

Nurses' Performance Regarding Care of Temporary Pacemaker among Critically Ill Patient

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Abstract

Background: Temporary Cardiac Pacing is the temporary delivery of electrical impulses, delivered by electrodes contacting the heart muscles, to regulate and automate the beating of the heart. **Aim of the study:** (1) Assess nurse's level of knowledge regarding management of temporary pacemaker in critically ill patient, (2) Assess nurse's level of practice regarding care of temporary pacemaker in critically ill patient. **Research design:** A descriptive exploratory research design was utilized to carry out this study. **Setting:** This study was conducted in three different cardiac care units at Ain shams university hospital affiliated to Ain Shams University. **Tools of data collection:** (1) Nurses' knowledge regarding care of temporary pacemaker assessment tool, (2) Nurses' observational checklist. **Results:** It was revealed that (56%) of nurses had an unsatisfactory level of knowledge regarding care of patient with temporary pacemaker, (56%) of nurses had a satisfactory level of practice pre pacemaker insertion procedure, while (56%) of nurses had unsatisfactory level of practice during the temporary pacemaker insertion procedure, and (56%) of nurses had unsatisfactory level of practice post temporary pacemaker insertion procedure. **Conclusion:** it can be concluded that more than half of nurses had an unsatisfactory level of knowledge regarding care of patient with temporary pacemaker. More than half of nurses had a satisfactory level of practice pre pacemaker insertion procedure. While more than half of nurses had unsatisfactory level of practice during the temporary pacemaker insertion procedure, and more than half of nurses had unsatisfactory level of practice post temporary pacemaker insertion procedure. **Recommendation:** future studies are recommended for training programs for nurses to improve their knowledge and practice regarding care of patients with temporary pacemaker.

Keywords: Critically ill patient, Nurses performance, Temporary pacemaker.

Introduction:

The human heart contracts approximately 2.5 billion times during the average person's lifespan; this is accomplished by the cardiac conduction system. The cardiac conduction system is a physiological system whereby the myocardium (heart muscle) is stimulated to contract without the requirement of any external stimulation (*Dokshokova et al., 2022*).

The conduction system consists of the sino atrial (SA) node, which is considered the physiological pacemaker of the heart. The SA node has the highest rate of spontaneous depolarization and under normal circumstances is responsible for generating most impulses (*Remme, 2022*).

Temporary Cardiac Pacing (TPM) is the temporary delivery of electrical impulses, delivered by electrodes contacting the heart muscles, to regulate and automate the beating of the heart. Temporary cardiac pacing is an artificial device that delivers a timed electrical stimulus which results in cardiac depolarization, an intervention that helps the heart beat get back to a normal pace if it has been temporarily out of rhythm (*van Loon et al., 2020*).

The primary purpose of temporary cardiac pacing is to maintain an adequate heart rate, either because the heart's native (intrinsic) pacemaker is not fast enough, or there is a block in the heart's electrical conduction system. Temporary cardiac pacing is used to maintain a normal heart rate in patients whose own heart

rate is not pumping enough blood through the body (*Choi et al., 2021*).

Pacemakers are used as single-chamber and dual-chamber in the rhythm changes accompanied by cardiac slowing. If the heart rate is less than 60 beats (30-40 beats) per minute and the heart does not fulfill the requirements of tissue oxygen, to compensate for tissue hypoxia and abnormal heart rhythm, a pacemaker will be placed inside the atrial or atrioventricular sinus node and the continuation of life will be possible for patients with this device (*Allshouse & Musialowski, 2021*).

Temporary cardiac pacing is generally indicated for the acute management of serious and often symptomatic brady arrhythmias that are refractory to medical therapy. Several approaches to temporary pacing are available, including transvenous, transcutaneous, epicardial, and transesophageal. Compared to the other modalities, the transvenous approach is the most stable and readily available option, with the unique ability for selective atrial or ventricular pacing. Conversely, this approach is associated with a variety of complications, and its safe and effective use requires considerable knowledge and technical skill (*Baloch et al., 2021*).

