

RESEARCH ARTICLE

HEALTH CARE TECHNOLOGIES AND NURSING CARE

Gülcan ÇİFTÇİOĞLU

Artuklu University, Faculty of Health Sciences, Department of Nursing, Mardin, Turkey

Email: gulcanciftcioglu@gmail.com

ABSTRACT

Background: The Evaluation of Health Technologies is a multidisciplinary activity that systematically, transparent, impartial, effectively summarizing the safety, clinical efficacy and effectiveness, cost, cost-effectiveness, organizational implications, social consequences, legal, ethical and organizational considerations of the application of a health technology. The Evaluation of Health Technologies has significantly improved the decision-making process. To evaluate the reliability of technological measuring devices used in patient care.

Methods: This study is a descriptive and observational study. The research was conducted between December 2019-April 2020 in Mardin Province hospitals. The population of the study consisted of 245 patients who were hospitalized in the clinics of these hospitals, over the age of 18 and 65 years agreed to participate in the study. The data were collected through a questionnaire. Descriptive statistics (number, percentage and average) were used to evaluate the data. In order to conduct the study, written permission was obtained from the relevant institutions, ethics committee permission from the university and written consent from the individuals participating in the study.

Results: The average age of the patients participating in the study was 42 years, and 35.1% were male, 64.9% were female, 82.0% were married and 69.4% were literate or primary school graduates. It was determined that 45% of the patients had at least one chronic disease and 38% of them used medication continuously. While the mean hunger blood glucose levels of the patients participating in the study were 128 mg / dl in measurements with the glucometer device, blood glucose laboratory levels obtained from the vein were found to be 122 mg / dl. Pulses of the patients were found to be 85 / min on average with a pulse oximeter device, and 87 / min on average in measurement by palpation from the artery method. While the temperature measurement average values of the patients were found to be 36.6 ° C with the forehead non-contact measurement device, the average temperature was found to be 35.7 ° C with the armpit digital measurement device.

Conclusion: The use of technology in nursing care applications is an indispensable element. However, for the safe use of technological devices in nursing care, it is extremely important to measure the measurement devices used correctly. Significant differences were detected in the blood glucose levels measured with the glucometer device. We can say that there is a difference in thermometers, but pulse oximetry devices measure safely. More comprehensive research is recommended on this subject.

KEYWORDS: Reverse Technology, Nurse, Care, Hospital.

BACKGROUND

Technology is a word coming from Greek origin ("craft science", Greek: techno, "craft, skill, handicraft") meaning "skills, methods, processes, a compilation of techniques, or scientific studies used in the production of goods or services, or in the realization of targets regarding such a purpose" [1,2]. Briefly, technology is the knowledge and skills that are needed to manufacture or construct tools and equipment to meet people's needs [3]. Health technology

was defined by the World Health Organization as "the devices, drugs, vaccines, procedures, and systems that are developed to solve a health problem and improve quality of life" [4]. The Evaluation of Health Technologies (EHT) provides scientific support in making policy decisions for the implementation of evidence-based health policies [5]. In addition, it is stated that the evaluation of health technologies has been proven by many researchers to be an important priority setting tool that supports an effective, efficient and sustainable health system with scientific

evidence. The European Network for the Assessment of Health Technologies (EUnetHTA) defines EHT as “in the use of a health technology; It is a multidisciplinary process that systematically, transparently, impartially and effectively summarizes information about the health problem and the current use of technology, the definition and technical characteristics of technology, clinical effectiveness, safety, social, economic, legal and ethical aspects [6,7].

The main purpose of health systems is to increase the quality of life and health standards of people. Health technologies have vital importance in terms of preventing, diagnosis, treatment and rehabilitation of diseases, as well as increasing life expectancy and quality [8]. Technology, which affects, intervenes, and regulates the course of health and disease, has become a vital part of “Healthcare Services”. Nurses have been using technology to support holistic nursing care for many years. Before the widespread use of technology, nurses used their senses of sight, touch, smell, and hearing to monitor the condition of their patients and detect changes. Over time, the senses of nurses were replaced by technology designed to detect the changes in patients. Advances in healthcare technology have led to changes in nursing care. The success of nurses is directly related not only to the implementation of nursing care, but also to the ability to apply technology supporting the further development of the nursing profession with continuous learning and improvement [9].

