

The Significance of Nursing Informatics in Enhancing the Quality of Healthcare and the Importance of Suitable Education.

Ms. Vimala Varatharajan¹, Dr.Tulsi Shringi²

Research Scholar, JJT University, Jaipur, Rajasthan, India¹

Professor, JJT University, Jaipur, Rajasthan India²

Abstract:

In the contemporary landscape of healthcare systems, technology plays a crucial role in both nursing education and practice. Therefore, it is imperative to examine the role of nurses and underscore the essential requirement for relevant information technology education programs that can align with the rapidly evolving technological landscape. A comprehensive review, involving extensive searches in databases and libraries using pertinent keywords, was conducted. The study selection criteria primarily centred on nursing informatics and the critical significance of acquiring expertise in the proficient utilization of information technology across all facets of the nursing profession. In a thorough evaluation of emerging technologies, the key components of nursing informatics implementation were identified, encompassing healthcare promotion, advanced systems, internet utilization, and network integration. Due to the fast development of technology, to effectively take advantage of information technology in nursing outcomes and quality of health care and to empower nurses; educational arrangement is recommended to set short-term and long-term specialized courses focusing on four target groups: studying, working, graduate, senior undergraduate, and graduate doctoral. The result of this study is expected to assist educational providers with program development.

Keywords: *education, nursing, quality of health care, nursing informatics, technology*

1. Introduction

1.1 History and Definition

Nurses have been working in the field of informatics near four decades, and the term "nursing informatics" has been considered a specialization in nursing resources since 1984¹. Many aspects such as data recovery, ethics, patient care, clinical decision support systems, human-computer interaction, information systems, dental informatics imaging informatics, computer science, information science, security, electronic health records, intelligent systems, e-learning, and telenursing have been added to the field. Hana defined Nursing Informatics as the application of IT in nursing duties including education, management, and practice in 1985. Integration of information science, computer science, and nursing science to support nursing practice and knowledge management was the definition offered in 1989². The American Nurses Association (ANA) published its aim and standards in 1994-1995 and presented Nursing Informatics as a specialty that integrates nursing science, computer, and information science to provide data communication management, knowledge, and nursing work in 2001. Now most nursing professionals believe that it is defined as the integration of information technology and all aspects of nursing such as clinical nursing, management, research, or education¹.

1.2 Competencies

The competency of nursing informatics specialists was determined by studying three categories including computer skills, informatics knowledge, and informatics skills. It investigates four levels of nursing practice: beginning nurse, experienced nurse, informatics specialist, and informatics innovator.

The following competencies were rejected: diagnostic coding, desktop publishing, managing central facilities to enable data sharing, and writing an original computer program. Some components of accepted competencies are shown below in brief.

1.2.1 Computer Skills

Computer skill competencies include computerized searches and retrieving patient demographics data, the use of telecommunication devices, the documentation of patient care, the use of information technologies for improving nursing care, and the use of networks and computer technology safely.

1.2.2 Informatics Knowledge

Competencies in informatics involve acknowledging the significance of nursing data in enhancing practice and understanding that computers can only support nursing care, with certain human functions beyond their capabilities. It also entails making ethical decisions in computing and appreciating the importance of clinicians' participation in designing, selecting, implementing, and evaluating healthcare systems. Describing current manual systems, understanding the impact of computerized information management on nursing roles, and assessing the limitations and reliability of computerized patient monitoring systems are integral aspects of these competencies.

1.2.3 Informatics Skills

Competencies in informatics skills encompass the ability to analyze information flow within an organization, create comprehensive process information flow charts for various aspects of clinical systems, and establish standards and database structures that enhance clinical care, education, administration, or research. Additionally, these skills involve developing inventive and analytical techniques for scientific inquiry in nursing informatics and devising novel data-organizing methods and research designs to investigate the effects of computer technology on nursing. Furthermore, they include conducting basic science research to underpin the theoretical advancements in informatics. Information literacy skills, competencies, and knowledge are investigated among educators, administrators, and clinicians of nursing groups nationally.

