© 2018 International Journal of Nursing and Health Services

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License which permits unrestricted non-commercial use, distribution, and reproduction in any medium provided the original work is properly cited

Innovation in Utilizing Information Technology Systems in Improving the Quality of Nursing Services

[1*]Ahmad Dahlan Syam, [2]Sukihananto

1 Student of Master of Community Nursing, Nursing Science Faculty, Universitas Indonesia, Depok, Indonesia.
2 Lecturer of Nursing Science Faculty, Universitas Indonesia, Depok, Indonesia.
* *Correspondence:* Ahmaddahlansyam@gmail.com

Abstract
Advances in technology in the field of health significantly increase, that is why everyone should be able to use existing technology. The study aimed to describe Innovation in Utilizing Information Technology Systems in Improving the Quality of Nursing Services**.** The conceptual framework proposed was to look at the theory and empirical literature used in nursing studies and its benefits, we search literature from various relevant sources. Four databases including PubMed, PROQUEST, Science Direct, and Ebsco were included in this study. Several innovations in the field of nursing information technology have been developed and evaluated for their benefits. Based on the literature in this article, Nurse Calling Systems (NCSS), EHR and CDSS, MDTT, portable computers and infusion management systems are some technological innovations that have been developed to provide better service quality. The benefits of these innovations, are efficiency of the management, cost-effective, improved planning programs, increased utilization of nurses, nurse spending more time with patients and less time in station nurses, reducing the use of paper-based documentation, nursing care automatically have the same standard in the nursing process, and also reduce the cost of nursing services measured. There are several innovations in the field of nursing that have been widely applied, which are carried out on enormous benefits in the practice of nursing services.

Keywords: Innovation, Nursing Information System, Benefits

1. Introduction

21st-century nursing services face some new challenges in increasing needs and demands that are growing faster than the resource availability, even though investment in the health sector have been raised, in all industrialized countries (1).

Nursing service systems throughout the world are currently asked to address three relevant issues: first, changes in social health problems related to social and demographic transitions, epidemiological issues and problems associated with the provision of health services. Second, existence patients hope, strongly influenced by the media, and the phenomenon of consumerism that turns patients into demanding clients. Third, limitless

technological expansion upheld by profitable health markets, which has a strong influence on supply and demand for services. The decision makers who involved in health politics must overcome this emerging problem. They must ensure the availability of high-quality and innovative nursing services, but on the other hand, save budget and ensure equal access(2).

Nursing services continue to experience unprecedented changes to improve service in the community. Huston (2013) observes, though, that it is the adoption of new technologies that will bring the most significant impact on nursing and the way of nurses care for patients and the results obtained by patients. It is hoped that changes will increase when new nursing models are developed, and the pressure to stem the increase in costs continuously happened (3).

All health professions now depend on advances in biomedicine and technology that affect the use of nursing informatics. This nation is at a critical point in empowering technology for health care. The time has come for nursing to abandon manual tools from the past and move on to the millennium era. The nursing profession is being transformed to meet the needs of the new world and will be a significant player in the revolution. Future nurses will play a key role as information mediators and facilitate the use of technology by health care consumers. Technology will encourage health and nursing services, which in turn nursing has the opportunity to discharge technology, to provide higher quality, data-based health services (4).

Today, advances in information technology offer many opportunities for the development of health care professional skills, and considering current epidemiological and sociodemographic transitions; it is essential for nurses to become familiar with health information systems. Nurses can obtain valuable information from the use of nursing information systems (5).

2. Objective

The study aimed to describe Innovation in Utilizing Information Technology Systems in Improving the Quality of Nursing Services.

3. Method

The literature review has used PRISMA to describe the Innovation in Utilizing Information Technology Systems in Improving the Quality of Nursing Services

3.1 Eligibility Criteria

We included various types of studies including quantitative research and qualitative research to describe innovation in nursing informatics and the benefit nursing informatics to improve the quality of nursing services

3.2 Search Strategy

We conducted the search strategy to find the relevant articles related to the nursing informatics system. The search strategies, including “innovation, “ benefits," "health information system," "nursing system."