METHODS

Design

This descriptive and observational study was conducted in the province of in Mardin City hospitals between December 2019 and April 2020.

Background information about the study area

Mardin is a metropolitan city located in Southeastern Turkey. Mardin is a city that has received a lot of immigration in recent years. It has nine public hospitals and three private hospitals. On average, 1400 patients are served daily. Raising the health status of the society is the primary goal of the health system. In order to realize this aim, it is necessary to ensure equity, increase efficiency and ensure sustainability in health services. The purpose of the present study was to provide information to healthcare personnel about the problems experienced in terms of both the follow-up and use of technological developments in care and innovative approaches in evidence-based care to increase the quality of patient care by considering the transformative effect of healthcare technologies in nursing care.

Study Questions

In this age, the nursing profession and nursing care are under the influence of technology in healthcare services applied in a considerably increased information and technology process [10]. In 2015, the National Nurses Association (NNA) stated that it is necessary to add courses that will improve nursing students’ technology skills to the nursing curriculum in terms of developing their technical skills and providing qualified care [11].

Nurses are at the forefront in integrating technology into healthcare services without losing the human factor [12]. For this reason, it is extremely important to develop their training in the face of developing technologies for quality and safe care. In a study that was conducted previously, it was emphasized that technology and informatics should be at the forefront of the subjects that should be given priority to research in nursing in the top ten priority list [10]. For this reason, the quality of care in healthcare services is especially related to the relations between nursing and technology. The basis of care is a healthy and sick person, namely, “human”. In the literature research, almost no studies were detected on the safe measurement of the measuring technological devices of healthcare professionals in our country. Briefly, since the connection between nursing and technology involves the effectiveness of the nurse, the quality of care, the safety of the patient, and the satisfaction of the nurse, this study has posed a critical issue to evaluate the reliability of technological measurement devices used in patient care.

- Do the devices used to measure body temperature measure safely?
- Do pulse oximeter devices measure safely?
- Do glucometer devices that are used in blood glucose measurements perform safe measurements?

The study population and sampling

The research population consists of adult individuals. The population of the study consisted of 245 patients, who aged between 18 and 65 years, who were hospitalized in the clinics of these hospitals, and who agreed to participate in the study.

The inclusion criteria for the study were as follows: being aged between 18 and 65, being literate in Turkish, volunteering to participate in the study, being hospitalized and having communicative skills.

Data Collection Tools

Data was collected using a “Personal Information Form”, and “measurement registration form”.

Personal information form

This form was created by the researchers and included questions related to demographic information such as age

(18–29, 30–39, 40–49, 50–65), gender (female, male), occupation (housewife, laborer, retired, student, civil servant, tradesman), marital status (married, single), family type (nuclear, extended), educational status (primary school, high school, university or higher), socioeconomic status (fairly high, high, moderate, poor), information regarding any diseases requiring regular medication (yes, no).

Measurement registration form

This form was created by the researchers and records the measurements related to the subject. With this form, both the results obtained with the technological tools and the manually measured measurements were recorded.

Implementation

After the study was planned, the permission of the institution and the ethics committee approval of the university were obtained from the relevant institution before the study. Written informed consent to participate in the study was obtained from the patients. Then, the data forms were filled with the patients by using the face-to-face interview method. The data that were collected by using digital records in patient files were obtained from 245 patients with the observation method. The data that were measured manually by the researcher were recorded after being collected by the clinical nurse while the patient was in the clinic. When the nurse was evaluating the patient, the researcher collected the data by observing 245 nurses, and in this way, 245 patients through observation. Each nurse was observed while evaluating patients. The patients were selected from non-emergency patients over

the age of 18 hospitalized in internal medicine and surgery clinics.

Analysis of the Data

The data obtained in the study were analyzed in the Statistical Package for Social Science for Windows (SPSS) for the Windows 16.0 program. The data were then saved in the database that was created in this program. The data analysis was performed in the same program. Descriptive statistics were presented as numbers, percentages, and means.