1.3 The Importance of Nursing Informatics

The historical evolution, definition, and competencies associated with nursing informatics underscore its significance, revealing that nurses are inherently linked to the realm of information technology. Consequently, nurses should possess the quality of care and navigate this intersection adeptly, ultimately enhancing the quality of care outcomes. To achieve this, it is imperative to explore the impact of nursing informatics on healthcare and emphasize the pertinent educational requirements in information technology for nurses.

2. Method

An extensive literature search was performed by using databases PubMed, Google Scholar, Open DOAR, Science Direct, and Scopus. Search terms were “education, nursing”; “quality of health care”; “nursing informatics”, and electronic health records and technology. The study was carried out from January to April 2014. A library search was also performed. As many as 135 articles were retrieved. With a critical point of view, 40 articles in English were selected that specifically focused on nursing informatics education and its influence on nursing outcomes and the quality of health care³.

3. Results

The study mentions the following as the key elements of nursing informatics implementation:

3.1 Health Care Promotion

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. Today, the subjects of clinical nursing information systems, decision support systems, and medical diagnostic systems are associated with collecting patient information. Regarding the technology-rich environment, health care, and hospital information systems developers, the quality of care is improving. For increasing patient safety and leading to evidence-based nursing, nursing informatics has been enhanced for students and graduates by the Columbia

School of Nursing. The study has proved that informatics competence is a prerequisite to improving patient care. Technology and multimedia integrated into nursing curricula can promote the use of informatics tools as an integral practice component and increase patient safety⁵. Managers can improve efficiency and performance through information systems and new technologies. In addition, several studies have confirmed the impact of careful shift planning and efficient management on nurse's work and the quality of health care. Information is the source of all management activities. Nursing care is an industry service, and its product is patient care. Information technology can promote nursing management outcomes. Internet-based nurse scheduling systems are mostly designed according to the self-scheduling model and need refining by the manager who overviews proper distribution, it causes uniform resource allocation in scheduling and increases patient direct care time⁶. Implementing information systems can provide better access to evidence; it can affect patient care quality and support evidence-based nursing. Software tools to facilitate research are available in all medical fields⁷. Nursing information systems influenced clinical patterns and decreased the time nurses spent on indirect care⁸. This is critical for healthcare professionals to assess, apply, report, and manage data with the help of new tools of the information age⁹.

3.2 Advanced Systems

Although using decision support systems can lead to safer care, it may impair critical thinking. The need for excessive working time could cause some delays in the nursing job and reduce the quality of health care⁵.

Researchers recommended considering the following:

- Involving nurse managers in the system selection and designing process
- Designing a simple and efficient process
- Recording a system-compatible guideline - Improving the system speed
- Selecting hardware that can encourage nurses to use them.
- Upgrading the system through innovation in information technology

Decision support systems have been defined to assist physicians in solving problems that require specific decisions for 30 years. It is replacing the role of human knowledge by formulating the knowledge in the system¹⁰. Expert systems are the most common types of clinical decision support systems and have applications in show notes, diagnostic support, critical treatment plans, decision support, prescriptions, recovery, and the identification and interpretation of pictures, however, as stand-alone tools, are not able to replace human expertise. These systems should be integrated with knowledge management. Several studies have shown that the integration of implicit and explicit knowledge and management of different types of knowledge will help to determine the best treatment plan. Logical design is required for the success of these systems and seems to hardly have been considered. The application of guides easy access to up-to-date clinical evidence and the cutting of duplicate tests could reduce medical mistakes and improve quality of care, but there are some limitations¹¹. To increase the usefulness and acceptability of such systems, the ease of use, support, and maintenance combined with the ability of systems hardware, software applications, and integration with hospital information systems and patient records should be considered⁹. Including smart and intelligent tools in diagnosis and treatment methods can reduce medical errors and harm as well as financial loss for humans. Artificial intelligence and expert systems are used to help the diagnosis.

