

Knowledge and Practice of Nurses Regarding Safety of Patients with Temporary Cardiac Pacemakers in the Critical Care Units

Ahmed Mohammed Elshal¹, Mahasen Ibrahim Abd Elsatar², Shima Nabil Abd Elsalam³,

¹B.Sc. Nursing, ²Assistant Professor of Medical Surgical Nursing, Faculty of Nursing-Ain Shams University

³Assistant Professor of Medical Surgical Nursing, Faculty of Nursing-Ain Shams University

Corresponding author: Ahmed Mohammed Elshal

Mobile: 01061789719 **Email:** ahmedelshalym@gmail.com

Abstract

Background: Temporary cardiac pacing provides electrical stimulation to a heart compromised by disturbances in the conduction system causing hemodynamic instability. The use of a temporary pacemaker to treat a brady dysrhythmia or in some cases, a tachydysrhythmia, is undertaken when the condition is temporary and a permanent pacemaker is not necessary or available in a timely fashion. Temporary cardiac pacing is utilized in acute situations and for critically ill patient populations requiring immediate therapy. **Aim:** The present study was conducted to assess nurses' knowledge and practice regarding safety of patients with temporary cardiac pacemakers in the critical care units. **Research design:** A descriptive exploratory design. **Setting:** This study was conducted at intensive and coronary care units at National Heart Institute affiliated to Ministry of Health. **Methods:** A purposive sample of 50 nurses working in the coronary care units at National Heart Institute, 50 nurses from both genders, with different ages, educational levels and years of experience was selected for this study. Data were obtained through two main tools; self administered questionnaire tool and observational checklist. **Result:** Nearly three quarters of the study nurses had unsatisfactory level of knowledge and incompetent levels of practice regarding care of patients with temporary cardiac pacemaker in the critical care units. There was a statistical significant relationship between demographic characteristics (age of the studied subjects, education, years of experience and training courses) regarding to total knowledge and practice of the studied subjects. While there was a statistical significant relationship between total practice levels of the studied subjects regarding to total knowledge of the studied subjects. **Conclusion:** The study concluded that, there are several factors affecting the knowledge and practice of the studied nurses including demographic factors (e.g. age, years of experience, level of education and attendance of training courses), in addition to the organizational factors (e.g. availability of resources, hospital policy and setting) as well as personal factors (e.g. presence of well trained and highly educated team leader and presence of competent team member). Also it was found that the knowledge level of the studied nurses was affecting their practice. **Recommendations:** Further study to evaluate the reflection of educational program regarding nurses' performance & consequently on the patient outcome. The study should be replicated on large sample & in different hospitals setting in order to generalize the results.

Keywords: Nurses' Knowledge, Nurses' Practice, Temporary cardiac pacemaker, Patient safety, Critical care units

Introduction

Cardiac pacing by an artificial pacemaker provides an electrical stimulation of the heart when its own natural pacemaker fails to provide synchronized atrial and ventricular contractions at rates and intervals sufficient for a patient's health.

Such antibradycardial pacing provides relief from symptoms and even life support for hundreds of thousands of patients. Cardiac pacing may also provide electrical overdrive stimulation to suppress or convert tachyarrhythmias, again supplying relief from symptoms and preventing or terminating

arrhythmias that could lead to sudden cardiac death (*El Nasasra et al, 2018*).

Temporary cardiac pacing is indicated in any situation in which bradycardia results in symptoms of decreased cerebral perfusion or hemodynamic compromise and doesn't respond to drug therapy. Signs and symptoms of hemodynamic instability are hypotension, change in mental status, angina or pulmonary edema. Temporary pacing is also used to terminate some rapid tachycardia's by briefly pacing the heart at a faster rate than the existing rate. When pacing is stopped, the sinus node may resume control of the rhythm if the tachycardia has been terminated. This type of pacing is termed overdrive pacing to distinguish it from pacing for bradycardic conditions (*Hollinger and Mebazaa, 2019*).

Trans-venous temporary cardiac pacemaker (TVTP) implantation is a life-saving procedure in patients with severely symptomatic bradycardia and can be used as a bridge to permanent pacemaker implantation or resolution of a transient or reversible cause for the bradycardia. Nevertheless, TVTP implantation can be associated with potentially fatal complications such as cardiac perforation and tamponade, puncture site bleeding, pneumothorax, as well as lead malfunction and a need for repositioning. Fluoroscopic guidance which is very commonly used to guide TVTP implantation may improve procedural safety and reduce complication rate; yet, the delay in activation of the fluoroscopy room team and the need for in-hospital transfer may expose an already unstable patient to unnecessary life-threatening risks (*El Nasasra et al, 2018*).

The rapid rise in technology has provided lifesaving advances in patients' care. On the other hand, it introduced a new complexities and increased risk of Patients' safety. Patients' safety was defined according to WHO (World Health Organization) as the prevention of errors and adverse effects to patients associated with health care, while health care has become more effective. It has also become more complex, with greater use

of new technologies, medicines and treatments (*Runciman et al., 2017*).

There has been increasing attention to patient safety and human errors issues in health care, specifically in the critical care context. Adverse events have often been used as quality and safety indicators in the delivery of health service. This has resulted in necessitating the continuous monitoring of patient safety and searching for new strategies (*Shojania and Dixon-Woods, 2017*).

According to the World Health Organization statistic one in every ten patients are harmed whilst receiving health care. Approximately 43 million patient safety incidences occur every year. Medication errors cost an estimated 42 billion USD annually. Clear policies, organizational leadership capacity, data to drive safety improvements, skilled health care professionals and effective involvement of patients in their care, are all needed to ensure sustainable and significant improvements in the safety of health care (*Mohiuddin, 2019*).

According to the World Health Organization statistic, one in every ten patients admitted to a health care centers suffers damage, including a wide range of errors or adverse events. In intensive care units, due to the sensitive and complex situations, such as conditions of critically ill patients, numerous incidents threaten patient safety (*Farzi et al, 2017, Slawomirski et al., 2017*).