The critical care nurses' responsibility rely on monitoring for, early detection of adverse events thus nurses should be knowledgeable as a health care provider responsible for monitoring and caring of the patient over the shift. When nurses detect early warning signs of pacemaker dysfunction, they can prevent its adverse events. Therefore, critical care nurses should monitor the cardiovascular function, patency of venous access, and medications affecting pacemaker function. They should assess cardiovascular function through normal and abnormal electrocardiogram (ECG) readings, manifestations associated with cardiac dysrhythmias, hemodynamics, and oxygenation parameters (*Liljeroos et al., 2020*).

Significance of study:

Transvenous temporary cardiac pacing (TV-TP) is a potentially life-saving therapy in patients with hemodynamically compromising arrhythmias. There are several complications that can be results from insertion of temporary cardiac pacemaker. These complications may be related to the transvenous lead such as lead dislodgement, lead malfunction and cardiac perforation or related to the venous access such as bleeding, infection, thrombosis and delirium (*El-Chami et al., 2019*).

Nurses caring for patients with temporary cardiac pacemaker should be aware of such complications and how to identify it early in order to prevent death of patient. Patients with TV-TP need special nursing care, and to assure to apply this care, it is important to apply specific nursing intervention that can entails knowledge and skills required by nurses in order to carry out care effectively (*Ignatavicius & Workman, 2015*).

Aim of the study:

This study aims to assess nurse's performance regarding care of temporary pacemaker in critically ill patient through the following:

- 1- Assess nurse's level of knowledge regarding care of temporary pacemaker in critically ill patient.
- 2- Assess nurse's level of practice regarding care of temporary pacemaker in critically ill patient.
- 3- Develop suggested guidelines for nurses caring for patient with temporary pacemaker.

Research Questions:

To fulfill the aims of the current study, following research questions were formulated:

- 1- What is the nurse's level of knowledge regarding care of temporary pacemaker in critically ill patient?
- 2- What is the nurse's level of practice regarding care of temporary pacemaker in critically ill patient?

Subjects and Methods

Research design:

A descriptive exploratory research design was utilized to carry out this study.

Setting:

This study was conducted in three different cardiac care units at Ain Shams university hospital affiliated to Ain Shams University. Cardiac Care Unit (A) at the first floor, it consists of six (6) beds. Cardiac Care Unit (C) at the first floor, it consists of ten (10) beds and Cardiac Care Unit at the second floor which consists of nineteen (19) beds.

Subjects:

A convenient sample of all available nurses (50) in the previously mentioned settings who are caring of patient with temporary pacemaker were included in the study.

Tools for data collection:

Two tools were utilized to collect data pertinent to the current study.

1- Nurses' self-administrated questionnaire:

This tool was used to assess nurses' knowledge regarding care of temporary pacemaker among critically ill patient. It was developed by the investigator based on review of relevant recent literatures (Beny, 2016; British Heart Rhythm Society, 2016). It included two parts:

- **Part I:** This part is concerned with demographic characteristics of nurses under study such as age, gender, marital status, educational level, Courses attended, work areas and years of experience.

- **Part II:** This part is concerned with assessment of nurses' knowledge regarding care of temporary pacemaker in critically ill patient. It consists of 40 questions inform of MCQ and matching questions that cover knowledge, 10 questions related to anatomy of conductive heart system, 7 questions related to indications of temporary pacemaker, 5 questions related to patient preparation for temporary pacemaker, 5

questions related to pacemaker codes, 8 questions related to nursing care post insertion of temporary pacemaker, and 5 questions related to complications of temporary pacemaker.

❖ The scoring system:

This tool consisting of 40 questions, the responses were either by choosing the correct answer in the multiple choice questions (MCQ) and matching questions, the correct answer was given one grade, while the incorrect answer was given zero. Total level of knowledge was categorized as either satisfactory level >50% (more than 20 degree) or unsatisfactory level <50% (less than 20 degree).

2- Nurses' observational checklist:

This tool was adopted from (Stein & Hollen, 2020; British Heart Rhythm Society, 2016). it was designed in English language and used to assess nurses' practices regarding care of patient with temporary transvenous cardiac pacemaker.