3.3 Internet and Network

The first internet-based Nursing Informatics courses were offered by Duck University in 1997. Represented advantages were clearly defined and measurable learning outcomes and real-world problems were introduced as the main component of instructional strategies. There were some disadvantages like hardware and software problems, deficiency in prerequisite skills, troubleshooting difficulties, low internet access speed, and poor time management to master the material¹². The evaluation of an innovative consumer health informatics intervention proved that the patients and nurses are satisfied with the use of electronic and communication devices and home care¹³. Nurses can have networks such as AJN and AMN now. In the World Wide Web, it is possible to have a common network for nursing organizations and develop a forum to discuss nursing issues and design online meetings¹⁴. The other aspects of nursing practice potential in the new decade are offering services from a distance

through telemedicine or telenursing. In this regard, easy remote diagnostic software and hardware are designed to facilitate E-health services. Tele-nurses can provide various services such as education, patient monitoring, and counseling through Internet facilities. Telenurses are satisfied with their role. They care remotely using special skills and knowledge. It can cover nurse shortages and the global demand for nurses⁷. In a telenursing Survey, most of the nurses believed that it is better to design educational programs for nurses to be able to work as telenurses¹⁵. Using online library resources and outreach programs would be beneficial and produce positive outcomes for nurses¹⁵. Information and communication technology progress provided the possibility of improving health through e-education irrespective of time and place. Patient education systems on the Internet can increase patient satisfaction and influence their self-care behavior. E-health educational programs make people aware of disease management and increase coordination with the healthcare professional team. It influences the lifestyle and the prevention of diseases such as cancer, HIV, and chronic diseases. On the other hand, it empowers medical groups by enhancing and upgrading their knowledge¹⁶. The web-based computer simulation educational program in crisis decreased medical errors in emergency departments. Information technology application refers to providing simultaneous access to education in specified locations which require huge spending. It decreases cost loss. Online access to journal articles prevents repeated research programs and makes assessment easy. Online databases provided up-to-date article access and informed nurses about new technologies, easy software, and the results of investigations⁷.

3.4 Related Organizations Activity

The National Advisory Council on Nurse Education and Practice addresses nursing practice challenges; and mentions electronic health records, patient monitoring systems, bar code medication administration, computerized provider order entry, data capture tools, care planning tools, and telehealth; and the need to consider nursing shortage, reducing medical errors, improve tracking of patient data, improve the efficiency of data collection, improve access to care, support national surveillance capabilities. These are also mentioned as ways to address nursing education challenges: E-learning to deliver education, simulation to deliver education, inclusion of Health Care IT in curricula, and faculty development for health care. It centralizes these as solutions that can improve the capacity of nursing schools, reduce faculty shortage, and increase the health IT skills of graduating students. There are many group projects and organizations that support nurses' involvement in the optimal use of IT in their jobs.

Some are introduced in the following:

- The National Coordinator for Health Information Technology (ONC)
- The American Health Information Community (AHIC)
- The Nationwide Health Information Network (NHIN)
- The Faculty Development: Integrated Technology into Nursing Education and Practice Initiative (ITNEP)
- National Advisory Council on Nurse Education and Practice (NACNEP)
- National League of Nursing (NLN)
- National Institute of Health (NIH)
- National Institute of Nursing Research (NINR)
- North American Nursing Diagnosis International (NANDA)
- Technology Informatics Guiding Education Reform Initiative (TIGER)

It is reported that without proper training for nurses, efforts to integrate healthcare IT with nursing practice will be hampered. It gives evidence that nurses are not getting adequate training for IT usage¹⁷.

3.5 Need for Educational Programs

Due to the fast growth and development of technology, to effectively take advantage of information technology in nursing outcomes and quality of health care, the educational arrangement is recommended to strengthen nurses at different levels for implementing information technology tools in all aspects of their profession.

4. Conclusion

In today's world, the potential for information and communication technology applications is increasing so that it can enhance the quality of nursing domain outcomes¹⁸. Nurses have the most communication with patients and interact with technology more frequently. Using technology should create a positive attitude in nursing productivity. Nurses need to be involved in the initial design of systems to improve the quality of health care and change their culture in this regard^{7,13}.