The first critical step in improving quality of care is ensuring patients' safety. This involves the establishment of operational systems and processes that minimize the like hood of adverse events. patients, clinical condition has been shown to be a risk factor for adverse events among critically ill patients who have actual or potential life threatening conditions, as consequence, they require intensive monitoring. Adverse events from advance medical modalities and interventions have become one of the unintended consequences of the increasingly complex health care system (*Bogner, 2018, Taylor et al., 2016*).

The safety of critically ill patients admitted to critical care units (CCU) may be threatened by the high number of attached supporting and monitoring devices and machines. Serious illness reduces both the patients' natural resilience and the ability to rebound from the consequences of adverse events. The complexity of the CCU and the patient condition result in a number of communication barriers hindering patients' ability to communicate their complaints and warning symptoms, increasing their liability to adverse events and their negative consequences (*Bogner, 2018, Taylor et al., 2016*).

The critical care setting is a highly complex environment. Critically ill patients are at a greater risk for poor prognosis and clinical outcomes when compared to other patients in the general ward context. Critical patients may be at risk for procedural injury or error due to their complex physiological problems, cognitive deficits, and complicated therapeutic regimens (*Adam et al., 2017, Castellán et al., 2016*).

Also, critically ill patients are more prone to adverse events than other hospitalized patients, whereas they had life threatening health problems with associated comorbidities which initiate the patient's stress response and interfere with the normal recovery process against the consequences of human errors. Thus, it is a challenge to maintain critically ill patients' safety while receiving high quality care in the intensive care unit (ICU) environment (*Nates et al., 2016*).

Critically ill patients constitute a small group of patients in need of the most advanced available health care. It is highly probable that in these patients, even small changes in, e.g., oxygenation or hemodynamics might induce a vicious cycle, deteriorating the patient's condition. Therefore, critical care presents significant patient safety challenges. Modern intensive care of severely critically ill patients is a fast paced, complex, and high risk environment. Many factors could potentially result in an increased rate of errors and adverse events that in the critically ill, may lead to fatal consequences (*Engström, 2016, Gillon et al., 2016*).

Significance of the study:

Pacemaker implantation rates increased from (329) implants per million populations in 1990 to (612) per million populations in 2002. In 2011, (400,000) cardiac devices were implanted and over 3million people in the United States had implantable cardiac rhythm management devices.

In 2016 in Egypt (180) patient admitted to National Heart Institute and had temporary pacing wire (*The statistical records of National Heart institute in Egypt*).

So the cardiac unit nurses play a vital role in the prevention of errors and adverse effects to patients associated with temporary cardiac pacemaker. Because they spent most of the time caring for patients with temporary cardiac pacemaker, nurses should have proper knowledge and practice to provide proper care to patients, prevent complications and improving patient condition.

Aim of the work

The present study was conducted to assess to assess nurses' knowledge and practice regarding safety of patients with temporary cardiac pacemakers in the critical care units and this was achieved through the following:

1.Assessment of nurses' knowledge regarding safety of patients with temporary cardiac pacemakers in the critical care units.

2.Assessment of nurses' practice regarding safety of patients with temporary cardiac pacemakers in the critical care units.

Research questions:

This study was conducted to answer the following research question:

1.What are the nurses' levels of knowledge related to the safety of patients with

temporary cardiac pacemakers in the critical care units?

2. What are the nurses' levels of practices related to the safety of patients with temporary cardiac pacemakers in the critical care units?

Patients And Methods

Research questions:

This study was conducted to answer the following research questions:

1- What are the nurses' levels of knowledge related to the safety of patients with temporary cardiac pacemakers in the critical care units?

2- What are the nurses' levels of practices related to the safety of patients with temporary cardiac pacemakers in the critical care units?

Operational definition:

Patient safety means prevention of errors and adverse effects to patients associated with health care, while health care has become more effective.

The subjects and methods for this study were portrayed under four main designs as follow:

I- Technical design:

The technical design includes research design, setting, subjects and tools for data collection.

Research design:

A descriptive exploratory research design was used to achieve the aim of this study.

Research setting:

This study was conducted at intensive care unit of cardiac unit at National Heart Institute.).

Subjects:

A purposive sample of 50 nurses working in the cardiac intensive care unit at National Heart Institute. They were recruited to assess the nurses' performance regarding care of patient with temporary cardiac pacemaker.

Inclusion criteria:

- Nurses already dealing with patients with temporary cardiac pacemakers.
- Nurses have at least one-year experience in the cardiac intensive care unit.
- Nurses who are willing to participate in the study.

Tools for data collection:

Two tools were developed by the researcher to collect data pertinent to this study, these tools are:

1-Nurses' self-administrated questionnaire:

The self-administered questionnaire was used to assess nurses' level of knowledge regarding care of patients with temporary cardiac pacemakers. It was developed by the researcher in simple Arabic language after reviewing the relevant and recent literatures (*Adam, Osborne & Welch, 2017 and El Nasasra et al., 2018*).

The questionnaire consisted of 50 questions in the form of multiple choices questions (MCQ), true/false questions.

It included two parts as follows:

The questionnaire included two parts as follow:

Part 1: this part was concerned with demographic characteristics of the nurses under study as age, gender, marital status, educational level, years of experience, attendance of training courses regarding temporary cardiac pacemaker.

Part 2: this part was used to assess nurses' level of knowledge regarding temporary cardiac pacemaker (*Adam, Osborne & Welch, 2017 and El Nasasra et al., 2018*). It was consisted of 50 MCQs and true or false which were divided into five sections as follow:

- Section 1: Questions about patient safety (17 MCQs).

- Section 2: Questions about Conduction system (8 MCQs).

- Section 3: Questions about Temporary cardiac pacemaker (12 true or false)

- Section 4: Questions about Temporary cardiac pacemaker Side Effects (9 true or false).

- Section 5: Questions about ECG (4 MCQs).

Scoring system:

Regarding scoring system of the nurses' questionnaire: it included 50 questions. The response for each question was either by choosing the correct answer and true or false. Each correct answer was given one grade and the incorrect answer or unanswered questions were given zero. The total scores for every section and for whole knowledge assessment questionnaire was summed up (50 grades). The percentage of the total scores was calculated then categorized as follow

- $\geq 80\%$ = satisfactory level of knowledge which equal ≥ 40 grades.