Ethical approval

Before the study was started, the necessary permission was obtained from the relevant institutions to conduct the study, with the decision dated 08.11.2019 and number 2019/01-4 from Mardin Artuklu University Non-Interventional Research Ethics Committee. Participation in the study was voluntary, and written consent was obtained from the participants with the face-to-face interview method.

Results

When the demographic characteristics of the patients who participated in the study were examined, the average age was found to be 42, and it was found that 35% were male, 64.9% were female, 82% were married, and 69.4% were literate or primary school graduates. It was also found that 45% of them had at least one chronic disease and 38% were using drugs continuously (Table 1).

TABLE 1- Distribution of Participants according to Demographic Characteristics (n=245)

Demographic Characteristics	Groups	n	%
Gender	Female	159	64.9
	Male	86	35.1
Mean age	Female	159	42
	Male	86	
Marital status	Married	201	82.0
	Single	44	18.0
Educational Status	Literate or primary school	117	69.4
	Secondary school graduate,	111	20.0
	Undergraduate	26	10.6

Presence of Chronic Disease?	Yes	110	44.9
	No	135	55.1
Using any Medications?	Yes	94	38.4
	No	151	61.6
Total		245	100

The mean pulse value of the patients who participated in the study was found to be 85/min on average with a pulse oximeter device at an average of 87/min with the arterial palpation method. The mean body temperature measurement value of the patients was found to be 36.6°C

with the non-contact measuring device on the forehead, and with the underarm digital measuring device, it was found to be 35.7°C. The mean fasting blood glucose level of the patients was 128 mg/dl in the measurements with the glucometer device, and the mean blood glucose laboratory level taken from the vein was 122 mg/dl (Table 2).

TABLE 2- Distribution of Measured Values according to Characteristics (n=245)

Measurement	Measurement Style	Mean	Standard Deviation
Pulse	Measurement with Pulse Oximeter	85.78	14.769
	Measurement with palpation in the artery	87.35	13.477
Body Temperature	Measurement with non-contact device on the forehead	36.6	.3784
	Measurement with contact device from arm pit	35.686	.8281
Fasting Blood Sugar	Measurement with <i>glucometer device</i>	127.51	54.315
	Measurement in the blood taken from the vein in the laboratory	122.42	61.281

DISCUSSION

The rapidly developing healthcare technologies in our age provide important contributions to the healthcare sector. In the future, healthcare technologies will continue to affect healthcare, individuals, society, and the nursing profession [13]. It is already known that the participatory and supportive roles of nurses include leading technologies and are important in terms of contributing to the use in all settings including nursing education, clinics, and virtual environments. It is necessary to improve healthcare outcomes and develop strategies for better use of technology to provide more effective and quality care. Also, value-based care practices need to be prepared for

new expansions and definitions in their profession [14-16]. For this reason, the study discussed whether the technological measuring devices used in healthcare practices perform a safe measurement. Since there are not many studies published on the reliability of technological devices used for body temperature measurement, heart rate, and blood glucose measurement, the data were compared with the conclusions of the researchers and studies conducted abroad and in our country.

The nursing profession is inevitably affected by technological developments in fields such as education, maintenance, research, and management [17]. For this

reason, it becomes inevitable to plan all the practice areas of nursing by thinking these again and examining previous studies to determine the effects of technology on patients and nursing practice [18].

In our daily life, the use of technical and technological developments is often seen in adapted forms with tools and machines. However, for the production of the service, not only the objects named as “devices, tools, materials, etc.” are used, but also other kinds of techniques are used. Although there are patient potential and healthcare technology products, these materials must be used effectively and accurately. Also, the presence of trained manpower in the use/practice and technical maintenance/repair of materials becomes mandatory [19]. In the present study, the purpose was to evaluate the reliability of technological measurement devices used in patient care of nurses who work in hospitals in a city.