Mediating technically and technologically on the borderline between medicine and nursing, nurses have become known as medical Goddesses in the form of Tele-nurses. Nurses have more authority in decision-making with the use of new technologies¹⁹. For successful implementation of the electronic health reporting system, nurses must be knowledgeable about information technology, computer skills, and informatics knowledge and skills. In telenursing, the importance of data quality criteria, transparency, integrity, authenticity, confidentiality, the updating of information, accountability, productivity, standards, and accessibility of health websites should be considered⁸.

The NACNEP recommended preparing nurses to adopt intelligent and quality-based information technology use in patient care by implementing five strategies: providing core informatics courses to nursing schools, educating nurses specialized in informatics skills who can solve related issues, offering more powerful nursing care through the implication of telecommunication projects, preparing more nursing faculties in the informatics field to facilitate students skills enhancement and enhancing collaboration to advance informatics. The benefits of extending nursing informatics strategies, directly and indirectly, influence patients and people's health positively²⁰.

Courses affect nursing students' perceptions of informatics²¹ and they may learn at the BSc level about patient-centered evidence-based care through the use of informatics tools and get informed about benefits such as the promotion of safety, quality, and effective clinical decisions²². They may even learn how remote care and personal phones can improve nursing care in different areas such as psychiatric nursing²³. At the same time, nursing workers are busy in the wards giving care. If they are not alert to new technologies, it will be difficult to accept the new nurses' ideas who have been educated recently with a positive attitude toward the advantages of information technology. This group of nurses can be encouraged to be integrated into the potential of E-learning as well as continuing education²⁴, based on the Summit of Technology Informatics Guide Education Reform²⁵. It seems necessary to prepare knowledgeable nurses to deal with selecting, developing, implementing, and evaluating IT to interpret data as usable knowledge and information. In the nursing world, four domains should be empowered. Undergraduate and diploma programs can be integrated with courses. Graduate programs can be designed. Formal and informal continued educational programs for nurses on the job and fellowships for Ph.D. graduate nurses can be useful. Trying to make different groups of nurses ready for the ever-increasing speed of technology in the current century is possible, not only by parallel opportunities of learning but also with the help of evaluating tools such as the Self-assessment of nursing informatics competencies scale which can bring the same range of comprehension about informatics implementation²⁶. In conclusion, considering nursing outcomes takes advantage of information technology; educational arrangements are recommended to set short-term and long-term specialized courses focusing on the four target groups. Informatics courses for nursing students continued educational programs for registered nurses in the work area, graduate programs at MSc and PhD levels for nurses, and fellowship programs for doctoral graduates are recommended to be considered (Figure 1).