❖ The scoring system:

The observational checklist consists of 90 step, 30 step related to nursing activities before inserting temporary pacemaker, 23 questions related to nursing activities during inserting temporary pacemaker, 37 questions related to nursing activities after inserting temporary pacemaker. The responses were either by "done" or "not done", the correct answer was given one grade while the incorrect answer was given zero. Total level of practice was categorized as either satisfactory level >50% (more than 45 degree) or unsatisfactory level <50% (less than 45 degree).

Tool validity:

The study tools was revised by a panel of (5) medical surgical nursing experts who reviewed the content of the tool for comprehensive, clarity and relevance.

Tool reliability:

Reliability of the tools was tested statistically using Alpha Chrombach test, it was 0.899 for nursing knowledge tool, 0.371for the nursing practice pre procedure

checklist tool, 0.404 for nursing practice during procedure checklist tool, and 0.05 for nursing practice post procedure checklist tool.

Pilot study:

A pilot study was carried out on 10% (5) of study subjects in the previous mentioned setting, to test feasibility, objectivity, applicability of the data collection tools and time required to fill in the study tools, and to determine any obstacles for data collection. The five nurses who included in the pilot study were included in the study. No modifications were done in the study tools.

Field work:

- The data collection tools were prepared.
- The collection of data of the current study lasted over three months; starting from beginning of December 2021 till the end of February 2022.
- An approval to conduct the study was obtained through a letter issued from the Dean of Faculty of Nursing, Ain Shams University to the medical and nursing directors of the previously mentioned settings. The official permission included the aim of the study and tools of data collection.
- The purpose and nature of the study were explained to nurses to gain their acceptance and support.
- The researcher obtained oral consent from nurses who are agree to participate in the study.
- The researcher visited the selected settings two days per week (Saturday, and Sunday) in morning and afternoon shift.
- The average number of nurses who fillin the questionnaire was 2-3 nurses per day.
- Each nurse fillin the questionnaire in 30 minutes.
- Nurses' practice was assessed indirectly and recorded by using nurses' observational checklist which the researcher was observe the nurses' while providing care for patient with temporary pacemaker.
- The average number of nurses who were observed was 2-3 nurses per day.

Ethical Considerations:

The research approval was obtained from the ethical research committee in the faculty of nursing Ain Shams University before starting the study, the investigator clarified the aim and objectives of the study to nurses included in the study, the investigator assured maintaining privacy and confidentiality of subjects' data and nurses were informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

Statistical analysis:

- The collected data was revised, coded, and tabulated, using statistical package for social science (SPSS 20).
- Mean, standard deviation (+ SD) and range were used for parametric numerical data, while median and interquartile range (IQR) for non-parametric numerical data.
- Frequency and percentage were used to describe non- numerical data.
- Student T Test was used to assess the statistical significance of the difference between two study group means.
- ANOVA test was used to assess the statistical significance of the difference between more than two study group means.
- Post Hoc Test is used for comparisons of all possible pairs of group means
- Spearman's rank correlation coefficient (rs) was used to assess the degree of association between two sets of variables if one or both of them was skewed and the confidence interval was set to 95% and the margin of error accepted was set to 5%. The observed difference and associations were considered as follows: P-value <0.05 was considered significant, P-value >0.05 was considered non-significant.

Results:

Table (1): Shows that the mean age of nurses under study was 31.48±6.10. As regard to marital status, it was revealed that 44% of nurses were single, 56% of them were married. As regard to educational level, the result shows that 52% of nurses had bachelor degree, and 16% had diploma. In relation to experiences of nurses in critical care units,

it was illustrated that the mean of years of experience was 7.84 +5.32. Regarding courses attended related to temporary pacemaker, it was revealed that 60% of nurses didn't attend any courses.

Table (2): Illustrated that 55.6%, 60%, 51.2%, 52.6%, and 66.4% of nurses under study stated the incorrect answers about anatomy of the conductive system of the heart, indications of temporary pacemaker, pacemaker codes, nursing care post insertion of temporary pacemaker, and complications of insertion of temporary pacemaker. While 54.4% of them reported correct answers about Patient preparation for temporary pacemaker insertion.

Table (3): As regard to total level of knowledge for nurses caring for patients with temporary pacemaker, table 8 showed that 56% of nurses had an unsatisfactory level of knowledge. While 44% of them had a satisfactory level of knowledge, with mean 17.88+8.35, also the range of degree was from 2-34 out of 40 degree.