- $< 80\%$ = unsatisfactory level of knowledge which equal < 40 grades.

II- Nurses' practices observational checklists:

It's used to assess actual nurses' practice regarding patients with temporary cardiac pacemakers (*Goldsworthy, & Graham, 2016 and Jones, Qureshi & Rajappan, 2018*). It included an observational checklist and consisted of nine sections as follow:

- Section 1: Assessment and Monitoring (patient and pacemaker device assessment and monitoring) (8steps).

- Section 2: pain management (5 steps).

- Section 3: Providing pacemaker insertion site care (3 steps).

- Section 4: Maintaining Electrical Safety precautions (4 steps).

- Section 5: Preventing pacemaker malfunction (4 steps).

- Section 6: Safety precaution during transportation inside the facility (3 steps)

- Section 7: Nurses response to pacemaker device failure (14 steps)

- Section 8: Patient Education (3 steps).

- Section 9: Documentation (9 steps)

Scoring system:

Scoring system of the Nurses' practices observational checklists was regarding to part two which was consisted of nine sections of observational checklists. Each step that was done correctly was given one grades and each step that was not done was given zero. Each

step was not applicable was not included in the total degree of this part of the checklist.

The total score for whole nine sections of the Nurses' practices observational checklists (53 steps) were summed up (53 grades) if all steps were applicable and it was categorized as follows:

▪ $\geq 90\%$ = competent level of practice which equal ≥ 47 grades.

▪ $< 90\%$ = incompetent level of practice which equal < 47 grades.

II- Operational design:

The operational design includes preparatory phase, content validity, pilot study and field work.

Preparatory phase:

It included reviewing of related literatures, and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals and magazines to develop tools for data collection.

Tools validity and reliability:

Testing validity of the proposed tools by inspecting the items to determine whether the tools measure what supposed to measure. The tools were revised by a jury of five experts from different academic categories (one professor, two assistant professors and two lecturers) from medical surgical nursing department, faculty of nursing, Ain Shams University. The experts reviewed the tools and its content for clarity, relevance, comprehensiveness, accurateness, logical consequence, applicability and simplicity. Modifications were done according to their recommendations.

Testing reliability of the proposed tools was done statistically by Cronbach Alpha test. It was used to examine whether the questionnaire

had an internal consistency. The knowledge and practice tools had an internal consistency. Alpha tests reached 0.867 for questionnaire regarding nurses' knowledge. Alpha tests for practice tool items reached 0.916 indicating acceptable reliability.

Pilot study:

A pilot study was carried out in the CCU department of National Heart Institute on 10% of the nurses under the study to test the applicability, clarity, feasibility of the tools used in the study and to determine the time needed to answer the study tools. Teams which were included in the pilot study were included into the study sample because no modifications were done after conducting pilot study.

Field work:

The aim of this stage is to assess the knowledge and practices of nurses regarding care of patients with temporary cardiac pacemaker through collecting the data using the study tools after confirming its validity and reliability and explaining the aim or purpose of the study simply by the researcher to the studied subjects and obtaining their written permission for data collection prior to data collection. All the available subjects (50 nurses) were included in the study.

Data collection took about six months started from the beginning of February 2018 to the end of July 2018. The data were collected by the researcher through four days per week (Saturday, Sunday, Wednesday and Thursday) in the morning and evening shifts (from 8 A.M to 8 P.M) at CCU department of The National Heart Institute.

III- Administrative design:

An official letter was issued from the faculty of nursing Ain Shams University to the medical and nursing director of The National Heart Institute and the medical and nursing director of CCU department at which the study was conducted, and explaining the purpose of the study.

A brief explanation of the study was given to the participants that the information obtained will be treated confidentially, used only for the purpose of the study, will not cause any harm to the participants and informed that their participation is voluntary. The participants were informed that they are allowed to choose whether to participate or withdraw from the study at any time.

Ethical considerations:

The ethical research considerations in this study included the following:

- The research approval was obtained from the scientific ethical committee in faculty of nursing, Ain Shams University before starting the study.

- The researcher clarified the objective and aim of the study to the nurses and physicians included in the study before starting the study.

- The researcher assured maintaining anonymity and confidentiality of the subjects' data that were included in the study.

- Nurses were informed that they were allowed to choose to participate or not in the study and they had the right to withdraw from the study at any time without any reason.

- Written consent was obtained from nurses to participate in the study.

IV- Statistical Design:

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found

parametric. Also qualitative variables were presented as number and percentages.

Cronbach Alpha test was used to assess the internal reliability and consistency of the studied questionnaire. The comparison between groups regarding qualitative data was done by using Chi-square test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as follow:

P > 0.05: Not significant (NS).

P < 0.05: Significant (S).

Limitations of the Study

Many obstacles faced the researcher during this study, including:

- Lack of researches that concerned with temporary cardiac pacemaker and the researcher compare the data that related to concept of nursing performance (knowledge and practice).

No previous studies done about nurses' performance regarding caring of patients with temporary cardiac pacemakers.

Results

Table (1) illustrates that, 40% of the studied nurses their age ranged between 20-<25 years with a mean age of 23.18 ± 6.27 , 56% of the studied nurses were females, 60% of the studied nurses were married, 36% of the studied nurses had technical institute of nursing, (40%) of the studied nurses had 5-10 years of experience and 70% of the studied nurses had no previous training courses regarding pacemaker

Table (2) illustrates that 90% of the studied nurses had unsatisfactory level of total knowledge about ECG. The table reveals that 30% of the studied nurses had satisfactory level of knowledge about temporary cardiac pacemaker side effects.

Table (3) illustrates that 82% of the studied nurses had incompetent level of practice about documentation. The table reveals that 62% of the studied subjects had competent level of practice regarding pacemaker device failure to capture.

Table 4 reveals that there was a high statistical significant relationship between nurses' total level of knowledge and total level of practice regarding caring of patients with temporary cardiac pacemakers

Figure (1) shows that, 74% of the nurses under study had unsatisfactory level of overall total

level of knowledge regarding caring of patients' temporary cardiac pacemakers.

Figure (2) shows that, 76% of the nurses under study had incompetent level of overall total level of practice regarding caring of patients' temporary cardiac pacemakers

Table (1): Frequency and percentage distributions of demographic characteristics of the studied nurses (n=50).