3.3 Study Selection

Four databases including PubMed, PROQUEST, Science Direct, and Ebsco were included in this study. We investigated the relevant articles published in the English version.

4. Results

Many of these technological innovations are already available, including usable monitoring tools, personalized genetic interventions, adoption of machine learning into diagnostic and treatment practices, as well as medical and social robotics applications. All of this is additional to the continued development of electronic health records and the realization of distributed information networks throughout the site. This technology creates new ways for research and clinical practice. The thing that not well articulated is how nursing staff can be more actively involved in the future that depends on technology (1).

Innovative programs will advance technology related to nursing services and maximize the potential contribution of the nursing profession in the design and implementation of creative solutions. Nurses also have the potential to improve their skills and knowledge (6).

The effectiveness of other types of communication technologies has also been tested. For example, Nurse Call Systems (NCSs) provide patients with a more natural and faster way to communicate with nurses; through NCSs, patients press a button on the bed, which turns on a light outside of a patient's room and on the bed station, showing which patient needs help Similarly, Guarascio-Howard (2011) found that wireless communication technology with audio and visual capabilities to facilitate communication between nurses and patients as well as among nurses improved the responses to patients falls from hospital beds, reduced cell phone usage among nurses and increased efficiency (7).

Also, the use of portable computers minimizes the need for staff to re-enter data recorded by medical recorders. In other words, various forms of communication technology are being explored and promoted in patient care in many different ways

The use of communication technology in nursing is so pervasive, even social media has been incorporated into nursing practice. The contribution of social media content can be a positive experience for nurses, allowing them to share professional experiences and receive support from others, Spector & Kappel (2013) outlines scenarios which the use of social media is unprofessional, unethical, and violates confidentiality standards. To help health care organizations and educators face the use of social media in the right way, Spector & Kappel (2013) produced a series of guidelines, including a proper idea of using social media.

Significant use of health information technology (IT) is now a requirement to receive a complete replacement from Medicare and Medicaid. Meaningful use goals include ensuring quality and safety and providing and improving communication and management of care. IT embrace electronic health records (EHR) as tools in integrated care delivery. An electronic health record (EHR) is a digital version of a patient’s paper chart. EHRs are real-time, patient-centered records that make information available instantly and securely to authorized users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider’s office and can be inclusive of a broader view of a patient’s care. EHRs can contain a patient’s medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results, allow access to evidence-based tools that providers can use to make decisions about a patient’s care, automate and streamline provider workflow (8).

Several components of the EHR offer advantages in the delivery of complete nursing care. Clinical Decision Support Systems (CDSS) with nursing carer reminders is a specific tool nurse have to provide quality care and is a requirement to attest to meaningful use of HIT. CDSS is is a reminder system for nurses, which is needed to prove the meaningful use of IT. Basic nursing tasks including feeding, bathing, ambulation, and hygiene are everyday care activities that are often overlooked. While the importance of primary nursing care is taught to nurses in their first year of education, these treatment items are not completed. Development of pressure ulcers and pneumonia are only two complications that can be prevented when primary care is given promptly. These complications can reduce the quality of life of patients and increase health care costs. The reason nurses did not complete this activity was found to be related to a lack of staff and material resources and lack of communication among teams and patients.

Technology is being implemented as a tool to prevent healthcare errors. The technique of interest in this study is the use of clinical decision support systems (CDSS). CDSS have long been used by physicians and are now being used by nurses to guide clinical practice and to improve patient outcomes. Electronic nursing care reminder usage, a type of CDSS, is related to decreased reports of missed.

Three studies have examined solutions to reduce negligence of care and improve quality of care (9,10). Kalisch et al. (2013) reported that successful teamwork on units was significantly associated with a decrease in missed care reports. CDSS as one of the component EHR shows a reduction in the incidence of missed care (11). In a study conducted by Piscotty, it was identified that nurses who use electronic nursing care reminders more often fulfill basic needs.