Table (4): Shows that 56% of nurses had a satisfactory level of practice pre pacemaker insertion procedure, while 44% of them had unsatisfactory level of practice pre pacemaker insertion procedure.

Table (5): Shows that 44% of nurses under study had a satisfactory level of practice during temporary pacemaker insertion procedure. While 56% of nurses had unsatisfactory level of practice during the temporary pacemaker insertion procedure.

Table (6): Shows that 56% of nurses had unsatisfactory level of practice post temporary

pacemaker insertion procedure. While 44% of them had a satisfactory level of practice post insertion of the temporary pacemaker.

Table (7): shows that there was a statistical significant relation between nurses' experience in critical care units and their level of practice during temporary pacemaker insertion procedure among critically ill patient where p value <0.05. While there was no statistical significant relation between nurses' experience in critical care units and their level of practice pre and post temporary pacemaker insertion procedure where p value >0.05.

Table (8): shows that there was no statistical significant relation between level of education for nurses under study and their level of knowledge about temporary pacemaker where p value >0.05.

Table (9): shows that there was no statistical significant relation between level of education for nurses under study and their level of practice regarding care of patients with temporary pacemaker where p value >0.05.

Table (10): shows that there was no statistical significant relation between the courses attended by nurses under study and their level of practice pre and post procedure of temporary pacemaker insertion where p value >0.05. While there was statistical significant relation between the courses attended by nurses and their level of practice during procedure temporary pacemaker insertion where p value <0.05.

Table (1): Demographic characteristics of nurses under study (n=50).

Nurse's characteristics		N	%
20-24		8	16%
25-29		14	28%
30-34		14	28%
35-40		10	20%
40-44		2	4%
45-50		2	4%
Mean+ SD		31.48+6.10	
Marital status	Single	22	44.0%
	Married	28	56.0%
	Diploma	8	16.0%
Level of education	Technical health institute	16	32.0%
	Bachelor	26	52.0%
Experiences in critical care units (by years)		7.84 +5.32	
Experiences in nursing (by years)		10.96 +6.28	
Courses attended related to temporary pacemaker	Yes	20	40.0%
	No	30	60.0%

Table (2): Distribution of nurses according to their total level of knowledge regarding care of patient with temporary pacemaker (n= 50).

Items of knowledge	Correct		Incorrect	
	N	%	N	%
Anatomy of the conductive system of the heart.	22.2	44.4%	27.8	55.6%
Indications of temporary pacemaker.	20	40 %	30	60%
Patient preparation for temporary pacemaker insertion.	27.2	54.4%	22.8	45.6%
Pacemaker codes.	24.4	48.8%	25.6	51.2%
Nursing care post insertion of temporary pacemaker.	23.7	47.4%	26.3	52.6%
Complications of insertion of temporary pacemaker.	16.8	33.6%	33.2	66.4%

Table (3): Distribution of nurses according to their total level of knowledge regarding care of patient with temporary pacemaker (n= 50).

Knowledge level	N	%
Satisfactory	22	44.0%
Unsatisfactory	28	56.0%

Table (4): Distribution of nurses according to their total practice levels pre insertion of temporary pacemaker procedure (n= 50).

Practice level	N	%
Satisfactory	28	56.0%
Unsatisfactory	22	44.0%

Table (5): Distribution of nurses according to their total satisfactory practice levels during insertion of temporary pacemaker procedure (n= 50).

Practice level	N	%
Satisfactory	22	44.0%
Unsatisfactory	28	56.0%

Table (6): Distribution of nurses according to their total practice levels post procedure(n= 50)

Practice level	N	%
Satisfactory	22	44.0%
Unsatisfactory	28	56.0%

Table (7): Relation between experiences of nurses in critical care units and their level of practice regarding temporary pacemaker (n=50).

Experiences in critical unites (by years)	Practice pre (total & %)	Practice during (total & %)	Practice post (total & %)
Spearman's rho	1.27	2.16	1.43
p-Value	0.211	0.036	0.158
Sig.	NS	S	NS

Table (8): Relation between nurse's level of education and their level of knowledge regarding care of patients with temporary pacemaker (n=50).