Demographic characteristics	No.	%	
Age	20: <25	20	40.0%
	25: <30yrs	13	26.0%
	30: <40yrs	12	24.0%
	>40	5	10.0%
Mean ± SD	Mean ± SD	23.18 ± 6.27	
Sex	Male	22	44.0%
	Female	28	56.0%
Marital status	Not married	20	40.0%
	Married	30	60.0%
	Diploma	14	28.0%
Education	Technical institute	18	36.0%
	Bachelor of nursing	14	28.0%
	Post graduate studies	4	8.0%
Years of experience	<5 yrs	12	24.0%
	5:10	20	40.0%
	10:15	12	24.0%
	>15	6	12.0%
Training courses	Other	0	0.0%
	No	35	70.0%
	Yes	15	30.0%

Table (2): Frequency and percentage distributions of the nurses' level of knowledge regarding safety of patient with temporary cardiac pacemaker (n=50).

Items of Knowledge	No.	%	
Patient safety	Unsatisfactory	42	84.0%
	Satisfactory	8	16.0%
Conduction system of the heart	Unsatisfactory	38	76.0%
	Satisfactory	12	24.0%
Indications and types of temporary cardiac Pacemaker	Unsatisfactory	39	78.0%
	Satisfactory	11	22.0%
Pacemaker side effect	Unsatisfactory	35	70.0%
	Satisfactory	15	30.0%
ECG drawing	Unsatisfactory	45	90.0%
	Satisfactory	5	10.0%

Figure (1): Percentage distribution of the nurses' total level of knowledge regarding caring of patients with temporary cardiac pacemakers (n=50).

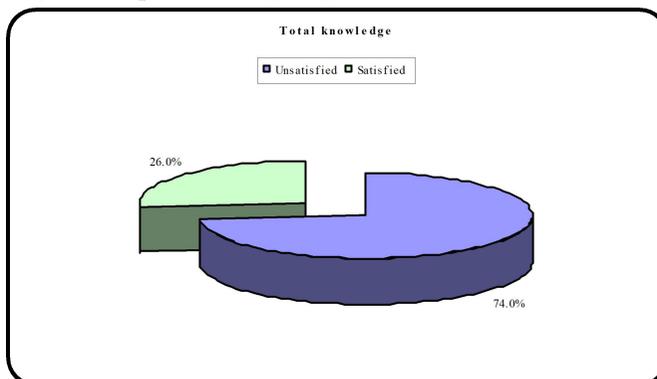


Table (3): Frequency and percentage distributions of the nurses' level of practice regarding safety of patient with temporary cardiac pacemaker (n=50).

Items of Practice (observational checklist)		No.	%
Assessment & monitoring	Incompetent	39	78.0%
	Competent	11	22.0%
Pain management	Incompetent	35	70.0%
	Competent	15	30.0%
Providing pacemaker insertion site care	Incompetent	31	62.0%
	Competent	19	38.0%
Maintaining electrical safety	Incompetent	38	76.0%
	Competent	12	24.0%
Preventing pacemaker malfunction	Incompetent	39	78.0%
	Competent	11	22.0%
Pacemaker device failure to pace	Incompetent	22	44.0%
	Competent	28	56.0%
Pacemaker device failure to sense	Incompetent	27	54.0%
	Competent	23	46.0%
Pacemaker device failure to capture	Incompetent	19	38.0%
	Competent	31	62.0%
Safety precaution during transportation	Incompetent	38	76.0%
	Competent	12	24.0%
Patient education	Incompetent	38	76.0%
	Competent	12	24.0%
Documentation	Incompetent	41	82.0%
	Competent	9	18.0%

Figure (2): Percentage distribution of the nurses' total level of practice regarding caring of patients with temporary cardiac pacemakers (n=50).

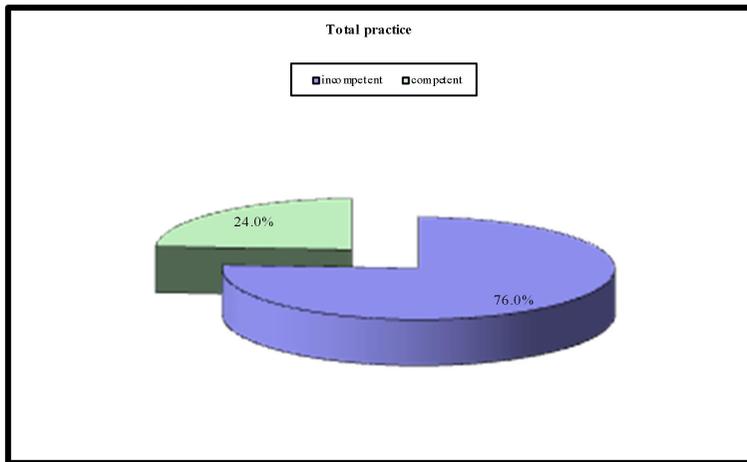


Table (4): Relation between nurses' total level of knowledge and nurses' total level of practice regarding caring of patients with temporary cardiac pacemakers (n=50).

Total practice	Total knowledge				Test value	P-value	Sig.
	Unsatisfactory		Satisfactory				
	No.	%	No.	%			
Incompetent	31	83.8%	7	53.8%	4.727	0.030	S
competent	6	16.2%	6	46.2%			

Discussion

Temporary cardiac pacing involves electrical cardiac stimulation to treat a brady arrhythmia or tachyarrhythmia until it resolves or until long-term therapy can be initiated. The purpose of temporary pacing is to re-establish circulatory integrity and normal hemodynamics that are acutely compromised by a slow or fast heart rate. In some situations, temporary pacing can be lifesaving (Hauffe et al., 2015).

Temporary cardiac pacing is indicated when a Brady arrhythmia causes symptoms and/or severe hemodynamic impairment and when permanent cardiac pacing is not immediately indicated, not available, or the risk of inserting a permanent pacemaker exceeds potential benefit. The main reason for temporary cardiac pacing is to treat severe symptoms and/or hemodynamic instability due to a bradycardia, or to prevent potential

deterioration resulting in hemodynamic instability (Batra and Zeltser, 2017).

