Successful Emerging Technologies in Nursing Care

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Abstract – Now that technology is becoming available in nursing care, the quality of care can be improved. Our study will answer this question: What is the effect of electronic health record, infusion pump, and near-infrared vein finder on nursing practice and patient outcomes? The purpose of this article is to determine the pros and cons of electronic health records on work and patient's outcome, to evaluate the extent to which intravenous infusion pumps contribute to reducing medication errors and facilitating the nurse's work, and to assess Near- Infrared Vein Finder effectiveness. The research design is qualitative and quantitative. The study population is nursing staff in Saudi Arabia. A near-infrared vein finder device has been found to increase nurses' confidence, result in more successful IV cannulations, and reduce pain, tension, and physical disturbances in adults. Electronic health records improve the quality of health care and expedite task completion. As a result of the use of an infusion pump, patients' fears of medication have been reduced. Patients' confidence in nursing care has increased.

Keywords – technology, nursing, care, practice, patient, electronic health records, infusion pump, near-infrared vein finder.

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1. Introduction

Information Technologies in nursing practice has become a worldwide trend. Saudi Arabia has seen the emergence of numerous successful new technologies in nursing, but their effectiveness and positive impact on nursing practice have not been examined. The modernization of society has resulted in the increasing development of information technology and systems. Information technology in nursing is viewed as improving patient safety and quality of care to continually improve the safety and quality of health care. The development of computing technology in clinical practice has been described as providing the opportunity to make nursing work easier and more effective, increasing the time available for direct patient care. In 2020, innovative, smart, immersive, and connected technology advances have made their way into nursing delivery environments around the world. Striking illustrations of nurses developing, advocating, embracing, and applying emerging technologies make better decisions in care and support operations is now a successful reality [1]. These technologies, which are already being implemented quickly, will continue to lead to better global health outcomes. In order to meet this need, nurses are enhancing safe, high-quality treatment by utilizing recent, effective technological breakthroughs [2]. Many modern technologies have appeared in the field of nursing and have changed the practice of nursing. The most important of these technologies is infusion pumps, electronic records, and Near-Infrared Vein Finder, each of which will influence and serve the nursing practice in several ways. An infusion pump is a medical device that delivers fluids, such as nutrients and medications, into a patient's body in controlled amounts. Infusion pumps are in widespread use in clinical settings such as hospitals, nursing homes, and in the home [3]. Electronic Health Records (EHRs) provide access to patient-centered information in real-time and securely to authorized users [4].
Near-infrared (NIR) technology was used to develop a low-cost NIR-guided cannulation device. Students and medical practitioners can use this portable device for developing their skills in cannulation [5].

The aim of this study to determine the pros and cons of electronic health records on work and patients' outcome, to evaluate the extent to which intravenous infusion pumps contribute to reducing medication errors and facilitating the nurse's work, and to assess Near-Infrared Vein Finder effectiveness.

Research question: What is the effect of electronic health record, infusion pump, and near-infrared vein finder on nursing practice and patient outcomes?

2. Literature review

There has been a previous study conducted by Saju et al. (2019) to evaluate the use of a venous viewing device to assist with venous cannulation and its effect on cannulation-related pain, anxiety, and behavioral disturbances in pediatric patients. It was found that the number of cannulation attempts was significantly reduced when a vein viewing device was used to assist cannulation. [6].

Community hospital nurses in a previous study perceived that using EHRs had an impact on their work and patient outcomes. Nurses felt that the use of EHRs was broad and time-consuming. It both assists and hampers nurses’ work, which has positive and negative effects on patient outcomes, and is preferred to paper records but should provide better support nursing work [7].

The previous study noted that EHRs were more structured than paper documents. The quality of the structure depends on the clarity of the documents, the ease of use and the use of abbreviations. The use of handwriting, or the use of paper-based documentation, may result in a number of pitfalls, including inconsistent terminologies, incomplete records, and the use of inappropriate abbreviations, unclear writing, and illegal alteration of records. The study demonstrated that EHRs improved quality of health care, patients' outcomes and reduced the workload on nursing practice [8].

An intravenous drug distribution system based on a modular technology device that enables the distribution of intravenous drugs by providing drug libraries, volume calculations, dose limits, soft and hard alerts, continuous quality improvement reports, clinical advisories, and bolus dose limits through wireless connectivity.

It was estimated that the pump increased the safe administration of medication and reduced anxiety without removing control or independence. Several nurses seemed uncertain about the effects of the pump.

However, there was a connection between their perceptions of lifestyle changes and job satisfaction, and their evaluations of nurses and management. It also demonstrates the importance of management teams and the quality of nursing care delivered in implementing new technologies. Moving forward, we may need to examine the extent to which technology affects the patient acuity, and overall nurse satisfaction [9].