		Level of education						Fisher exact test		
		Diplome		Technical		Bachelor		value	p value	sig.
		N	%	N	%	N	%			
Knowledge satisfaction	No	2	25.0%	14	87.5%	12	46.2%	10.76	0.003	NS
	Yes	6	75.0%	2	12.5%	14	53.8%			

Table (9): Relation between nurse's level of education and their level of practice regarding care of patients with temporary pacemaker (n=50).

		Level of education						Fisher exact test		
		Diplome		Technical		Bachelor		value	p value	Sig.
		N	%	N	%	N	%			
Practice pre procedure satisfaction	No	6	75.0%	8	50.0%	8	30.8%	5.05	0.080	NS
	Yes	2	25.0%	8	50.0%	18	69.2%			
Practice during procedure satisfaction	No	6	75.0%	10	62.5%	12	46.2%	2.35	0.267	NS
	Yes	2	25.0%	6	37.5%	14	53.8%			
Practice post procedure satisfaction	No	6	75.0%	10	62.5%	12	46.2%	2.35	0.267	NS
	Yes	2	25.0%	6	37.5%	14	53.8%			

Table (10): Relation between total mean of courses attended by nurses under study and their level of practice regarding care of patients with temporary pacemaker (n=50).

	Courses attendance		t	Student t-test	
	Yes	No		p-Value	Sig.
	Mean ± SD	Mean ± SD			
Practice pre procedure score	15.3 ± 2.87	14.87 ± 3.3	0.479	0.634	NS
Practice during procedure score	12.3 ± 2.2	10.13 ± 2.62	3.045	0.004	S
Practice post procedure score	18.7 ± 1.72	17.6 ± 2.85	1.701	0.095	NS

Discussion

Regarding nurse's demographic characteristics, the present study revealed that about near one third of the studied nurses their ages ranges from 25- 29 years with mean age 31. 48. Result may be due to most of nurses under study were newly graduated. These results were disagreed with **Mohammed et al. (2020)** who found that about more than two thirds of studied nurses' ages range from 18-25 years in a study that titled "Studied nurses' performance regarding patient with permanent pacemaker in intensive care unit".

Regarding nurses' marital status, the present study showed that more than half of nurses were married. These findings was agreed with **Ebada et al. (2017)** who found that three quarters of the studied subjects were married in a study that titled "Effect of self-care management on nursing-sensitive patients' outcomes after permanent pacemaker implantation".

Regarding nurse's level of education, the present study revealed that half of nurses had a bachelor degree. This may be due to that intensive care units are considered a critical area in which highly qualified nurses who have bachelor degree are working in it. These results were contradicted with **Mohammed et al. (2020)** who found that more than half of studied nurses were graduated from nursing institute in a study that titled "Studied nurses' performance regarding patient with permanent pacemaker in intensive care unit".

Regarding years of experience in critical care units, the present study revealed that near half of nurses had experience year in critical care units from 5-10 years. This result is disagreed with **Farah, (2017)** who found that half of nurses had experience in critical care units ranged from 1-5 years in a study that titled "Nurses' knowledge regarding nursing care of adult patients with permanent pacemaker at medani heart centre".

Regarding courses attended related to temporary pacemaker, the present study revealed that nearly two thirds of nurses didn't attend any courses. This may be due to shortage in nursing staff and decreased chance to attend free courses. This result was contradicted with **Ha& Kang, (2018)** who found that two thirds of nurses attended courses in a study that titled "Knowledge, attitude and associated factors toward heart failure management among nurses working in the cardiac unit of selected government hospital in Addis Ababa".

Regarding total knowledge of nurses caring for patients with temporary pacemaker, the present study showed that more than half of nurses had an unsatisfactory level of knowledge regarding temporary pacemaker. This may be due to that the nurses did not have enough information or training courses about temporary pacemaker. Also more of them working in other hospitals and did not have enough time to read or attend training courses. These result disagreed with **Mohammed, (2016)** who found that two thirds of nurses had a satisfactory level of knowledge regarding temporary pacemaker in a study that titled "Nurses, knowledge concerning an implantation pacemaker for adult patients with cardiac rhythm disorder at al- Nassirryhia heart center".