Nurses are responsible for caring for patients who have planned insertion of a cardiac device so should be aware of indications, functions, contraindications and complications. Moreover, nurses should be knowledgeable when preparing patients for the procedure and when providing post-implantation care that includes close observation, continuous monitoring, and providing pre-discharge education and instructions to help patients and their families deal with any potential problems that may arise (Ali et al., 2015).

This chapter presented a detailed discussion of the findings emanating from the present research inquiry. An evaluation of finding of the study was expanded on, making reference and comparisons to previously published works. The implication of the research findings and recommendations for

future research and educational initiatives were made.

The current study was descriptive exploratory study and it was conducted to assess nurses' levels of knowledge and practice regarding safety of patients with temporary cardiac pacemakers in the critical care units.

This aim will be achieved through the following:

1. Assessing the nurses' levels of knowledge regarding safety of patients with temporary cardiac pacemakers in the critical care units.

2. Assessing the nurses' levels of practices regarding safety of patients with temporary cardiac pacemakers in the critical care units.

Research Questions:

1. What are the nurses' levels of knowledge related to the safety of patients with temporary cardiac pacemakers in the critical care units?

2. What are the nurses' levels of practices related to the safety of patients with temporary cardiac pacemakers in the critical care units?

The discussion of the result was represented in the following sequences:

Part 1; was to discuss demographic characteristics of the studied subjects, part 2; was to discuss knowledge of the studied subjects, part 3; was to discuss knowledge of the studied subjects, part 4; was to discuss the relation between total knowledge and total practice of the study subjects.

Regarding demographic characteristics, more than one third of the studied nurses were of age group between 20 to 25 years and more

than half of studied nurses were females. About two thirds of the studied nurses were married and about two thirds of them had nursing diploma and technical institute of nursing. About three quarter of studied subjects had experience more than five years and had no training courses.

Regarding the studied nurses, demographic characteristics, the results of the present study revealed that the majority of the studied subjects were of age group between 20 to less than 25 years old. This finding is in agreement with *Hadiyah and Mohammed (2016)* who conducted a study about "Nurses, Knowledge Concerning an Implantation Pacemaker For Adult Patients with Cardiac Rhythm Disorder at Al-Nassirrhya Heart Center" and found that, the majority of the studied subjects were of age group between 25 to less than 30 years and this findings were contraindicated with *Mohamed, Shreif, Mohamed, & Maaty, (2016)*, who conducted a study about "Effectiveness of Educational Program on Knowledge and Practice of Patients Undergoing Permanent Pacemaker". and found that the majority of the study sample ages 40 to 50 years

From the investigator point of view, this might explain that most of those nurses were newly graduated, young and tolerate the nature of the work also may be explained by the fact that younger nurses were freshly, more interested and motivated and much active than the older.

Related to gender, the present study showed that, more than half of the studied nurses were females. This finding is in agreement with *Nahla, (2015)*, which conducted a study about "Nurses' knowledge and practice regarding implantable cardiac devices in Egypt" and found that, the majority of the studied subjects were female. These results disagreed with the finding of many studies, which indicated that the majority of

study nurses were male such as, *Al-Ftlawy, (2014)*, who conducted a study about Determination of nurses' knowledge toward care provided to patients with acute myocardial infarction in Al-Najaf City.

From the investigator point of view, this is may be due to the greater fraction of the nurses in Egypt was female and may also related to the studying of nursing in Egyptian universities were exclusive for females only till few years ago.

Concerning to marital status, the present study showed that two thirds of the studied nurses were married. This finding is inconsistent with *Mohamed, (2014)* who conducted a study about "effect of CPR training program on knowledge and practices of internship technical institute of nursing students" and found that, the majority of the studied subjects were single.

Concerning educational level, the present study showed that about two thirds of the nurses under the study were nursing diploma, technical nurses while the rest of were nursing bachelor and post graduate nurses. These findings are on the same line with *Elsadee, (2017)* who conducted a study about "nurses' perception and barriers as regarding cardiopulmonary resuscitation" and found that, more than half of the studied nurses had nursing diploma and technical institute of nursing.

From the investigator point of view, this might elaborate the current condition of nursing qualifications in Egypt.

Regarding years of experience, the current study showed that more than three quarter of the study nurses had experience more than five years. This finding were contraindicated with that of *El Feky, & Ali, (2013)* who studied "nurses' practices and perception of delirium in the intensive care

units in Egypt" and revealed that around three quarters of the studied sample was approximately had one to four years of ICU experience.

Concerning the pacemaker training courses, it was noted that about three quarters t of the studied nurses had no training courses. This may reflect job regulation related factors that affecting nurses' performance. The training courses for nurses about pacemaker are very important to improve their performance that affect positively on quality of care. This finding is in agreement with *Hadi Atiyah, & Mohammed, (2016)*, who conducted a study about "Nurses, Knowledge Concerning an Implantation Pacemaker for Adult Patients with Cardiac Rhythm Disorder at Al-Nassirrhya Heart Center" and found that, about two thirds of studied subjects had no training courses. This is contraindicated with *Mohamed, Elbana & AbdElhaleim, (2017)* who conducted a study about "maternity nurses' performance regarding cardiopulmonary resuscitation during pregnancy: simulation based intervention" and found that, that more than two thirds of studied subjects were had previous CPR training courses.

Studied subjects' knowledge regarding pacemaker.

Assessment of studied subjects' knowledge regarding pacemaker which was divided into five sections as follow: patient safety, conduction system, temporary cardiac pacemaker, pacemaker side effects and ECG. This part answered the first statement in the aim of the study which stated that, assessment of the nurses' knowledge regarding safety of patients with temporary cardiac pacemakers in the critical care units.

Concerning the results of the current study, it was found that, more than three quarter of the studied nurses had unsatisfactory level of knowledge about patient safety. These findings were in the same line with *Hurray, Sundin, & Cope, (2018)*, who conducted a

study about "New graduate registered nurses' knowledge of patient safety and practice" and found that, the majority of the studied subjects had unsatisfactory level of knowledge about patient safety.

