiencies. An example of improved efficiency is in designing and building COVID-19-specific functionality in the EHR and other technology applications. Due to their key role in health care, nurses experienced a substantial increase in workload during the coronavirus disease (COVID-19). During the pandemic, nursing informatics specialists played a key role in establishing new clinical workflows, increasing operational efficiencies and improving care quality for their patients (Ibrahim et al., 2022; Yoo & Lee, 2022).

The pandemic underscored the opportunity and importance of the health informatics discipline, as demonstrated by the widespread utilization of health informatics applications like telehealth, remote patient monitoring, patient engagement among others. Nurse informaticists have been using their skills to streamline specific infectious disease history documentation for quicker triage. This has led to revamping documentation in EHRs and pre-screening patients before ambulatory on-site visits and entry to the hospital to proactively identify potentially infected patients and direct them to the appropriate care, as well as limit these patients from visiting facilities for face-to-face appointments to protect patients, physicians, nurses and staff.

### **Communication**

Telemedicine is defined as the use of telecommunication technologies to facilitate patient to provider or provider to provider communication. Communication maybe synchronous with real-time 2-way video communication or asynchronous transmission of patient clinical information. These technologies provide better patient experience with COVID-19 patients when family members are not allowed in patient care settings(Schoenbaum, Anna. E., 2020). During this period nurses used video app chats to connect in isolation patients to their families hence creating some amount of presence despite reduced human touch(Garcia-dia et al., 2021).Telemedicine enables patients to receive medical attention at the convenience of both doctor and him, and at the same time, it is safe. This implies that a person does not need to take time off from work or arrange childcare. Examples of tele-health technologies include implementing devices with video capability to provide human interaction, and conversational agent intelligence solutions such as voice-controlled virtual care assistants(Jadczyk et al., 2021) to further connectedness with patient care staff and family. In addition to communication, telemedicine may provide health information that is collected remotely from medical may be used to monitor patients, track or change their behaviour (Yasser K. AlotaibiFrank Federico, 2017).

### **Documentation**

Today's health information systems have significant data captured in event and timer logs that could research the influences of EHRs regarding end-user adoption, efficiency, and utilization of workflows. Electronic nursing documentation systems can facilitate complete, accurate, timely documentation practices.After nurses complete a task, they translate their action into documents in EHRs (e.g., texts, checkbox, images, etc.) during data entry.

Evidence from studies(Yasser K. AlotaibiFrank Federico, 2017;Karp et al., 2019) has shown maximizing use of EHR event files can provide practice based insights into clinical workflows and interventions, with added insight into the context of data collected during clinical care and the impact on clinical decision making. This framework can support a health system's ability to use HER data for discoveries, creating data-driven contextual intelligence to develop strategies to optimize and advance knowledge related to clinical practice in an EHR environment.

### **Automated medication dispensing technology**

The revelation that medical errors in hospitals are one of the leading causes of death has caused unsettling reverberations in the healthcare industry.Consequently studies show that when an adverse drug events occur in the hospital setting, they increase the patient's length of stay by an average of 4.6 days To this effect scientists have proposed several measures to curb this turmoil. Automated dispensing cabinets (ADC) are electronic drug cabinets that store medication at the point of care with controlled dispensing and tracking of medication distribution. These systems are intended to prevent medication error by ensuring that the right patient receives the right medication at the right time.(Alotaibi & Federico, 2017)

Automated dispensing cabinets were first used in hospitals in the 1980s, but have evolved over time to include more sophisticated software and digital interfaces to synthesize high-risk steps in the medication dispensing process. A clinical trial study (Chapuis et al., 2015) reported evidence of reduced medication errors when ADCs are used. In the clinical trial, the use of ADC resulted in a 28% reduction in the rate of medication errors in a hospital critical care unit. Recent studies (Batson et al., 2021;Pak & Park, 2012)have proved the same where they was found that the ADC prevents overdosing, mis-dosing, and under-dosing. The systems reduce medication errors by electronically verifying the '5 rights' of medication administration—right patient, right dose, right drug, right time, right route—at the patient's bedside. For example, when a nurse scans a bar code on his or her identification badge, on the patient's wristband, and on the medication to be administered, the data are delivered to a computer software system where algorithms check various databases and generate real-time warnings or approvals. A systematic review of quasi-experimental studiesfound that bar codemedication administration when integrated with electronic medication administration records may reduce medication administration errors by 50% to 80%.

## **IV. Conclusion**

With the rapid evolution of NI, many organizations have recognized the impact and value NI professionals can have on the quality of patient care, including improved safety. Including smart and intelligent tools in diagnosis and treatment methods can reduce medical errors and harm as well as financial loss for humans (Darvish et al., 2014). In summary use of information technology in the workplace enables nurses to spend less time documenting patient care and spend more time delivering quality care to patients.In addition to enhancements in care and improved evidence-based practice, the increased amount of data collected by EHRs and other data systems has created a massive amount of data that hospitals and health care organizations now

have to manage and analyze. It is therefore imperative that to become and remain an integrated profession, leaders at the forefront of nursing must adopt and embrace informatics.

### Acknowledgements

Special acknowledgement to colleagues and all those who assisted in conducting the study or critiquing the manuscript.