Regarding knowledge of nurses caring for patients with temporary pacemaker, the present study showed that more than half of nurses stated the incorrect answers about anatomy of the conductive heart system, near two thirds of nurses sated the incorrect answers about indications of temporary pacemaker, more than half of nurses stated the incorrect answers about pacemaker codes, more than half of nurses stated the incorrect answers about nursing care post insertion of temporary pacemaker and two thirds of nurses stated the incorrect answers about complications of temporary pacemaker.

These findings is agreed with **Alshal, (2020)** who showed nurses have unsatisfactory level of knowledge regard anatomy of the conductive heart system, indications of temporary pacemaker, pacemaker codes, care post insertion of temporary pacemaker, complications of temporary pacemaker, in a study titled "Knowledge and practice of nurses regarding safety of patients with temporary cardiac pacemakers in critical care units".

In relation to nurses' practice regarding insertion of temporary pacemaker (pre procedure), the present study showed that more than half of nurses had a satisfactory level of practice pre temporary pacemaker insertion. This may be due to that pre procedure preparation steps consider as similar steps for other procedures as cardiac catheterization that make steps easy for them. These findings came in contrast with **Elsebai et al. (2022)** who showed that most of nurses had unsatisfactory level of practice pre pacemaker insertion in a study that titled "Effectiveness of an educational program for management of patients undergoing permanent pacemaker on nurse's performance".

These findings was agreed with **Thabet et al., (2019)** who showed that most of nurses had unsatisfactory level of practice pre temporary pacemaker insertion procedure in a study that titled "Assessment of nurses' knowledge and practices regarding temporary pacemaker patient's care".

Regarding nurses' practice during insertion of temporary pacemaker, the present study showed that more than half of nurses had unsatisfactory level of practice. This may be due to that most of nurses had lack of knowledge and training courses about pacemaker insertion procedure. These findings was agreed with **Han (2017)** who showed that half of nurses had unsatisfactory level of practice during pacemaker insertion procedure in a study titled "Nurses' lived experience of delivering temporary epicardial cardiac pacing care".

These findings was agreed with **Thabet et al., (2019)** who showed that most of nurses had unsatisfactory level of practice during temporary pacemaker insertion procedure in a study that titled "Assessment of nurses' knowledge and practices regarding temporary pacemaker patient`s care".

Regarding nurses' practice about care of patients post insertion of temporary pacemaker (post insertion procedure), the present study showed that more than half of nurses had unsatisfactory level of practice post temporary pacemaker insertion. This may be due to 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 about management protocol for emergency procedures or lack of qualifications about dealing with a temporary pacemaker, and lack of motivation to learn or take training courses.

These finding agreed with **Alshal, (2020)** who showed that two thirds of nurses have unsatisfactory level of practice post insertion of temporary pacemaker in a study titled "Knowledge and practice of nurses regarding safety of patients with temporary cardiac pacemakers in critical care units".

The present study revealed that there was no statistical significant difference between nurses' experience in critical care units and their level of practice pre and post temporary pacemaker insertion procedure. This might be due to lack of nurses' incentives to improve their performance and had lack of desire to update their skills or may due to lack of time. These findings was agreed with **Ali et al., (2015)** who was showed that there is no statistical significant difference between nurses' experience in critical care units and their level of practice regarding pacemaker in a study that titled "Nurses' knowledge and practice regarding implantable cardiac devices in Egypt".

The present study revealed that there was no statistical significant difference between nurses' level of education and their

level of knowledge regarding temporary pacemaker among critically ill patient. This might be due to nurses in this study newly graduated so they didn't have enough information about temporary pacemaker. These results was agreed with **Mohammed et al. (2020)** who showed that there is no statistical significant difference between nurses' level of education and their level of knowledge regarding pacemaker in a study that titled "nurses' performance regarding patient with permanent pacemaker in intensive care unit".

The present study revealed that there was no statistical significant difference between nurses' level of education and their level of practice regarding temporary pacemaker among critically ill patient. This might be due to nurses in this study were newly graduated so they didn't have motivation for identifying more about care of temporary pacemaker. These findings was disagreed with **El Gazzar, (2021)** who showed that there is statistical significant difference between nurses' level of education and their level of practice regarding pacemaker in a study that titled "efficiency of an intervention protocol on nurses' knowledge, practices regarding pacemaker patients' care".