Concerning conduction system knowledge, the current study showed that, about three quarters of the studied nurses had unsatisfactory level of knowledge about conduction system of the heart. The previous findings were contraindicated with *Salim, (2017)*, who conducted a study about " Nurses' knowledge regarding Nursing Care of Adult Patients with Heart Block " and found that, two third of the studied nurses had satisfactory level of knowledge about conduction system.

Concerning temporary cardiac pacemaker knowledge, the current study showed that, more than three quarter of the studied nurses had unsatisfactory level of knowledge about temporary cardiac pacemaker. The previous findings were in the same line with *Ali, Youssef, Mohamed, & Hussein, (2015)* who conducted a study about " Nurses' knowledge and practice regarding implantable cardiac devices in Egypt." and found that, two third of the studied subjects had unsatisfactory level of knowledge about temporary cardiac pacemaker.

Concerning temporary cardiac pacemaker side effects knowledge, the current study showed that, more than three quarter of the studied nurses had unsatisfactory level of knowledge about temporary cardiac pacemaker. These findings were in the same line with *Chan et al., (2017)*, who conducted a study about " Nurses' lived experience of delivering temporary epicardial cardiac pacing care. " and found that, two third of the studied nurses had unsatisfactory level of knowledge about temporary cardiac pacemaker side effects.

Concerning nurses' knowledge about ECG, the current study showed that, the majority

of the studied subjects had unsatisfactory level of knowledge about ECG. These findings were in the same line with *Ebrahimian, Fakhro-Movahedi, Davari& Tourdeh, (2015)*, who conducted a study about " The Effect of Peer-Nurses' Lecturing On Critical Units Nurses' Retaining Knowledge Of Electrocardiogram Interpretation." and found that, two third of the studied nurses had unsatisfactory level of knowledge about ECG.

Concerning the total knowledge of temporary cardiac pacemaker, the current study revealed that nearly three quarter of the studied nurses had unsatisfactory level of knowledge about temporary cardiac pacemaker. This finding was similar to *Farah, (2017)*, who conducted a study about " Nurses' Knowledge regarding Nursing Care of Adult Patients with Pacemaker" and found that, the majority of the nurses have poor knowledge.

From the investigator point of view, this may be due to that the nurses did not have enough information or training about cardiac pacemaker. Also more of them working in another hospitals and did not have enough time and neglect to read or attending courses under the pretext that they did not have enough time.

Studied subjects' practice regarding pacemaker.

Assessment of studied subjects' practice regarding pacemaker which was divided into nine sections as follow: Assessment and monitoring, pain management, providing pacemaker insertion site care(dressing), Maintaining Electrical Safety, Preventing pacemaker malfunction, Safety precaution during transportation inside the facility nurses' response to pacemaker device failure, Patient Education and documentation. This part answered the first statement in the aim of the study which stated that, assessment of the nurses' practice regarding safety of patients

with temporary cardiac pacemakers in the critical care units.

ECG monitoring is the standard of care for critically ill patients and nurses play a vital role in detecting cardiac dysrhythmias and checking for the temporary pacemaker pacing, capturing and sensing function through ECG monitoring. Concerning Assessment and monitoring patient and ECG, the current study showed that, more than three quarter of the studied nurses had incompetent level of practice about patient and pacemaker device monitoring. The previous findings were in the same line with *Gazarian, Carrier, Cohen, Schram, & Shiromani, (2015)*, who conducted a study about " Nurses' decision-making in managing electrocardiographic monitor alarms." and found that, the majority of the studied subjects had incompetent level of practice regarding ECG monitoring.

Concerning nurses' role in pain management, the current study showed that, more than two third of the studied nurses had incompetent level of practice regarding pain management. The previous findings were in the same line with *Rose, Smith, Gélinas, Haslam, Dale, Luk, & Watt-Watson, (2012)*, who conducted a study about " Critical care nurses' pain assessment and management practices " and found that, the majority of the studied nurses had incompetent level of practice regarding pain management.

Concerning nurses' role in providing insertion site care and change dressing, the current study showed that, three fifth of the studied nurses had incompetent level of practice while more than one third of the studied nurses had competent level of practice regarding insertion site and dressing change. The previous findings were contraindicated with *Wood, Powers, & Rechter, (2019)*, who conducted a study about " Comparative Evaluation of Chest Tube Insertion Site Dressings." and found that, the majority of the

studied nurses had competent level of practice regarding insertion site dressings.

The present study revealed a statistically significant difference between preparations for dressing procedure, dressing change is more likely to be a sterile procedure which requires the use of sterile materials when the pacemaker is Trans venous. This is probably because temporary Trans venous pacing electrodes are commonly central venous catheters, and are treated with strict aseptic technique.

Concerning nurses' role in maintaining electrical safety, the current study showed that, three quarters of the studied nurses had incompetent level of practice regarding maintaining electrical safety. The previous findings were contraindicated with *Sancar, (2019)*, who conducted a study about " Safety Alert for Certain Pacemaker " and found that, the majority of the studied nurses had competent level of practice regarding maintaining electrical safety.

Concerning nurses' role in preventing pacemaker malfunction, the current study showed that, more than three quarter of the studied nurses had incompetent level of practice regarding preventing pacemaker malfunction. The previous findings were in the same line with *Rahman, Nishtala, & Goldschlager, (2018)*, who conducted a study about "A Case of Possible Pacemaker Malfunction " and found that, about two third of the studied subjects had incompetent level of practice regarding preventing pacemaker malfunction.

Concerning nurses' role regarding safety precautions during transportation inside the facility, the current study showed that, more than three quarter of the studied nurses had incompetent level of practice regarding safety precautions during transportation inside the facility. The previous findings were

contraindicated with *van Lieshout, Binnekade, Reussien, Dongelmans, Juffermans, de Haan, & Vroom, (2016)*, who conducted a study about " Nurses versus physician-led interhospital critical care transport. " and found that, about two third of the studied nurses had competent level of practice regarding safety precaution during inter hospital transport.

Concerning nurses' response to pacemaker device failure, the current study showed that, more than half of the studied nurses had incompetent level of practice regarding nurses' response to pacemaker device failure. The previous findings were contraindicated with *Chen, (2015)*, who conducted a study about " Is your pacemaker pacing the way it should? " and found that, about two third of the studied subjects had competent level of practice regarding nurses' response to pacemaker device failure.