### References

- [1]. (ANA), A. N. A. (2019). What is Nursing Informatics ?
- [2]. Alotaibi, Y. K., & Federico, F. (2017). The impact of health information technology on patient safety. *Saudi Medical Journal*, 38(12), 1173–1180. <https://doi.org/10.15537/smj.2017.12.20631>
- [3]. Batson, S., Herranz, A., Rohrbach, N., Canobbio, M., Mitchell, S. A., & Bonnabry, P. (2021). Automation of in-hospital pharmacy dispensing: a systematic review. *European Journal of Hospital Pharmacy : Science and Practice*, 28, 2081.
- [4]. Berry, J. C., Davis, J. T., Bartman, T., Hafer, C. C., Lieb, L. M., Khan, N., & Brilli, R. J. (2020). Improved Safety Culture and Teamwork Climate Are Associated with Decreases in Patient Harm and Hospital Mortality Across a Hospital System. *Journal of Patient Safety*, 16(2), 130–136. <https://doi.org/10.1097/PTS.0000000000000251>
- [5]. Chapuis, C., Bedouch, P., Detavernier, M., Durand, M., Francony, G., Lavagne, P., Foroni, L., Albaladejo, P., Allenet, B., & Payen, J. (2015). Automated drug dispensing systems in the intensive care unit : a financial analysis. *Critical Care*, 2011–2015. <https://doi.org/10.1186/s13054-015-1041-3>
- [6]. Darvish, A., Bahramnezhad, F., Keyhanian, S., & Navidhamidi, M. (2014). The Role of Nursing Informatics on Promoting Quality of Health Care and the Need for Appropriate Education. 6(6), 11–18. <https://doi.org/10.5539/gjhs.v6n6p11>
- [7]. Farokhzadian, J., Khajouei, R., Hasman, A., & Ahmadian, L. (2020). Nurses ' experiences and viewpoints about the benefits of adopting information technology in health care : a qualitative study in Iran. 5, 1–12.
- [8]. Garcia-dia, B. M. J., Informatics, N., & Technology, I. (2021). LEADERSHIP Q & A Nursing informatics : An evolving specialty. 19.
- [9]. Ibrahim, R., Najjar, A., & Shafie, Z. M. (2022). Impact of Nursing Informatics on the Quality of Patient Care. 02(05), 418–421.
- [10]. Jadczyk, T., Wojakowski, W., Tendra, M., Henry, T. D., Egnaczyk, G., & Shreenivas, S. (2021). Artificial intelligence can improve patient management at the time of a pandemic: The role of voice technology. *Journal of Medical Internet Research*, 23(5), 22959. <https://doi.org/10.2196/22959>
- [11]. Joukes, E., Abu-Hanna, A., Cornet, R., & De Keizer, N. F. (2018). Time Spent on Dedicated Patient Care and Documentation Tasks before and after the Introduction of a Structured and Standardized Electronic Health Record. *Applied Clinical Informatics*, 9(1), 46–53. <https://doi.org/10.1055/s-0037-1615747>
- [12]. Karp, E. L., Freeman, R., Simpson, K. N., & Simpson, A. N. (2019). Changes in Efficiency and Quality of Nursing Electronic Health Record Documentation After Implementation of an Admission Patient History Essential Data Set. May, 260–265. <https://doi.org/10.1097/CIN.0000000000000516>
- [13]. KOPPEL, ROSS, T. W. J. L. T. B.-T. K. (2008). Workarounds to Barcode Medication Administration Systems: Their Occurrences, Causes, and Threats to Patient Safety. *American Medical Informatics Association*, 15(4), 408–423. <https://doi.org/10.1197/jamia.M2616.Introduction>
- [14]. Loesin, R. C. (2017). The Co-Existence of Technology and Caring in the Theory of Technological Competency as Caring in Nursing. 64(6), 160–164.
- [15]. Luo, S., EdD, MSN, RN, Young, V., & MLS. (2020). From Data to Knowledge and Practice: A Framework for Nurses' Use of Electronic Health Records | *Canadian Journal of Nursing Informatics*. 1–14. <https://cjni.net/journal/?p=6825>
- [16]. Moore, E. C., Tolley, C. L., Bates, D. W., & Slight, S. P. (2020). Review A systematic review of the impact of health information technology on nurses ' time. 27(March), 798–807. <https://doi.org/10.1093/jamia/ocz231>
- [17]. Nicholas R. Webb. (2021). Nursing Informatics as Caring: A Literature Review. . . *Online Journal of Nursing Informatics (OJNI)*, 25(1). <https://www.himss.org/resources/online-journal-nursing-informatics>, 25(1).
- [18]. Pak, J., & Park, K. (2012). Construction of a Smart Medication Dispenser with High Degree of Scalability and Remote Manageability. 2012. <https://doi.org/10.1155/2012/381493>
- [19]. Schoenbaum, Anna. E., W. M. C. (2020). Nursing Informatics Key Role in Defining Clinical Workflow, Increasing Efficiency and Improving Quality.
- [20]. Sharma, K., Devi, S. D., & Sharma, B. (2021). The Role of Nursing Informatics in Healthcare Sector. October 2020.
- [21]. Yasser K. AlotaibiFrank Federico. (2017). The impact of health information technology on patient safety. 38(12), 1173–1180. <https://doi.org/10.15537/smj.2017.12.20631>
- [22]. Yoo, H. J., & Lee, H. (2022). Critical role of information and communication technology in nursing during the COVID-19 pandemic: A qualitative study. *Journal of Nursing Management*, 30(8), 3677–3685. <https://doi.org/10.1111/jonm.13880>