The present study revealed that there was no statistical significant difference between nurses' course attendance and their level of practice pre and during procedure regarding temporary pacemaker among critically ill patient. This might be due to nurses in this study didn't attended courses regard care of temporary pacemaker. These results was agreed with **Ahmed et al. (2021)** who showed that there is no statistical significant difference between nurses' course attendance and their level of practice regarding temporary pacemaker among critically ill patient in a study that titled "nurses' role regarding the care of patients with pacemaker".

Conclusion

Based on the findings of this study it can be concluded that the present study reveals that about more than half of nurses had an unsatisfactory level of knowledge regarding care of patient with temporary pacemaker. More than half of nurses had a satisfactory level of practice pre pacemaker insertion procedure. While more than half of nurses had unsatisfactory level of practice during the temporary pacemaker insertion procedure, and more than half of nurses had unsatisfactory level of practice post temporary pacemaker insertion procedure.

Recommendations:

Based on the findings of the present study, the following recommendations are suggested:

1. Training programs for nurses to improve their knowledge and practice regarding care of patients with temporary pacemaker.
2. Periodic assessment and evaluation of nurses regarding care of patients with temporary pacemaker.
3. Encourage nurses for self-education to improve their knowledge to reduce complications and give appropriate practice to patients with temporary pacemaker.
4. Provide nurses with regular books and papers to update their knowledge, also should be encouraged to attend scientific meetings and conferences to keep pace with the rapidly growing wealth of knowledge and practice necessary for proper nursing service.

Recommendations related for future studies:

- The study should be replicated on large sample and different hospitals setting in order to generalize the results.
- Further study should be done to raise awareness of nurses towards the care of patients with temporary pacemaker.

Recommendations related to suggested guide lines:

Developing a simplified and comprehensive booklet including guidelines about nursing care of patients with temporary

pacemaker in cardiac care unites including the following:

- The electrical conduction system of the heart
- Indications of a temporary pacemaker.
- Components of a temporary pacemaker.
- How a temporary pacemaker works.
- Troubleshooting temporary pacemaker functions.
- Nursing care needed for patients with a temporary pacemaker.

References:

- Ahmed, A. M., Taha, N. M., Zytoon, H. K., & Mohammed, M. A. (2021):** Nurses Role Regarding the Care of Patients with Permanent Pacemaker. *Zagazig Nursing Journal*, 17(2),161-174.
- Ali, N., Youssef, W., Mohamed, A. & Hussein, A. (2015):** Nurses' knowledge and practice regarding implantable cardiac devices in Egypt. *British Journal of Cardiac Nursing* Vol. 10(1): 23-27.
- Allshouse, K. J., & Musialowski, R. S. (2021):** Temporary Transvenous and Transcutaneous Pacemakers. In *Interventional Critical Care*. Springer, Cham: 191-201.
- Baloch, F., Kabani, A. S., Naseem, M., & Khan, A. H. (2021):** Perfecting temporary pacemakers in a developing country. *Expert review of cardiovascular therapy*, 19(2), 177-180.
- Beny, N. R. (2016).** Effectiveness of pacemaker care protocol on knowledge and skill regarding care of client undergoing pacemaker implantation among nurses at selected hospitals, Nagercoil, 2015 (Doctoral dissertation, Omayal Achi College of Nursing, Chennai).
- Choi, Y. S., Yin, R. T., Pfenniger, A., Koo, J., Avila, R., Benjamin Lee, K., & Rogers, J. A. (2021):** Fully implantable and bioresorbable cardiac pacemakers without leads or batteries. *Nature biotechnology*, 39(10), 1228-1238.
- Dokshokova, L., Pianca, N., Zaglia, T., & Mongillo, M. (2022):** Optogenetic Control of Heart Rhythm: Lightly Guiding the Cardiac Pace. In *cAMP Signaling*. Humana, New York: 205-229., NY.
- Ebada, R. A., El Senousy, T. A., Mohamed, S., & AbdallaAbdelatif, D. (2017):** Effect of