In the present study, the mean body temperature measurement values of the patients were found to be 36.6°C on the forehead with the non-contact measuring device, and it was 35.7°C with the underarm digital measuring device. Although body temperature is an important follow-up parameter for clinicians, there is still no consensus on how and where it should be measured. In parallel with the developments in technology, there are different methods for body temperature measurement. The non-contact infrared thermometer was developed as a promising alternative method. With this method, measurements can be made from the forehead and temporal artery. It is already known that it is also preferred by parents because it is a non-invasive method producing fast results, is portable, and is easy to use. The fact that the device does not have disposable attachments, does not need sterilization before use in different individuals, or non-contact infrared thermometers suggest that it may be suitable for use in hospitals [20-22]. In a previous study, measurements were made to 276 patients simultaneously, and the infrared measurement from the ear was found to produce significantly higher results ($p < 0.001$) than the non-contact measurement from the axillary (armpit) and temporal paths. Infrared temperature measurement from the ear produced higher results when compared to an axillary digital thermometer and non-contact measurement from the forehead [23]. The results of this study are similar to the results of the present study. In another study, although it was found appropriate to use thermometers measuring with the non-contact infrared method for screening purposes, it is necessary to conduct more comprehensive studies involving more children with fever, preferably using mercury thermometers as a reference, to decide on their use in the follow-up of ill children in hospitals [24]. One of the limitations of our study was that the interventional body temperature measurement method cannot be performed.

A pulse oximeter is a tool used constantly in surgical procedures, operating rooms, and intensive care units to measure oxygen saturation in arterial blood. It is also used to determine heart rate [25]. If the nurse measuring SpO₂ with a pulse oximeter device knows what factors prevent the reliability of the measurement, she will reach the right measurement results by taking the right steps. In this way, effective follow-up of the patient will be ensured, increasing the quality of care, the time allocated for the patient, and the efficiency [26]. In the present study, no statistically significant differences were detected between the measurements made with the pulse oximeter and the arterial palpation method. In line with these results, we can say that the measurements of pulse oximeter devices used in healthcare are within safe ranges.

Glucometer devices are used widely outside the hospital and in hospital wards due to rapid results. However, the reliability and accuracy of glucose measurement of glucometers are very important [5]. Clinical nurses need to measure blood glucose at the right time and safely for the treatment and management of diabetic patients. Bedside fingertip blood glucose measurement is the most widely used method especially in critical decisions that require emergency care because it is advantageous in terms of less sampling and time [27]. According to the American Diabetes Association (ADA) criteria, precision results with CV < 5% are considered appropriate [28]. In the study, the venous blood value was 122±61.281mg/dL, and the blood value taken from the capillaries with the glucometer device was found to be 128±54.315. In a previous study, the comparison of the fasting venous blood and capillary blood vessel measurement results of the patients was examined, and statistically significant differences were detected between the blood values of the venous, right, and left hands [27]. The results of the study were similar to our study.

CONCLUSION

It is extremely important in terms of developing health, education standards, and workforce designs for the future of nursing that healthcare technologies and nurses cooperate, develop, design, implement, and evaluate medical devices and materials. It can be suggested that the nursing sector must change the way of thinking about healthcare technologies and new care models must be supported. Increasing studies in the field of nursing and technology, focusing future studies on nursing care management and technological systems, and evaluating safe results will fill an important gap in the field of nursing. Also, conducting studies by using different technologies in parallel with technological developments will make a significant contribution to the development of this field.

Limitations of the Study: The present study was conducted to determine the practices for accurately measuring some

findings of patients who are hospitalized in an institution. Conducting comparative studies in patients hospitalized in different institutions, in different clinics, especially with patients hospitalized in intensive care units and larger groups may increase the effectiveness of the results.

Abbreviations

EHT: The Evaluation of Health Technologies

NNA: National Nurses Association

SPSS: Statistical

ADA: According to the American Diabetes Association

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Authors' contributions

GÇ: Conceived and designed the study. GÇ: reated the first draft of the manuscript. MÖ, NA and RA: Assisted with data collection. GÇ: edited the manuscript. GÇ: Performed data analysis and edited the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Declarations

Ethics approval and consent to participate

This study was prepared in accordance with the guidelines of the Helsinki Declaration. The study was approved by Non-Interventional Ethics Committee (08.11.2019, 2019 / 01-4) of Mardin Artuklu University. Necessary legal permissions were obtained from the relevant institution. Informed consent was obtained from all participants who volunteered to participate in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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