Nursing and Implementation of Modern Technology

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ABSTRACT

Introduction. Implementation of technology in health care has become a global trend. The society modernization has led to the increasing development of technology and information systems. Nurses in everyday work encounter with the application of communications and information technologies. The implementation of modern technology in nursing increases nurses efficiency, but it is also changing the way of care for patients. Implementation of modern technology in nursing is the result of interactions between technical skills, culture and social acceptance in the working environment.

Aim. The aim of this article was to investigate the application of modern technology in nursing and how it affects the nursing profession, what competencies are required for the introduction of technology and the role of nurses in the process.

Materials and methods. PubMed database, OJIN base (Online Journal of Issues in Nursing), HCA (Hospital Corporation of America) were searched with the aim of finding appropriate studies and articles. Keywords which were used: nursing, modern technology, nursing challenges, education.

Results. During a search of the databases, we found seven articles of which according to the inclusion criteria for this study we used three. Data from the literature that was used showed that the application of modern technology in nursing is still in the initial process of adaptation.

Conclusion. Modern technology in the nursing profession is in its infancy, a lot of factors are contributing to slower development such as high cost, a shortage of nurses and training of medical staff to work with the new technology.

Key words: nursing, modern technology, nursing challenges, education

INTRODUCTION

The application of modern technologies is an essential factor required for the advancement of nursing. Health care itself and continuous monitoring of patients requires using of Information-communication system. However, information -comunication sysytem is essential for efficient implementation of nursing documentation and effective providing of health care. Information technology in health care involves the processing and application of information and easier access to patient's history of care. Data entry, data conversion into useful information, and the application of data affecting the health care system are the factors included in this process. Nurses who provide direct health care are among other specialists, registered nurses with advanced practice, coordinators of care, visiting nurses, and health promoters and so on. In short, they are everywhere where nurses work. (1) In the past, prior to the development of medical technology, nurses relied on their own senses of sight, touch, smell and hearing to follow up on the status of the patient and detect specific changes. (2) Although the benefits of technology are likely increase health care quality, we need to consider the disadvantages that result in work errors arising from the use of different technologies and developments. Although promising, the benefits of technology cannot be realized due to four reasons: (2)

- bad technological design that do not observe human factors and ergonomic principles
- bad technological interface with the patient or the environment
- inadequate plan for implementing new technologies into practice
- inadequate maintenance plan.

Nurses have an excellent opportunity to contribute and innovations to creating better care for patients using information and communication technology (ICT).

Bosman et al revealed that the use of the Intensive Care Information System (ICIS) in patients after cardio – thoracic surgery affects nursing activity. Using ICIS reduce the time nurses spent on documentation up to 30 %. (3) In private life we have adapted to new technologies. When we accept new technology in healthcare, we can reduce physical exertion of nurses and increase the productivity. The new technology can improve communication between nurses and patients, other health professionals, and patients' families. Patient safety can also be improved if the entire medical history of patients was available to every department in the hospital. By identifying how technology can improve our work and service that we provide, we could achieve more time in direct contact

with the patient. (4) Nurses play an active role in the implementation of technology in nursing practice in order to maintain control of the complex system that is implemented in health care. Systems that are based on knowledge are set to become a major component in the skills of nurses.

Modern technology represents a new challenge for health care professionals, especially nurses in the care of the patients. Nurses must be familiar with the technology which requires additional training to provide quality health care. This paper will present information and communication technology in nursing and technology of the future.

MATERIAL AND METHODS

A literature search was conducted using the electronic databases of NCBI (National Center for Biotechnology Information; available at NCBI). We included studies and articles published in the last eight years. Criteria for inclusion was English written article. Key words used in the search were nursing, modern technology, nursing challenges, education. Literature was selected as described in table 1.

RESULTS

Results of our literature search are shown in figure 1. Our review included 7 articles from cross sectional studies. Nurses are faced to use machines and equipment in order to exchange knowledge, skill and education. The outcome of patient care is the primary focus of interest in nursing practice.(5) Nurses have an excellent opportunity to create better care for patients using ICT. There are many upcoming technologies that will change the practice of nurs-ing process in the next decade. Six will be discussed here: genetics and genomics, less invasive and more correct tools for diagnosis and treatment, 3D printing, robotics, biometrics, Hospital information system (Croatian BIS).