The impact of comprehensive EHR on nurse working and caring efficacy has been measured. It was found that nurses spent significantly more time in the patient's room, and less time on drug documentation and administration, after the application of the EHR. Although nurses change their time allocation, they do a more hourly intervention. In the use of EHR that nurses with advanced skills in computer applications feel that the system is easy to use, advanced users will find the system more useful regarding patient benefits, cost reduction, and improving workflow (12).

However, usability problems produce inefficiencies, frustrations, reduced productivity, and threats to patient safety at all sites and vendors. Health IT design is reported to inhibit nurses from working and increase the cognitive and stressful burden. Cognitive load increases due to ineffective or irrelevant designs and lack of integration throughout the system. Difficulties with coordinating care, design or critical applications, and gaining awareness of the patient's situation are reported to produce gaps in care. Experts say that excessive documentation in IT systems takes time away from patients and interferes with the ability to develop a comprehensive view of the patient's clinical intervention. Long-term care facilities have specific problems with inefficiencies because these settings depend on unique workflows and extensive external communication. EHRs are currently primarily designed for hospitalized patients in a hospital setting resulting in excessive documentation requirements or lack of information that can be used (13).

Innovations in other nursing fields are infusion management systems, optimizing the infusion process. In traditional infusion processes, nurses often rush to each ward, when the patient is being given intravenous infusion. Because of heavy work, nurses cannot always observe the patient's infusion. They are often passively informed by the system to

find out infusion information. Automatically monitors infusion, accurately transmits information and inerrably saves the date is gaining attention. The infusion management system is an infusion management platform which combines information, intelligence, and digital technologies. Without any change of the original infusion way, the management mode of infusion is improved, and centralized monitoring, quantitative management and normative service of infusion are achieved. This system could make plans on intravenous infusions, precisely management the dripping speed, monitor and record the whole infusion process and automatically sound an alarm when necessary, which would reduce labor intensity of nurses and ease patients' tensions and anxiety during infusion. This could make intravenous infusions more scientific and safe as well as raise the information management level in modern hospitals Through the application of an intelligent infusion management system, simplifying and integrating traditional infusion processes to improve process efficiency(14).

The efficiency of nurse work has dramatically improved, there are two challenges ahead of nursing managers, one of which is how to improve the quality of care, and the other is how to improve work efficiency. Modern nursing information technology can overcome this problem effectively. The infusion management system can record and manage infusion information in real time, merely leading work routes so that it can improve work efficiency. Early warning of various infusion information allows nurses to save time and space for other nursing jobs while avoiding back and forth and reducing nurse workload and labor intensity (14).

By using an infusion management system, nurses can quickly resolve problems that often occur in intravenous infusions, for example, fluid extravasation, needle prolapse, infusion hose distortion, and others. With internet technology, we can carry out monitoring and early warning for infusion problems. In this process, the information path is not blocked, and the results of information gathering can be traced, which makes it a closed-loop management model. The infusion management system can calculate and track infusion information for each patient. This system can show nurse data in detail, which includes the type of infusion, input speed, start and end time of infusion, total infusion time and others (14).

Infusion management systems based on Internet of Things technology can play a catalytic role in nursing. Can optimize nursing workflows, save time and improve nursing work efficiency. At the same time, promoting the concept of Nursing Informatics and providing support for the construction of a primary platform for significant data infusions for the application of medical data and evidence-based data to improve the quality of ongoing nursing work (14).

Other innovations, mobile devices can represent a viable solution for the health sector, because we face scenarios in the digital era, where technology adoption for care provides higher case management, fast and secure client assessment, data management and storage. In a study of the use of mobile technology for clinical evaluation of newborns, it was observed that the advantages in using this technology focused on mobility and agility to document information, thus optimizing time, giving greater flexibility in managing treatment actions using tablets, because recordings can be made at the patient's bedside. This application is an objective and precise tool that allows nurses to systematize the nursing care, facilitating data collection with pooling of clinical signs, and assisting in the identification of diagnoses and selection of nursing interventions for neonates. This

application intends to contribute so that the nurse can perform the nursing process, based on nursing theories, offering care based on scientific evidence, enabling the nurse to complete part of the process of carrying out nursing systematization (15).