Patient education is widely recognized as a core component of nursing care, Moreover, it is considered a part of communication between critical care nurses and patients. Concerning nurses' role regarding patient education, the current study showed that, more than three quarters of the studied nurses had incompetent level of practice regarding patient education. The previous findings were in the line with *Norouzinia, Aghabarari, Shiri, Karimi, & Samami, (2016)*, who conducted a study about "Communication barriers perceived by nurses and patients " and found that, the majority of the studied subjects had incompetent level of practice regarding patient education.

From the investigator point of view, this might be related to nurses' workload and the lack of formal training regarding patient's education about temporary pacemaker safety. In addition to, patient's related barriers namely their old age and inappropriate level of consciousness.

Accurate and complete recording of data are essential for communicating information to other health care team members. In addition, documentation is the basis to report identified problems.

Concerning nurses' role regarding Documentation, the current study showed that, the majority of the studied nurses had incompetent level of practice regarding documentation. The previous findings were in the line with *Halvorsen, Eide, Sortland, & Almendingen, (2016)*, who conducted a study about " Documentation and communication of nutritional care for elderly hospitalized patients " and found that, the majority of the studied subjects had incompetent level of practice regarding documentation.

From the investigator point of view, this can be explained by the fact that communication concerning implementation of interventions must be provided through written documentation and should also be verbally conveyed when the responsibility of the patient's care is transferred to another nurse.

Concerning the total practice of temporary cardiac pacemaker, the current study revealed that more than three quarters of the studied nurses had incompetent level of practice about temporary cardiac pacemaker. This finding was similar to *Kaihula, Sawe, Runyon & Murray, (2018)* that conducted study about "assessment of CPR knowledge and skills among healthcare providers at an urban tertiary referral hospital in Tanzania" and found that, overall of the studied subjects' skills about CPR were poor.

From the investigator point of view, lack of training, lack of continuous in service educational programs, absent of continuous supervision and evaluation. Also, it might be due to lack of hospital policy or lack of qualifications, lack of motivation to learn or take training courses and lack of exchange of funds for training were considered the main causes for poor level of

practices, and these poor levels prevent patients to receive standardized level of care during ICU stay.

The relation between levels of total knowledge of the studied subjects regarding to their practice.

Regarding relation between total nurses' knowledge and practice, the current study showed statistically significant relation between nurses' knowledge and practice regarding safety of patient in the critical care units. This is consistent with *Regan, Laschinger, & Wong, (2016)* who found a significant relation between knowledge and practice.

Conclusion

References

- Adam, S., Osborne, S., & Welch, J. (Eds.): (2017):** Critical care nursing: science and practice. Oxford University Press.
- Al-Ftlawy, D. M. H. (2014):** Determination of nurses' knowledge toward care provided to patients with acute myocardial infarction in Al-Najaf City. Kufa Journal for Nursing Sciences, 2(2)www.uokufa. edu. iq/ journals/ index. php/ kjns/article/view/2299.
- Ali, N. S., Youssef, W., Mohamed, A., & Hussein, A. (2015):** Nurses' knowledge and practice regarding implantable cardiac devices in Egypt. British Journal of Cardiac Nursing, 10(1): 34-40
- Batra, A. S., & Zeltser, I. (2017):** Temporary pacing in children. Cardiac Pacing and Defibrillation in Pediatric and Congenital Heart Disease, 195-208
- Bogner, M. S. (2018):** Human error in medicine. CRC Press.
- Nearly three quarter of the study nurses had unsatisfactory level of knowledge and incompetent level of practice regarding safety of patients with temporary cardiac pacemaker in the critical care units. Moreover, there was statistical significant relation between total knowledge, total practice and their demographic characteristics as regards: age, education and experience

Recommendations

The results of this study the following suggests on going and regular in-service educational and training programs to improve their knowledge and practice regarding safety of patients with temporary cardiac pacemakers in the critical care units.

Castellan, C., Sluga, S., Spina, E., & Sanson, G. (2016): Nursing diagnoses, outcomes and interventions as measures of patient complexity and nursing care requirement in Intensive Care Unit. Journal of advanced nursing, 72(6): 1273-1286.

Chan, E. D., Terada, L. S., Kortbeek, J., & Winston, B. W. (Eds.): (2017): Bedside Critical Care Manual 3rd Edition Volume I. Foolsap & Quill LLC.

Chen, A. (2015): Is your pacemaker pacing the way it should?. British Journal of Cardiac Nursing, 10(2): 59-59.

Ebrahimian, A., Fakhr-Movahedi, A., Davari, H., & Tourdeh, M. (2015): The Effect Of Peer-Nurses' Lecturing On Critical Units Nurses' Retaining Knowledge Of Electrocardiogram Interpretation. Journal of Payavard Salamat, 8(5): 390-398