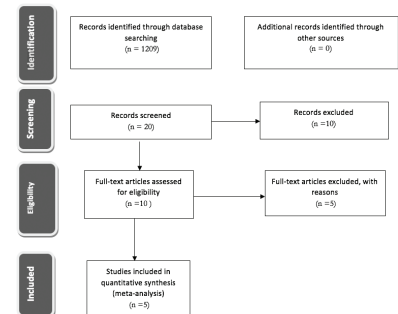Data of six new technologies (table 2) that will change nursing:

Figure 1.Prisma 2009 Flow Diagram.

Table 1. Inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Article category	Systematic review Review article Original research Report	Letters Editorials
Key words	nursing modern technology nursing challenges education	
Date of publishing	2008. – 2016. before 2008.	
Language	English All other	

Table 2. Six emerging technologies that will change the work in nursing.

Technology	Benefits	Challenges
Genetics and Genomics	Most of the risk for diseases, health conditions and therapies used to treat these conditions are genetic and genomic element caused by the environment, lifestyle, and other factors and therefore touch upon the entire nursing profession. (Calzone et al, 2010).	A large number of nurses currently in practice little is known about the genetics and genomics, and they have a lack of competencies required for an effective patient education.
Less invasive and more precise tools for diagnosis and treatment	Non-invasive and less invasive devices for the diagnosis and treatment are resulting lower risk for patients and lower costs in health care.	The rate at which introduces a non-invasive and minimally invasive tools makes permanent competence in terms of their use as a challenge for nurses.

3-D Printins	Bioprinters, using „Bio- ink " consists of a mixture of living cells that can build 3D cell structure, layer by layer, in the form of human tissue and eventually the replacement of human organs. (Thompson, 2012).	Health care is just beginning to explore the limits of this technology. There are limitations of materials that can be used for printing (Nusco, 2012).
Robotics	Robotics can provide enhanced diagnostic capabilities; less invasive and more comfortable experience for the patient; and the ability to make more precise intervention (Newell n.d). In addition, the robots can be used as an extra care providers for the physical and mental health care provision.	More research on the comparative effectiveness of robotic and human care providers. Many doctors have expressed concern about the lack of emotion in robots, suggesting that this is an element that will never replace human caregivers.
Biometrics	Biometrics enhances security of confidential health information and eliminates the cost of management.	Measurement of biometric markers may occur in less than ideal situations in health care, rapidly changing workforce and costs can become a problem.
Hospital information system (cro.BIS)	Health care providers have access to confidential information of patients from several areas, 24 hours a day, 7 days a week, which allows better coordinated care.	The costs of implementation, connection of computers remains a challenge.

Use of technology can reduce the risk of adverse events such as errors in dosage of drugs, delays in diagnosis and treatment of diseases, hospital infections, and so on. Devices that are currently related to adverse events, Sommor et al. claim those factors: Foley catheter (57 % adverse events involving this device), arterial catheter (17 % of), central venous catheters (17%), peripheral central catheter (7 % of cases). All mentioned devices has been used by nurses in direct care for patients. (4) Use of modern technology can help nurse in order to spot the failure of the catheter before it cause serious problems. Competent nursing staff can identify problems in the process of nursing care and make proper prevention activities. Control and early detection of adverse events are really important issue which well trained nurses can assure. They need to recognize the problem and conduct systematic collection of data and interpret where the error occurred. Nurse can manage all these with help of new technology. Filling the forms and nursing documentation represent significant period in the working hours. Literature review showed that every hour spent on health care, a nurse spends 30 minutes to an hour to paperwork. (6) According to other studies, documentation – testing drugs, the course of recovery plans for health care, vital signs, and discharge from hospital; require two to three hours per nurse per shift. Handwritten documents is time-consuming and often incomplete or illegible. (7) Searching the Website of Hospital Corporation of America (http://hcahealthcare.com/)

we found portable devices for nurses who would alert the worsening condition of the patient. Tablets, self-adhesive devices that measure heart rate at any time, wrist watches that connect nurses directly with doctors in case of rapid deterioration; all the technology that can be used to improve not only the hospital system work, but also our work with patients who suffer from chronic diseases at home. E-health services such as telephone, messaging, web support and remote monitoring of patients and patient vital signs make it easier for individuals, families and communities to improve and promote health through ICT. (8) Moreover, as the technology is implemented, organizational processes that will face the technology must be carefully tailored to minimize adverse effects of changes. (9) Progress in technology is essential when it comes to improving health care delivery and the only question is how and in what way technology can incorporate into nursing practice. Document Medical Institute (Institute of Medicine, 2003) indicates the five competencies required for nurses and other health professionals who practice "twenty-first century" health care. These competencies include: patient-centred care, the ability to work in a multidisciplinary team, a practice based on evidence, a strong focus on improving the quality and use of information technology. (10)