By applying this application, the nurse intends to exclude the clinical judgment and diagnostic reasoning of the nurse, since, for the professional to use it, previous scientific knowledge is demanded (15)

A satisfactory result was found by Schachner et al. (2016) when evaluating the use of mobile devices by nursing staff at Buenos Aires, Argentina hospitals. The users consider that tablet is a useful tool, for helping them in carrying out tasks in real time in a faster way, thus facilitating workflows, allowing more accurate and dynamic records. Another study conducted by nurses from two hospitals in the state of Santa Catarina, Brazil, regarding the use of mobile devices revealed that the system presents practical applications by allowing nurses to assess, intervene, and manage nursing care, providing more security and more nursing involvement in client needs alongside their bed. It seems that the development of software for care planning tends to allow nurses to use the content in the material to help them apply or modify the clinical judgment, support decision making in the process of selecting diagnoses and nursing interventions, in addition to being learning tools capable of expanding the knowledge of professionals.

Medical dose tracking technology (MDTT), which allows identification of the location of treatment after administration, has been used to improve the process and performance of pharmaceutical delivery. PharmTrac.PD (Plus Delta Technologies, Durham, NC) is one of the examples of MDTT. This cellular device offers drug tracking that supports barcodes and collects data through web-based portals that can be seen by authorized staff members. The findings of this study indicate that nurses' access to the MDTT web portal caused a significant decrease in the frequency of communication received by pharmacy staff. Access to the MDTT web portal also causes a moderate increase in nursing satisfaction, as measured by a modified pre and post NAS MAS survey. Two survey items achieved a statistically significant increase in satisfaction. The survey items are as follows: "The current drug distribution system helps reduce the number of disorders that I encounter," and "The current drug distribution system provides nurse access to information about the location of the drug." CTICU nurses make use of the MDTT web portal several times every day, and cost savings due to the reduced processing time of pharmaceutical technicians for clear drug demand. Based on the research findings, the savings in pharmaceutical costs can be much higher if the same results can be realized by large hospitals (1).

5. Discussion

ANA described that nursing information systems are related to the legality of obtaining and using data, information and knowledge about standards of documentation, communication, supporting decision making processes, developing and disseminating new knowledge, improving the quality, effectiveness, and efficiency of nursing care and empower patients to choose the desired nursing care. The reliability of an information system in an organization lies in the relationship between existing components to be generated and streamed into useful, accurate, reliable, detailed, fast, relevant information for the organization (16).

Some innovations in the field of information technology in the field of nursing have been developed and evaluated for its benefits. Based on what is contained in the literature review in this article, Nurse Call Systems (NCSS), EHR and CDSS, MDTT, portable computers and infusion management systems are some innovations that have been developed in response to emerging technological challenges to provide better quality services.

The NCSS system as already mentioned, this system can improve nurses' responses to patients, so that it can reduce the number of patients falling out, thus work efficiency can be assessed to increase with this system (7).

While the EHR and CDSS systems, this system has also been widely developed in Indonesia, especially in large hospitals in Indonesia, from some literature found that this system can assist nurses in providing more comprehensive services as of they consider to improving the quality of nursing services. Also, with this system, nurses can fulfill basic tasks and can spend more time together with patients (8).

The use of a portable computer is considered to be more time-saving, energy efficiency because the data is directly inputted alongside the patient, so there will be no missing data, and no need to spend time in inputting data in the nurse's room (12).

The infusion management system, this system saving time and space for other nursing activities, avoid back and forth, workload and work intensity decreases, and improving patient safety related to patient infusion conditions(14). Besides that there is innovation in MDTT, this system is related to collaboration between nurses and pharmacy in service delivery, this system is considered to be more time-saving and efficient (1).

Several methods have been developed; several benefits are felt by nurses in the use of nursing information systems, feeling more time used together with patients, reducing paper-based (paper data loss), availability of data that can be used for research, and the availability data as a basis for legal protection for nurses. Also, with an integrated system, inter-professional communication is felt to increase, because data can be easily accessed by health workers. It is even more efficient management, more effective use of cost resources, improving planning programs, increasing the utilization of nurses. The benefits of information systems in nursing more time with patients and less time at the nurse station, reducing the use of the same standard automatic nursing documentation in nursing (nursing process) reduces the cost of quality nursing services can be measured.