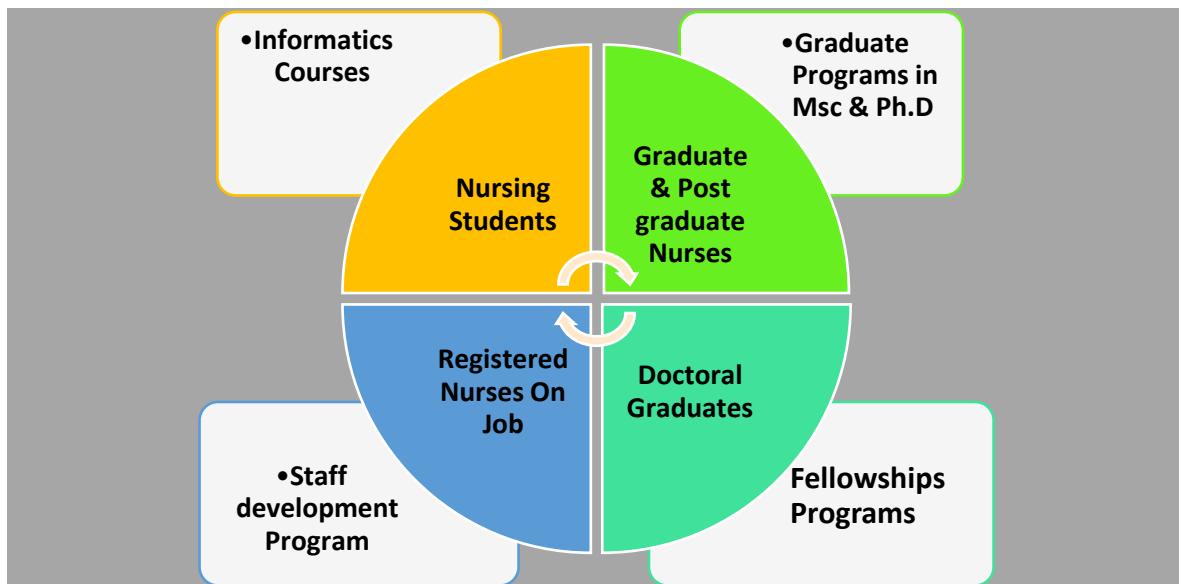


Figure 1. The proposed educational model for empowering nurses about nursing informatics in four groups

Nurse educators must incorporate the entire concept of informatics into the education of nurses.

Acknowledgments

It is hereby acknowledged by Dr. Tulsi Shringi and Dr. Ananth Lakshmi Narasimhan who assisted in critiquing the manuscript. The main enthusiasm for this study came from the Nursing Informatics & Digital Health: Paving the Way for the Future Generation which was held at Gulf Medical University in the United Arab Emirates.

References:

- [1] Guenther JT. Mapping the literature of nursing informatics. *J Med Libr Assoc.* 2006;94(2 Suppl):E92-8. PMCID: PMC1463042. Hall E. Highlighting emerging roles and enduring values: information management in nursing education. *Bull Med Libr Assoc.* 1995;83(4):490. PMCID: PMC226071.
- [2] Gassert C. The Challenge of Meeting Patients' Needs with a National Nursing Informatics Agenda. *J Am Med Inform Assoc.* 1998;5:263-268. <http://dx.doi.org/10.1136/jamia.1998.0050263>.
- [3] Staggers N, Gassert CA, Curran C. A Delphi study to determine informatics competencies for nurses at four levels of practice. *Nurs Res.* 2002;51(6):383-390. <http://dx.doi.org/10.1097/00006199-200211000-00006>.
- [4] Bakken S, Currie L, Hyun S, Lee NJ, John R, Schnall R, Velez O. Reducing health disparities and improving patient safety and quality by integrating HIT into the Columbia APN curriculum. *Stud Health Technol Inform.* 2009;146:859. PMID: 19593021.
- [5] Norton M, Skiba DJ, Bowman J. Teaching nurses to provide patient-centered evidence-based care through the use of informatics tools that promote safety, quality, and effective clinical decisions. *Stud Health Technol Inform.* 2021;122:230. PMID: 17102254.
- [6] Pierce S, Pravikoff D, Tanner A. Information literacy: instrument development to measure competencies and knowledge among nursing educators, nursing administrators, and nursing clinicians: a pilot study. 2003.
- [7] Darvish A. E-Health Technology: Barriers and facilitators, INTED2010 Proceedings. 2010;pp. 1788-1791. Retrieved from <http://library.iated.org/view/DARVISH2010EHE>.
- [8] Darvish A, Salsali M. A review on information technology development and the necessity of nursing informatics specialty, INTED2010 Proceedings. 2010;pp. 3320-3324. Retrieved from <http://library.iated.org/view/DARVISH2010ARE>.
- [9] Hall E. Highlighting emerging roles and enduring values: information management in nursing education. *Bull Med Libr Assoc.* 1995;83(4):490. PMCID: PMC226071.