The technology has a direct correlation with historical, scientific, philosophical and social rules that are incorporated in our lives, culture, politics, business, profession, language, values, education, knowledge and skills. Nurses need to assume the roles and responsibilities associated with the application and interpretation of medical technology. (11)

In the USA (United States of America) 71 % of nurses use smart mobile devices at work, while 66% used by students of nursing. These data show how the technology is important in nursing profession, but with the managing of new technologies there are new skills and challenges that nurses have to adapt. The remote control system such as 3D cameras, laser imaging devices, and high-definition video, make nurses job easier than ever before. (12)

In table 3 there is presented all the skills needed for the nursing profession in order to implement the technology in our practice.

Table 3. Four leading challenges of integration of new technologies.

Balancing human element to technology
Balancing cost and benefits
Training provided technical workforce and ensuring competence
Ensuring that the use of technology in accordance with the code of ethics

These are the challenges for nurses in the integration of new technologies. The main questions are: Who will determine the ratio of costs and benefits that would jus-

tify the development and use of expensive technological innovation? Who will be responsible for overseeing the development of technology and working with new innovations? Who will provide training for medical staff to manage emerging technologies? Finally, what role will nurses have in helping to establish ethical parameters of technology in health care?

Nurses need to promote the use of technology and require a system that recognizes the needs of patients. (13) What expansion of this industry in health care mean for nurses? The most important thing is ensure that human element is not lost in the expanding the technology. The human approach represent the art of the care in which nurses are actively involved in determining how to use technology. One of the most important challenges nurses will face in the coming decade is to find a balance between achieving the benefits of using technology and not to depreciate human element.

DISCUSSION

There is reasonable expectation of increased use of technology in nursing practice. Additional competencies and education are required in order to achieve efficient implementation. Implementation of technology within the workplace is a result of the interactions between technical skills, workplace culture, and social acceptance. (14) Head nurses have to change way of thinking about new technology. Implementation of new technologies may change practice, and we have to create educational models and develope programs of leadership. It is necessary to ensure that nurses have competencies necessary to work with

these new technologies. Since the implementation of technology in care delivery, use of proven technological solutions have a huge impact on hospital system. (12) Patient health care has to be safe and quality international standards. The applications of new technologies in healthcare represent new chapter of modern medicine. The fact is, health needs of our populations have changed, nurses remain the foremost providers and, above it all, the coordinators of care. (15) Unlike other countries, Croatia lags behind in the process due to labor shortages, high costs that come with the use of advanced technologies in healthcare, with a large question mark who will be the deed training of medical staff to work with the new technology. This method of care and treatment, the introduction of cutting-edge technologies should be the primary sentence of each country to raise the scale of care for patients such as chronic patients and older population with this we could minimize days of treating in the health institutions. It is because of these factors that "hut" our health care system. We believe that with the investment in this branch we can achieve quality care and all invested cost and education would be worth for improvements to the functioning of all levels of healthcare. In the US, after the introduction and training of health personnel, improve the level of care and the only questionable element is humanity that can be lost between patients and nurses. But using technology medical staff is able to be in constant contact with the patient and their condition, nurses are the ones who should endeavor to be in spite of the implementation of the technology does not forget the importance of familiarity with the patient because we are still their representatives and we spend the most time with them.

CONCLUSION

One of the important segments in nursing is that nurses take care to be in the midst of all these new innovations do not lose vital human element, humanity. Communication and human connection is nursing skills and the role of nurses is to be actively involved in the process of introducing technology to the patient. This represents a significant challenge facing nursing in the coming decade which will be a key finding balance between technology and the human element. With the proper training of medical staff with the new coming technology and proper implementation, the work of nurses and technicians with patients would be much more efficient. Technology does not have to be a negative factor that keep us away from the patient, but on the contrary, technology can be used for a better relationship with them, especially in health care in the home and patronage, where with the help of the aforementioned technologies such as tablets can quickly make contact with the patient and find out necessary information first-hand. In the same way, and in a hospital environment, while the technology of the equipment collets data needed for the analysis, nurses and technicians had to devote more time to the patient and provide them with the necessary psychological preparation for their treatment, preoperative preparation, and postoperative recovery. Despite the expensive cost that would be required for such an improvement long term implementation of technology in nursing is a great cost-effective step toward improving our care where nurses and technicians will have the opportunity to further improve their profession.

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