- El Nasasra, A., Alnsasra, H., Zahger, D., Lerman, T. T., Kobal, S., Cafri, C., & Shimony, A. (2018):** Feasibility and safety of exclusive echocardiography-guided intravenous temporary pacemaker implantation. *Journal of echocardiography*, 1-5
- Elsadee, M. O. (2017):** Nurses' Perception and Barriers as Regarding Cardiopulmonary Resuscitation. Available at: http://srv3.eulc.edu.eg/eulc_v5/Libraries/Thesis/BrowseThesisPages.aspx?fn=PublicDrawThesis&BibID=12515818.
- Engström, J. (2016):** Patient safety in the Intensive Care Unit: With special reference to Airway management and Nursing procedures (Doctoral dissertation, Acta Universitatis Upsaliensis):
- Farah, Z. M. A. (2017):** Nurses' Knowledge regarding Nursing Care of Adult Patients with Pacemaker at Medani Heart Center, 2016 (Doctoral dissertation, University of Gezira):
- Farzi, S., Moladoost, A., Bahrami, M., Farzi, S., & Etminani, R. (2017):** Patient safety culture in intensive care units from the perspective of nurses: a cross-sectional study. *Iranian journal of nursing and midwifery research*, 22(5): 372.
- Gazarian, P. K., Carrier, N., Cohen, R., Schram, H., & Shiromani, S. (2015):** A description of nurses' decision-making in managing electrocardiographic monitor alarms. *Journal of clinical nursing*, 24(1-2): 151-159.
- Gillon, S., Wright, C., Knott, C., McPhail, M., & Camporota, L. (2016):** *Revision Notes in Intensive Care Medicine*. Oxford University Press.
- Goldsworthy, S., & Graham, L. (2016):** *Compact Clinical Guide to Arrhythmia and 12-Lead EKG Interpretation*. Springer Publishing Company.
- HadiAtiyah, H., & Mohammed, H. (2016):** Nurses, Knowledge Concerning an Implantation Pacemaker For Adult Patients with Cardiac Rhythm Disorder at Al-Nassirryhia Heart Center. *Kufa journal for nursing sciences*, 6(1): 216-223.
- Halvorsen, K., Eide, H. K., Sortland, K., & Almendingen, K. (2016):** Documentation and communication of nutritional care for elderly hospitalized patients: perspectives of nurses and undergraduate nurses in hospitals and nursing homes. *BMC nursing*, 15(1): 70
- Hauffe, T., Krüger, B., Bettex, D., & Rudiger, A. (2015):** Shock management for cardio-surgical ICU patients—the golden hours. *Cardiac failure review*, 1(2): 75.
- Hollinger, A., & Mebazaa, A. (2019):** Choosing the Ideal Hemodynamic Therapy in Acute Right and Left Heart Failure. In *Hemodynamic Monitoring* (pp. 393-410): Springer, Cham.
- Hurray, M., Sundin, D., & Cope, V. (2018):** New graduate registered nurses' knowledge of patient safety and practice: A literature review. *Journal of clinical nursing*, 27(1-2): 31-47
- Kaihula, W. T., Sawe, H. R., Runyon, M. S., & Murray, B. L. (2018):** Assessment of cardiopulmonary resuscitation knowledge and skills among healthcare providers at an urban tertiary referral hospital in Tanzania. *BMC health services research*, 18(1): 935. Available at: <https://doi.org/10.1186/s12913-018-3725-2>

- Khairkhahan, A., Klenk, A., & Eby, T. B. (2019):** U.S. Patent Application No. 10/188,425.
- Lieshout, E. J., Binnekade, J., Reussien, E., Dongelmans, D., Juffermans, N. P., de Haan, R. J., & Vroom, M. B. (2016):** Nurses versus physician-led interhospital critical care transport: a randomized non-inferiority trial. *Intensive care medicine*, 42(7): 1146-1154.
- Mohamed, A. I., Elbana, H. M., & Elhaleim, S. A. (2017):** Maternity Nurses' Performance Regarding Cardiopulmonary Resuscitation During Pregnancy: Simulation Based Intervention. *International Journal of Studies in Nursing*, 3(1): 144.
- Mohamed, A., Shreif, W., Mohamed, H., & Maaty, A. (2016):** Effectiveness of Educational Program on Knowledge And Practice of Patients Undergoing Permanent Pacemaker. *IOSR Journal of Nursing and Health Science*, 5(6): 72-83
- Mohiuddin, A. K. (2019):** Patient Safety: A Deep Concern to Caregivers. *INNOVATIONS in pharmacy*, 10(1): 7-7.
- Nahla, (2015):** Nurses' knowledge and practice regarding implantable cardiac devices in Egypt, *British Journal of Cardiac Nursing* January, 10(1): 551-557.
- Nates, J. L., Nunnally, M., Kleinpell, R., Blosser, S., Goldner, J., Birriel, B., & Sprung, C. L. (2016):** ICU admission, discharge, and triage guidelines: a framework to enhance clinical operations, development of institutional policies, and further research. *Critical care medicine*, 44(8): 1553-1602
- Norouzinia, R., Aghabarari, M., Shiri, M., Karimi, M., & Samami, E. (2016):** Communication barriers perceived by nurses and patients. *Global journal of health science*, 8(6): 65
- Rahman, S., Nishtala, A., & Goldschlager, N. (2018):** A Case of Possible Pacemaker Malfunction: The Pacemaker That Did Not Make Sense. *JAMA internal medicine*, 178(3): 408-410.
- Regan, S., Laschinger, H. K., & Wong, C. A. (2016):** The influence of empowerment, authentic leadership, and professional practice environments on nurses' perceived interprofessional collaboration. *Journal of nursing management*, 24(1): E54-E61.
- Rose, L., Smith, O., Gélinas, C., Haslam, L., Dale, C., Luk, E., & Watt-Watson, J. (2012):** Critical care nurses' pain assessment and management practices: a survey in Canada. *American Journal of Critical Care*, 21(4): 251-259.
- Runciman, B., Merry, A., & Walton, M. (2017):** Safety and ethics in healthcare: a guide to getting it right. CRC Press.
- Salim, R. A. A. (2017):** Nurses' knowledge regarding Nursing Care of Adult Patients with Heart Block, Medani Heart Center, Gezira State, Sudan (2016) (Doctoral dissertation, University of Gezira)
- Sancar, F. (2019):** Safety Alert for Certain Pacemakers. *Jama*, 321(23): 2274-2274
- Shojania, K. G., & Dixon-Woods, M. (2017):** Estimating deaths due to medical error: the ongoing controversy and why it matters. *BMJ Qual Saf*, 26(5): 423-428.
- Slawomirski, L., Auraaen, A., & Klazinga, N. S. (2017):** The economics of patient safety.

- Taylor, B. E., McClave, S. A., Martindale, R. G., Warren, M. M., Johnson, D. R., Braunschweig, C., & Gervasio, J. M. (2016):** Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN): Critical care medicine, 44(2): 390-438.
- Urden, L. D., Stacy, K. M., & Lough, M. E. (2013):** Critical care nursing, diagnosis and management, 7: critical care nursing. Elsevier Health Sciences.
- Wood, M. D., Powers, J., & Rechter, J. L. (2019):** Comparative Evaluation of Chest Tube Insertion Site Dressings: A Randomized Controlled Trial. American Journal of Critical Care, 28(6): 415-423.