6. Conclusions and recommendations

There are several innovations in the field of health that have been widely applied, which after evaluation of them turned out to provide enormous benefits in the practice of nursing services, thus increasing performance for nurses in providing nursing services to the community, and thus giving satisfaction to the community towards services that they get.

Then it is recommended that in the future Indonesia can implement innovations that can help improve the performance of nursing in Indonesia, accordance with existing needs, but still pay attention to the readiness of resources in the operation of the system and whether the system can answer the needs of Indonesian nurses.

References

1. Peek, G., Campbell, U., & Kelm M. Impact of Medication Dose Tracking Technology on Nursing Practice. Hosp Pharm. 2016;646–53.
2. Ismail A, Jamil AT, A Rahman AF, Abu Bakar JM, Mohd Saad N, Saadi H. The implementation of Hospital Information System (HIS) in tertiary hospitals in Malaysia. Malaysian J Public Heal Med 2010. 2010;10(2):16–24.
3. Deloitte. Health and life sciences predictions 2020: A bold future? Deloitte Center for Health Solutions. //www2.deloitte.com/uk/en/ pages/life-sciences-and-healthcare/articles/healthcareand-life-sciences-predictions-2020.html. 2014;
4. Pramila R. Application of Nursing Informatics: Need to Transform into Reality. Int J Nurs Educ. 2013;153–6.
5. Agustino, F., Zega, M., Rocto, G., Luzzi, L., Vellone, E., & Alvaro R. Impact of a nursing information system in clinical practice: a longitudinal study project. 2013;Ann Ig, 329-241.
6. Glasgow, M. E., Colbert, A., Viator, J., & Cavanagh S. The Nurse- Engineer: A New Role to Improve Nurse Technology Interface and Patient Care Device Innovations. J Nurs Scholarsh. 2018;1–11.
7. Bayramzadeh, S., & Alkazemi M. Centralized vs. Decentralized Nursing Stations: An Evaluation of the Implications of Communication Technologies in Healthcare. Nurs Stn Des Commun Technol. 2014;62–80.
8. Schenk, E., Schleyer, R., Jones, C., Fincham, S., Daratha, K., & Monsen K. Impact of Adopting of a Comprehensive Electronic Health Record on Nursing Work and Caring Efficacy. Comput Informatics, Nurs. 2018;1–8.
9. Kalisch, B., Xie, B., & Ronis DL. Train-the-trainer intervention to increase nursing teamwork and decrease missed nursing care in acute care patient units. Nurs Res. 2013;62(6), 405–413.
10. Piscotty, R., & Kalisch B. Nurses' use of clinical decision support: A literature review. Comput Informatics, Nurs. 2014;562–8.
11. Piscotty, R., & Kalisch B. The relationship between electronic nursing care reminders and missed nursing care. Comput Informatics, Nurs. 2014;32(10):475–481.
12. Tubaishat A. Perceived usefulness and perceived ease of use of electronic health records among nurses: Application of Technology Acceptance Model. Informatics Heal Soc Care. 2017;1–11.
13. Staggers, N., Elias, L., Makar, E., & Alexander G. The Imperative of Solving Nurses_ Usability Problems With Health Information Technology. J Nurs Adm. 2018;191–6.
14. Gaoa, Y., Kong, D., Fu, X.-j., & Pi H–. Application and Effect Evaluation of Infusion Management System Based on Internet of Things Technology in Nursing Work. Nurs Informatics. 2018;111–4.
15. Lima, J. J., Viera, L., & Nunes M. Computerized nursing process: development of mobile technology for use with neonates. Heal Woman Child. 2017;1273–80.
16. Ikwueme S. Assessing Nurses' Safety Attitudes in Preventing CLABSI. Assess Nurses' Saf Attitudes Prev CLABSI [Internet]. 2018 Dec 31;1. Available from: http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=131796502&site=ehost-live