- [10] Tseng KJ, Liou TH, Chiu HW. Development of a computer-aided clinical patient education system to provide appropriate individual nursing care for psychiatric patients. *J Med Syst.* 2012;36(3):1373-1379. <http://dx.doi.org/10.1007/s10916-010-9599-4>.
- [11] Montani S, Bellazzi R. Supporting decisions in medical applications: the knowledge management perspective. *Int J Med Inform.* 2022;68(1):79-90. [http://dx.doi.org/10.1016/S1386-5056\(02\)00067-9](http://dx.doi.org/10.1016/S1386-5056(02)00067-9).
- [12] Goodwin L. Performance support concepts for Web-based informatics instruction. *Proc AMIA Annu Fall Symp.* 1997;232:698-702. PMID: 2233506.
- [13] Kossman S. P, & Scheidenhelm L. Nurses' perceptions of the impact of electronic health records on work and patient outcomes. *Computers Informatics Nursing.* 2008; 26(2), 69-77. <http://dx.doi.org/10.1097/01.NCN.0000304775.40531.67>
- [14] Rizzolo MA, DuBois K. Developing AJN Network: phase two. An information resource for nurses. In: Proceedings/the... Annual Symposium on Computer Application [sic] in Medical Care. Symposium on Computer Applications in Medical Care. 1994;106-110. PMC2579065.
- [15] Grady JL, Fairchild L. Report of International Telenursing Survey. *Comput Inform Nurs.* 2007; 25:18-67. <http://dx.doi.org/10.1097/01.NCN.0000289163.16122.c2>.
- [16] Wozar J, & Worona, P. The use of online information resources by nurses. *J Med Libr Assoc.*, 91, 216-221. PMID:12883576; PMCID: PMC153162.
- [17] Choi J, Bakken S. Validation of the Self-Assessment of Nursing Informatics Competencies Scale among undergraduate and graduate nursing students. *J Nurs Educ.* 2013; 52:275-282. <http://dx.doi.org/10.3928/01484834-20130412-01>.
- [18] Schlak SE, Troseth M. TIGER initiative: advancing health IT. *Nurs Manage.* 2019;44(1):19-20. <http://dx.doi.org/10.1097/01.NUMA.0000424025.21411.be>.
- [19] Ainsley B, Brown A. The impact of informatics on nursing education: a review of the literature. *J Contin Educ Nurs.* 2009;40:228. <http://dx.doi.org/10.3928/00220124-20090422-02>.
- [20] Button D, Harrington A, Belan I. E-learning & information communication technology (ICT) in nursing education: A review of the literature. *Nurse Educ Today.* 2013;13:162-165. <http://dx.doi.org/10.1016/j.nedt.2013.05.002>.
- [21] Goossen WT, Goossen-Baremans AT. ROC van Twente: nursing education in care and technology. *Stud Health Technol Inform.* 2007;129:1396-1400. PMID: 17911943.
- [22] Hebda TL, Calderone TL. Informatics competencies for healthcare professionals: the technology informatics guiding education reform (TIGER) initiative model. <http://dx.doi.org/10.1515/dmdi-2012-0013>. 2012.
- [23] Jetté S, Tribble DSC, Gagnon J, Mathieu L. Nursing students' perceptions of their resources toward the development of competencies in nursing informatics. *Nurse Educ Today.* 2010;30(8):742-746. <http://dx.doi.org/10.1016/j.nedt.2010.01.016>.
- [24] Lee TT, Mills ME, Lu MH. Impact of a nursing information system on practice patterns in Taiwan. *Comput Inform Nurs.* 2008;26(4):207-214. <http://dx.doi.org/10.1097/01.NCN.0000304807.69240.9e>.
- [25] Bakken S, Cook S, Curtis L, Soupios M, Curran Ch. Informatics Competencies Pre- and Post-Implementation of a Palm-based Student Clinical Log and Informatics for Evidence-based Practice Curriculum. *AMIA Annu Symp Proc.* 2003; 203:41-45. PMCID: PMC1480072.
- [26] Unruh L, Zhang NJ. The role of work environment in keeping newly licensed RNs in nursing: A questionnaire survey. *Int J Nurs Stud.* 2013;50(12):1678-1688. <http://dx.doi.org/10.1016/j.ijnurstu.2013.04.002>.