- Self Care Management on Nursing-Sensitive Patients' Outcomes after Permanent Pacemaker Implantation. *Egyptian Journal of Health Care*, 8(1): 38-43.
- El-Chami, M. F.; Johansen, J.B.; Zaidi, A.; Faerstrand, S.; Reynolds, D.; Garcia-Seara, J. and Soejima, K. (2019):** Leadless Pacemaker Implant in Patients with Pre-existing Infections: Results from the Micra Post-Approval Registry. *J Cardiovascular Electrophysiology*. 30(4):569–74.
- Elgazzar, S. E. (2021):** Efficacy of an Intervention Protocol on Nurse's Knowledge, Practices regarding Permanent Pacemaker Patient's Care. *International Journal of Novel Research in Healthcare and Nursing*, 8 (3): 324-333.
- Elsebai, H., Ragheb, M.& Ghonaem, S. (2022):** effectiveness of an educational program for management of patients undergoing permanent pacemaker on nurses performance. *Journal of science*, 3 (1):63-71.
- Elshal, A.M. (2020):** knowledge and practice of nurses regarding safety of patients with temporary cardiac pacemakers in the critical care units, available at http://srv4.eulc.edu.eg/eulc_v5/Libraries/Thesis/BrowseThesisPages.aspx?fn=PublicDrawThesis&BibID=12721413
- Farah, Z.M.A. (2017):** Nurses' Knowledge regarding Nursing Care of Adult Patients with Pacemaker at Medani Heart Center, available at <http://41.67.35.36/handle/123456789/660>
- Ha, J. H., & Kang, S. J. (2018):** Knowledge and Educational Needs Related to an Artificial Pacemaker among Hospital Nurses. *Journal of Korean Clinical Nursing Research*, 24(2), 235-244.
- Han, M. (2017):** nurses' lived experience of delivering temporary epicardial cardiac pacing care available at <https://digital.library.adelaide.edu.au/dspace/bitstream/2440/111325/1/02whole.pdf>
- Ignatavicius, D. and Workman, M. L. (2015):** Medical-Surgical Nursing-E-Book: Patient-Centered Collaborative Care, Single Volume. Elsevier Health Sciences 2015; 649:700.
- Ignatavicius, D. and Workman, M. L. (2015):** Medical-Surgical Nursing-E-Book: Patient-Centered Collaborative Care, Single Volume. Elsevier Health Sciences 2015; 649:700.
- Liljeroos, M., Thylén, I., & Strömberg, A. (2020):** Patients' and nurses' experiences and perceptions of remote monitoring of implantable cardiac defibrillators in heart failure: cross-sectional, descriptive, mixed methods study. *Journal of Medical Internet Research*, 22(9), e19550.
- Liljeroos, M., Thylén, I., & Strömberg, A. (2020):** Patients' and nurses' experiences and perceptions of remote monitoring of implantable cardiac defibrillators in heart failure: cross-sectional, descriptive, mixed methods study. *Journal of Medical Internet Research*, 22(9), e19550
- Mohammed, H. (2016):** Knowledge Concerning an Implantation Pacemaker For Adult Patients with Cardiac Rhythm Disorder at Al-Nassirrhya Heart. *Kufa Journal for nursing sciences*, 6(1): 73-79.
- Mohammed, O. A., Abd ELstar, M., & Mohamed, H. A. (2020):** Nurses' Performance Regarding Patient with Permanent Pacemaker in Intensive Care Unit. *Egyptian Journal of Health Care*, 11(1), 28-40.
- Padala, S.K., Cabrera, J.A. & Ellenbogen, K.A.(2021):** Anatomy of the cardiac conduction system. *Pacing and Clinical Electrophysiology*, 44(1), 15-25.
- Remme, C. A. (2022):** Getting to the heart of rhythm: A century of progress. *Physiological Reviews*, 102(3), 1553-1567.
- Stein, L., & Hollen, C. J. (2020).** *Concept-Based Clinical Nursing Skills: Fundamental to Advanced*. Elsevier Health Sciences, 890-899.
- Thabet, E. M., Helmy, H. A., Abdelaziz, M. A., & Khalf, G. S. (2019):** Assessment of Nurses' knowledge And Practices Regarding Temporary Pacemaker patients care. *Assiut Scientific Nursing Journal*, 7(19), 9-16.