A systematic review and meta-analysis conducted by Rho et al. (2019) found that the use of infusion pumps significantly reduced medication errors in hospital settings. The study included 21 randomized controlled trials and found that the risk of medication errors was reduced by 59% when infusion pumps were used. The use of infusion pumps, particularly those with safety features such as smart pumps and drug libraries, can significantly reduce medication errors and improve patient safety. Education and training on the safe use of infusion pumps can also be effective in reducing errors [10].

3. Methodology

The research design is mixed methods (qualitative and quantitative). The study population is a nationally representative snowball sample of nursing staff in Saudi Arabia. The primary data has been collected via online survey, and secondary data was carried out using electronic databases from Google scholar and science direct. We have included studies and articles that have been published for the past 14 years. Data collection via an online survey in Google form consists of 4 sections with 33 structured and unstructured questions in Arabic because the target population is from Saudi Arabia, the results will be translated in the results section. Some questions are inspired by [11]. Data will be analyzed via content analysis.

4. Results

The sample consisted of staff nurses in Jeddah hospital. (95.7% , n=22) their age average from 22-30, and (4.3% , n=1) age average from 40-48. Years of work (43.5% , n=10) one year , (17.4% , n=4) two years , and the rest as in Figure 1. Most frequently mentioned (82.6%) having electronic health records in their hospital, shown in Figure 2. The other technology is near-infrared vein finder (56.5%) they have it in their hospital and (60.9%) use it as in Figure 3 and Figure 4. The last is infusion pump (87%) that they have it in their hospital, which is shown in Figure 5.
5. Discussion

Approximately (95.7%) of the participants were in the age groups of 22-30 years, indicating a significant association between younger age groups of participants and their use of smart devices in their careers. This could be explained by that younger nurses are more familiar with technology.

The previous study in literature review demonstrated that near infrared-vein finder significantly reduced pain and anxiety in pediatric patients, and it was found that the number of cannulation attempts was significantly reduced when a vein viewing device was used to assist cannulation. This finding goes in agreement with our study, and we have found more advantage of this device such as increases nurses’ confidence level that resulted in more successful IV cannulation, reducing pain, tension and physical disturbance in adults. In the questionnaire, we asked the participants about the benefits of the device, and we have found an answer such as "veins detection speed, time reduced, attempts reduced, vein location detected easily, some patients feel more comfortable". And we asked them about its disadvantages, in which they replied that "sometimes patients get nervous because it is a new device, the difficulty of using it with an uncooperative patient, the device's accuracy sometimes, some get nervous when they see the device". Additionally, we asked if they preferred to use the device or not (85% preferred it).

As a result of the use of an infusion pump, 87% of drugs are administered safely, patients' fears of medication have been reduced (68.2% agree, 27.3% neither agree nor disagree), patients' or families' confidence in nursing care has increased (77.3% agree, 18.3% neither agree nor disagree), assuring high quality nursing care is achieved (81.8% agree, 13.6% disagree), increasing self-confidence (63.6% agree, 9.1% disagree, 27.3% neither agree nor disagree), reducing worries about medication mistakes (76.2% agree, 19% neither agree nor disagree) and reducing work pressure (72.7% agree, 27.3% neither agree nor disagree). Literature review findings match some of those in our study.
Our study found that 95.7% of respondents believed that electronic health records improved the quality of health care and expedited task completion, while 78.3% agreed that EHRs reduced workload, which is consistent with previous research in the literature review. According to the current study, electronic medical records are easier to use than paper medical records. The participants were asked about the advantages of EHRs in the questionnaire, and they responded as follows: "Simplifying work, creating clarity in writing, easily accessing patient information and saving time". And we asked about its disadvantages, which they replied that "It takes time to get accustomed to the system, the lack of devices, and not enough time to capture the data".

6. Conclusion

Using an electronic health record, an infusion pump, and a near-infrared vein finder, this study answered the question of what effect these technologies have on nursing practice and patient outcomes. The majority of nurses have proven that the technology we illustrated in our research is very beneficial and important to health care providers, especially nurses.

Numerous technologies have been introduced into the field of health care. As with electronic health records, it facilitates work, saves time when entering patient information, and eases the workload. The infusion pump has shown to have a significant impact on reducing patient anxiety and increasing nurses' confidence in administering medications safely, a near-infrared vein finder device has been found to decrease pain, tension, physical disturbances in adults, which results in more successful IV cannulation.

Technology is a very significant part of the healthcare field and plays a major role in improving patient outcomes, as well as improving and facilitating nursing practice.

However, there are still some challenges associated with the use of technology in nursing care, such as the need for training and the time required to get accustomed to new systems. Overall, the benefits of technology in nursing care outweigh the challenges, and continued research and implementation of technology in healthcare is essential for improving patients' outcomes and enhancing the nursing profession. We strongly recommend that more research is to be conducted to evaluate the effectiveness of advanced technologies used in nursing and their effect on patient-centered care and nurses' functional satisfaction. New technologies are constantly evolving in the field of nursing, and we recommend that more research be conducted.

To obtain accurate and comprehensive results, future studies should involve more participants in order to address the limitations of this study.

References: