Efficacy of Nursing Care Guidelines on Clinical Outcomes for Patients Undergoing Permanent Pacemaker

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Abstract

Background: Pacemaker Implantation is a crucial procedure which saves patient from life-threatening arrhythmias. Patients undergoing permanent implantable pacemakers face various physical and psychological challenges that are increase need to be fully informed about the specific restrictions and precautions for daily activities following pacemaker implantation to improve quality all over their life. **Aim:** This study was conducted to evaluate efficacy of nursing care guidelines on clinical outcomes for patients undergoing permanent pacemaker. **Design:** A quasi experimental research design was utilized. **Setting:** This study conducted at Cardiac Care Department of Tanta Educational Hospital. **Subjects:** A purposive sample of 80 adult patients undergoing permanent pacemaker surgery divided into two equal groups, **Tools**: four tools were used. **Tool (I):** Structured Interview schedule **Tool (II)**: Patients' Knowledge Assessment Sheet **Tool (III)**: Adherence to Pacemaker Care Practice **Tool (IV)**: Clinical Outcomes Assessment Tool **Results:** There was a highly significant statistical difference in the total knowledge levels of all studied patients as (87.5%, 90% and 85%) of study group had high level of knowledge about permanent pacemaker and its work after ten days, one month and three months post implementation of nursing care guidelines. Additionally, significant differences were observed between the study and control groups in adherence with pacemaker care practices (52%of control group had moderate adherence while 62% of study group had high adherence and performance of daily activities post-implementation. Furthermore, the study group showed a significant difference in pain levels according to the Visual Analog Scale**. Conclusion:** Knowledge, adherence to pacemaker care practices and independency in daily activities were improved in the study group after implementation of nursing care guidelines. **Recommendations**: Nursing care guidelines are essential for managing patients with permanent pacemakers. It's crucial to enhance caregivers' awareness about pacemaker practices, necessary precautions, and handling complications.

Keywords: Adherence, Nursing Care Guidelines, Outcomes, Permanent Pacemaker.

Introduction

Cardiac arrhythmia is a complex and insufficiently studied issue that affect 1.5% to 5% of the population and cause about 13% of global deaths. Arrhythmias can be asymptomatic or paroxysmal, complicating prevalence estimates, and are linked to higher morbidity and mortality **(Dalia & Amr, 2022; Ibrahim, 2019)**.

Cardiac stimulation mainly including temporary and permanent pacing is the primary treatment for symptomatic bradycardia or high-grade atrioventricular block. Permanent pacemakers (PPMs) are implanted devices used to ensure an adequate heart rate when the body's natural mechanisms are unable to do so. In 2023, approximately 3 million people relied on pacemakers, with 1.25 million new implants annually **(González, Vargas & Vallejo, 2023)**.

Pacemaker implantation is a crucial procedure that saves patients from life-threatening arrhythmias. However, post-operation, patients often face numerous issues due to shortage of knowledge, inadequate pre-operative preparation, and poor postoperative management. These issues can lead to both direct and indirect complications, including physical and psychological conditions as well as loss of bodily function, changes in individual hygiene, and limitations in social and sexual activities **(Magnusson & Liv, 2019)**.

Direct complications from pacemaker implantation can include infection at the pacemaker location, bleeding, hematoma, pneumothorax, ventricular ectopy, hemothorax, tachycardia, phrenic nerve stimulation, lead dislocation, and frozen shoulder. Additionally, patients may experience physiological effects such as pain, limited physical activity, shortness of breath, arrhythmias, and sudden death. Psychological impacts may involve anxiety, depression, alterations in self-image, and a decrease in self-esteem. **(Carrión, Marín, Molina & González, 2019)**.

Effective management for patients with pacemakers requires comprehensive knowledge of the device, its complications, and the patient's hemodynamic condition. Nurses play a critical role in patient education and reducing complications. Proper nursing care can prevent device performance issues and complications **(Ibrahim, 2019)**.

Adherence to recommended treatments and identifying worsening symptoms are crucial for preventing negative outcomes. Self-care is vital for improving the quality of life for these patients **(Magnusson & Liv, 2019)**. Managing cardiac rhythm disorders with device implantation necessitates lifestyle changes, including maintaining device efficiency, following a prescribed diet, managing stress, exercising as tolerated, recognizing symptoms, taking medications as prescribed, and regular follow-ups with healthcare providers.

Follow-up provides better communication between the treatment team members and the patients, increases the patients' self-confidence, and provides the opportunity to express their doubts and concerns. Improving the self-care behaviors can help the patients not to lose their control over their life and

adapt to the complications of their disease; this adaptability will lead to improvement of the quality of life in these patients **(Magnusson & Liv, 2019)**.

Significance of the Study: pacemaker implantation saves lives and improves health, self-care is crucial for device functionality **(Dalia & Amr, 2022)**. The documented medical records of the statistical data of the cardiology unit at the Tanta University Hospital reported that the number of patients who were admitted for pacemaker insertion was more than 25% of patients in 2023. Common issues include sleeping on the pacemaker side, passing through metal detectors, wearing tight clothing over the pacemaker site, and holding electrical devices near the pacemaker.

Aim of the study was to:

Evaluate efficacy of nursing care guidelines on clinical outcomes for patients undergoing permanent pacemaker.

Research hypotheses

-Knowledge and adherence score for patients undergoing permanent pacemaker is expected to be improved post implementation of nursing care guidelines than control group.

-Patients undergoing permanent pacemaker will exhibit improvement in their clinical outcomes (Activity of daily living and visual analogue scale for pain) post implementation of nursing care guidelines.

Subjects and Method

Design: quasi experimental design was used in this study.

Study settings: -

The study was conducted at Cardiac Care Department of Tanta Educational Hospital, which is affiliated to ministry of higher education and scientific research.

Study subjects: -

A purposive sample of 80 adult patients undergoing permanent pacemaker surgery were selected based on the Epidemiological Information Program, the total patient per year was 100 patients in (2022) according to review of Tanta educational hospital and Tanta University Hospital statistical records. The sample size was estimated using power analysis for independent t-tests [One tail, Effect size = 0.55; significance level (α) at 0.05; Power (1-β) = 0.85].

The sample was divided into two equal groups, with 40 patients in each, as follows: -

Group I: Study group (40 patients) who received nursing care guidelines provided by the researcher, in addition to the hospital's routine care for pacemaker patients.

Group II: Control group (40 patients) who received only the hospital's routine care for pacemaker by nursing staff as assessment of vital signs, wound care, administration of medication and hygienic care.

-Inclusion criteria of subjects:

-Patients with permanent pacemaker implementation for first time.

- 21 to 60 years.

-Both sex.

-Free from any other disorders as visual, mental and hearing disorders.

-Patients who agreed to take part in the research study.

Study tools:

Tool I: **"Structured Interview schedule**'' The researcher developed the tool after reviewing relevant literature **by Mulpuru et al. (2017) and Proclemer et al. (2016).** It consisted of three parts:

Part (a): Socio-demographic Data: This section included information on the patient's age, gender, educational level, marital status, occupation, income, and living status.

Part (b): Clinical Data: This section covered the patient's past medical and surgical history, duration of the disease, previous cardiac-related medical and surgical history, and hemodynamic stability (including oxygen saturation and vital signs)

Part (c): Observational checklist of patients' manifestations. It was developed. by the researcher after reviewing of related literatures **(Mulpuru et al., 2017) and Proclemer et al. (2016)** and assessed presence of dyspnea, fatigue, syncope, dizziness and chest pain.

Tool II: Patients' Knowledge Assessment Sheet

-It was developed by researcher following review of related literatures **(Mulpuru et al., 2017) and (**Proclemer **et al., 2016)** To evaluate patients' knowledge of the pacemaker implantation process, including the functioning of a permanent pacemaker, medications, permissible activity levels, appropriate nutrition, follow-up care, postoperative complications, wound care, and the principles for maintaining the efficiency of a permanent pacemaker.

-It consisted of 51 questions in total covering 4 main areas and included four categories in the form of MCQ; Patients' knowledge regarding heart's basic structure (7 items), Patients' knowledge regarding permanent pacemaker process and its work (18 items), Patients' knowledge regarding pacemaker postoperative phase, postoperative complications and follow up (12 items) and Patients' knowledge regarding principles of maintaining pacemaker - efficiency (14 items).

Knowledge' scoring system:

-Each correct answer response for multiple choice questions was given one score and the wrong answer was given zero score. The overall scoring system of patients' knowledge was categorized as the following:

-The total score of knowledge >75%: high.

-The total score of knowledge from 60% to 75%: moderate.

-The total score of knowledge < 60%: low.

Tool III: ''Adherence with Pacemaker Care Practice Tool'' (Sharma& Singh, 2018):

(Khina Sharma 2018) has developed that tool and adopted by the researcher to evaluate permanent pacemaker patients'-adherence with care practices. It was questionnaire that include (15 items) like assessing pulse daily, Pressure over location, diet, loose cotton clothes over site, allowed exercise, dryness of wound, follow up and interference with other machines.

Scoring system:

Each item was given (1) mark for performing right activity and (0) marks for not performing appropriate activity.

-The total score of (11-15) indicated high adherence t0 pacemaker care practices.

-The total score of (6-10) indicated moderate adherence t0 pacemaker care practices.

-The total score of (0-5) indicated low adherence t0 pacemaker care practices.

Tool (IV): Clinical Outcomes Assessment Tool (Mahoney & Barthel, 1965), (Nair, 2022) and (**Woodforde & Merskey, 1972).**

It comprised of 2 parts:

Part (a): Barthel Index scale (Mahoney & Barthel, 1965).

This tool was developed by **(Barthel and Mahoney 1965)** and was adopted by **(Nair 2022)** and was modified by the researcher to measure activity of daily living which includes (feeding, grooming, bathing, toilet use, transfer, mobility, dressing and stairs).

Scoring system:

Each performance item was rated on a scale, with points assigned based on the patient's ability to perform the task independently, with assistance, or dependently (0 = dependent, 1 = needs some assistance, and 2 = independent). The scores for the items were summed up, and the total was divided by the number of items, and then classified as follows:

- A total score of 13-16 (> 75%) indicated independence in daily activities.
- A total score of 8-12 (≥ 50% - 75%) indicated the need for assistance.
- A total score of 0-7 (< 50%) indicated dependence in daily activities

Part (b): Visual analog scale (VAS) for shoulder pain (**Woodforde & Merskey, 1972) and (Catharina et al., 2022).**

This tool was used to measure of pain intensity condition before and after application of nursing care guidelines by 1 and 3 months.

Scoring system:

The score is determined by using a ruler to measure the distance (in mm) on a 10-cm line between the "no pain" anchor and the patient's mark, resulting in a score range of 0 to 100.

Ethical Considerations: The study received approval from the Faculty of Nursing's ethical committee (code no. 118/11/2022). Informed consent was obtained from each patient after explaining the study's procedures and purpose. Patients were assured of data confidentiality and their right to refuse participation or withdraw at any time without any consequences. Code numbers were used in place of names. Permission was obtained officially from the relevant authorities and the head of the cardiology department at Tanta Educational Hospital.

Tools developments: Tool I and tool II were developed by the researcher after review of the relevant literature **(Mulpuru et al., 2017), (Proclemer et al., 2016)**. Tool III **‘‘Adherence with Pacemaker Care Practice Tool’’** was developed by **(Khina Sharma 2018),** Tool IV part (a) **“Barthel Index scale”** was developed by **(Barthel and Mahoney 1965)** and was adopted by (Nair 2022) was modified by researcher after review of literature (**Mahoney&**

Barthel 1965) and Tool IV part (b) **"Visual analog scale (VAS) for shoulder pain"** was developed by **(Woodforde and Merskey 1972)** and was adopted by (Catharina 2022).

Content Validity: The tools developed for the study were tested for content validity and clarity by nine experts from the Medical-Surgical and Cardiology departments accordingly needed modifications were done. It was calculated and found to be = (98%).

Reliability of the Tools: Reliability was assessed using Cronbach's alpha, with scores of 0.89 for tool II, 0.921 for tool III, 0.869 for tool IV part (a), and 0.794 for tool IV part (b). Appropriate statistical tests were used to evaluate questionnaire reliability.

Pilot Study: A pilot study was carried out on 10% of patients with permanent pacemakers, who gave oral approval, to test the clarity, feasibility, and applicability of the tools. Modifications were made based on the results of the pilot study. Data from these patients were excluded from the main study.

Duration of Data Collection: Data were collected over 10 months, from April 2023 to January 2024. Control group was studied first, followed by the study group to prevent data contamination.

Study Phases: The study was conducted in four phases: assessment, planning, implementation, and evaluation.

1-Assessment phase:

The researcher used Tool I parts (a), (b), and (c) to collect patient data and assess eligibility for the study at the time of admission. Patients' knowledge about the pacemaker implantation process, medications, activity levels, nutrition, follow-up, postoperative complications, and maintaining pacemaker efficiency was assessed twice, before and after implementing nursing guidelines, using Tool II.

Post-implementation, patients were assessed three times: on the 10th day, one month, and three months after pacemaker implantation, using Tool II, Tool III, and Tool IV parts (a) and (b).

2-Planning phase:

This phase was developed using data from the assessment phase, a review of relevant literature, and identified priorities and goals. Expected outcome criteria were also taken into account when planning patient care.

Each patient was individually interviewed in the cardiology department, with interviews lasting 15-20 minutes to complete the tools during follow-up.

The researcher prepared a booklet and PowerPoint presentation based on the literature review. The PowerPoint was presented, and the booklets, which included diagrams and pictures, were designed in Arabic and given to patients as a guideline to understand all aspects of permanent pacemaker implantation.

The nursing care guidelines were presented to the study group in three sessions, each lasting 30-45 minutes. The sessions were scheduled according to hospital policy on the 1st and 10th days post-implantation and one month after implantation to complete the application of the nursing care guide lines.

3- Implementation phase:

Nursing care guidelines for patients with permanent pacemakers were developed

and implemented by the researcher based on, assessment data and literature review. Motivation and reinforcement were used during sessions to encourage participation in the study.

Each session were divided as follow:-

Session 1: Focused on basic knowledge of permanent pacemakers, possible postoperative complications, and basic care guidelines. The objective was to enhance understanding of pacemakers, including their definition, types, function, medications, activity levels, nutrition, follow-up, signs of complications, wound care, and maintenance principles.

Session 2: Covered guidelines for daily living activities and nursing interventions for shoulder pain. The objective was to improve knowledge about daily activities such as toilet use, dressing, grooming, mobility, stairs, bathing, and feeding. Each session lasted 30-45 minutes.

Session3: Addressed pacemaker precautions, risks, signs of malfunctions, and a review of guidelines related to pacemaker care and daily activities. This session was conducted one month after pacemaker implantation and lasted 30-45 minutes.

Control Group: Received routine nursing care from cardiology staff, including wound dressing, medication administration, vital signs assessment, and hygienic care.

Teaching Methods: Theoretical part was delivered through lectures and group discussions using booklets and PowerPoint presentations. The practical part was demonstrated and re-demonstrated using a doll.

4- Evaluation phase:-

Patients were evaluated using the following tools:

Tool II: Administered before pacemaker surgery and after sessions on the 10th day, 30 days, and three months post-implantation to assess efficacy of nursing care guidelines on clinical outcomes for both the study and control groups.

Tool III and Tool IV (parts a and b): Used after pacemaker implantation on the 10th day, one month, and three months to evaluate the impact of nursing care guidelines on clinical outcomes for both groups.

Methods of data analysis:

All data were collected, coded, tabulated and subjected to statistical analysis. Statistical analysis was performed by statistical Package SPSS in general (version 24), Data expressed as number and percentage. A probability level of p-value $\leq$ 0.01was adopted as a level of significance for testing the research hypotheses (22).

Results

Table (1): Distribution of the Studied Patients According to Socio-demographic Characteristics in Both Study and Control Groups.

The study results indicate that the majority of patients in both the study and control groups were aged 50-60 years (60% and 52.5%, respectively), with mean ages of 47.65±9.64 for the study group and 48.80±10.28 for the control group. Most patients were male (70% in the study group and 62.5% in the control group), while females comprised 30% and 37.5% of the study and control groups, respectively. Additionally, the majority of patients were married (77.5%

in the study group and 82.5% in the control group).

Regarding educational levels, about half of the patients were illiterate (55% in the study group and 47.5% in the control group), while 22.5% and 25% had primary education in the study and control groups, respectively. In terms of occupation, more than one-third of the patients in the study group were employees or housewives (30%), while more than one-third of the control group patients had manual jobs (35%). Furthermore, over two-thirds of the patients (62.5% in the study group and 67.5% in the control group) reported insufficient income.

Table (2): Percentage Distribution of the studied patients According to Their Total Level of Knowledge Regarding Permanent Pacemaker and its work in Pre and after 10th day, one month and three months post implementation of Nursing care Guidelines.

For the control group, there was no significant improvement in overall knowledge about permanent pacemakers and their function throughout the routine hospital care period. The majority of patients (77.5%, 75%, and 70%) had low knowledge levels before implantation, 10 days after, and one month after implantation, respectively. After three months, about 55% still had poor knowledge levels.

In contrast, the study group showed a significant improvement in their knowledge about permanent pacemakers and their function. Initially, 75% had low knowledge levels before the implementation of nursing care guidelines. However, after ten days, 30 days, and three months post-implementation, 87.5%, 90%, and 85% of patients, respectively, had high knowledge levels

Figure (1): Percent-age Distribution of the studied patients According to Their Total level of adherence with pacemaker care practice after 10th day, one month and three months post implementation of Nursing care Guidelines.

For the control group, there was no significant improvement in adherence to pacemaker care practices throughout the routine hospital care period. The majority of patients (70%, 62.5%, and 65%) had low adherence levels at the follow-up periods (10 days, one month, and three months post-implantation). Only 25% and 27.5% of patients showed moderate adherence at one month and three months post-implantation, respectively.

In contrast, the study group showed significant improvement in adherence to pacemaker care practices. The majority of patients (85%, 92.5%, and 87.5%) demonstrated high adherence at the follow-up periods (10 days, one month, and three months post-implantation) after the implementation of nursing care guidelines.

Figure (2): Percent-age Distribution of the studied patients According to Their Total level of activity of daily living throughout periods of the study.

The figure shows a highly significant statistical difference in the total level of daily living activities among all studied patients throughout the study period. In the control group, 30% were dependent on their daily activities compared to

12.5% in the study group. Additionally, 60% of the control group needed assistance with daily activities, whereas 57.5% of the study group were independent in their daily activities.

Figure (3): Distribution of the Studied patients According to Visual analog scale (VAS) for shoulder pain in Both Study and Control Groups After 10th day, one month and three months post implementation of Nursing care Guidelines(n=80).

The figure indicates that nearly half (42.5%) of the control group patients experienced severe pain 10 days after pacemaker implantation during routine nursing care. Additionally, 52.5% and 62.5% of the control group reported moderate pain levels at one month and three months post-implantation, respectively. There was no significant difference in pain levels among the control group throughout the study period according to the Visual Analog Scale (VAS) (p-value = 0.090).

In contrast, the study group showed significant improvement, with 67.5%, 77.5%, and 90% of patients reporting mild pain levels at 10 days, 30 days, and three months post-implantation, respectively, after implementation of nursing care guide lines. There was a statistically significant difference in pain levels among the study group throughout the study period according to the VAS (p-value = 0.001).

Table (3): represents Correlation between Total Level of Knowledge and Total level of adherence to care practice and Clinical outcomes.

Total Adherence to Care Practice: There is a significant positive correlation between the total level of knowledge and adherence to care practices (r = 0.378, p = 0.012).

Activity of Daily Living: The total level of knowledge positively correlates with daily living activities (r = 0.312, p = 0.027). Additionally, adherence to care practices also positively correlates with daily living activities (r = 0.287, p = 0.038).

Pain: There is a significant negative correlation between the total level of knowledge and pain (r = -0.405, p = 0.005). Similarly, adherence to care practices shows a significant negative correlation with pain (r = -0.485, p = 0.001), indicating that better adherence to care practices is associated with lower pain levels.

Table (1): Distribution of the Studied Patients Acc0rding to Socio demo-graphic Characteristics in Both Study and Control Groups (n=80).

Socio demographic Characteristics	The studied groups				χ^2 P
	Study (n=40)		Control (n=40)		
	N	%	N	%	
Age (in years)					
21 – 30	2	5	3	7.5	
> 30 – 40	5	12.5	5	12.5	
> 40 – 50	9	22.5	11	27.5	0.896
> 50 – 60	24	60	21	52.5	
Mean ± SD	47.65±9.64		48.80±10.28		
Sex					
Male	28	70	25	62.5	0.478
Female	12	30	15	37.5	
Marital status					
Married	31	77.5	33	82.5	
Single	4	10	3	7.5	0.939
Divorced	2	5	2	5	
Widow	3	7.5	2	5	
Education level					
Illiterate	22	55	19	47.5	
Read and write	5	12.5	6	15	
Primary education	9	22.5	10	25	0.456
Secondary education	2	5	5	12.5	
University / higher	2	5	0	0	
Occupation					
Not work	5	12.5	0	0	
Manual work	11	27.5	14	35	0.142
Employee	12	30	13	32.5	
House wife	12	30	13	32.5	
Income					
Enough	15	37.5	13	32.5	0.639
Not enough	25	62.5	27	67.5	
Living status					
Alone	4	10	2	5	0.396
With family	36	90	38	95	

Table (2): Percentage Distribution of the Studied patients According to Their Total Level of Knowledge Regarding Permanent Pacemaker and its work in Pre and After 10th day, one month and three months post implementation of Nursing care Guidelines (n=80).

Total Knowledge level			Study	Control	X^2	P-value
Pre implantation of permanent pacemaker	Low	N	30	31	0.216	0.897
		%	75.0%	77.5%		
	Moderate	N	7	7		
		%	17.5%	17.5%		
	High	N	3	2		
		%	7.5%	5.0%		
After 10th day	Low	N	2	30	53.047	0.001*
		%	5.0%	75.0%		
	Moderate	N	3	7		
		%	7.5%	17.5%		
	High	N	35	3		
		%	87.5%	7.5%		
After one month	Low	N	1	28	53.011	0.001*
		%	2.5%	70.0%		
	Moderate	N	3	8		
		%	7.5%	20.0%		
	High	N	36	4		
		%	90.0%	10.0%		
After three months	Low	N	4	22	39.204	0.001*
		%	10.0%	55.0%		
	Moderate	N	2	12		
		%	5.0%	30.0%		
	High	N	34	6		
		%	85.0%	15.0%		

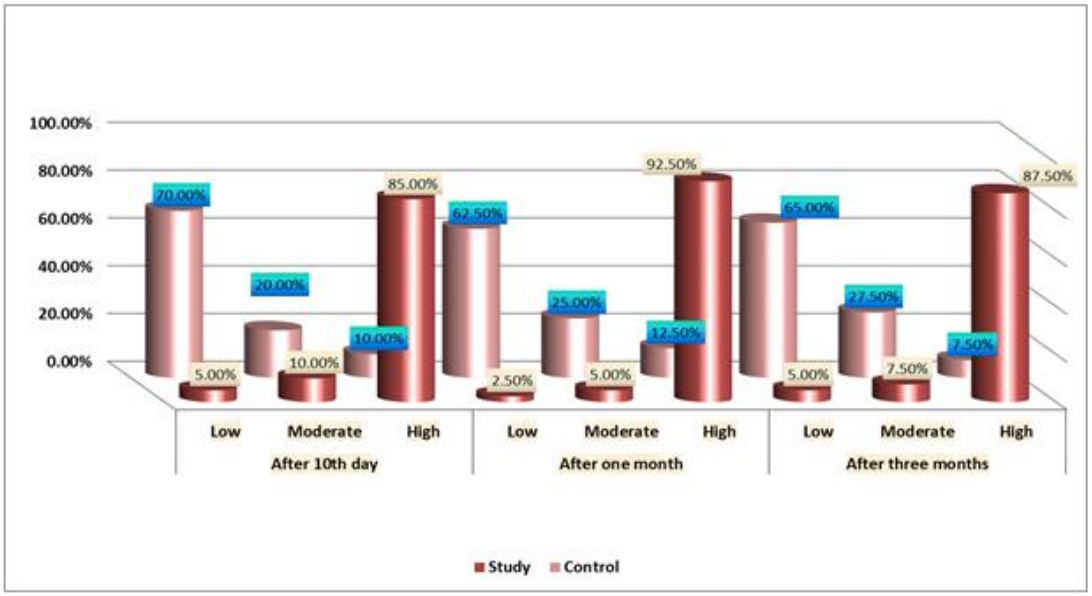

Figure (1): Percentage Distribution of the studied patients according to their total level of adherence with pacemaker care practice after 10th day, one month and three months post implementation of Nursing care Guidelines.

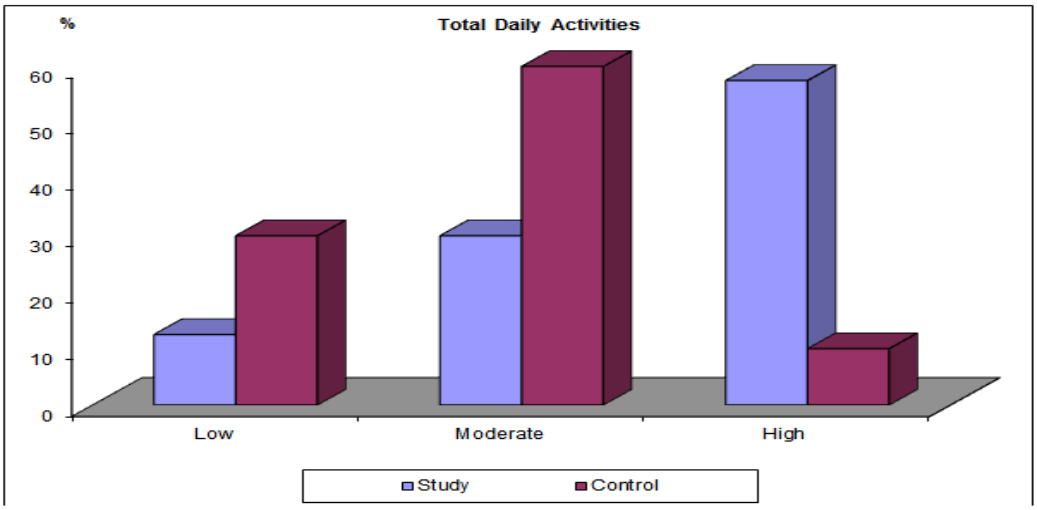

Figure (2): Percentage Distribution of the Studied patients According to Their Total level of activity of daily living throughout periods of the study (n=80).

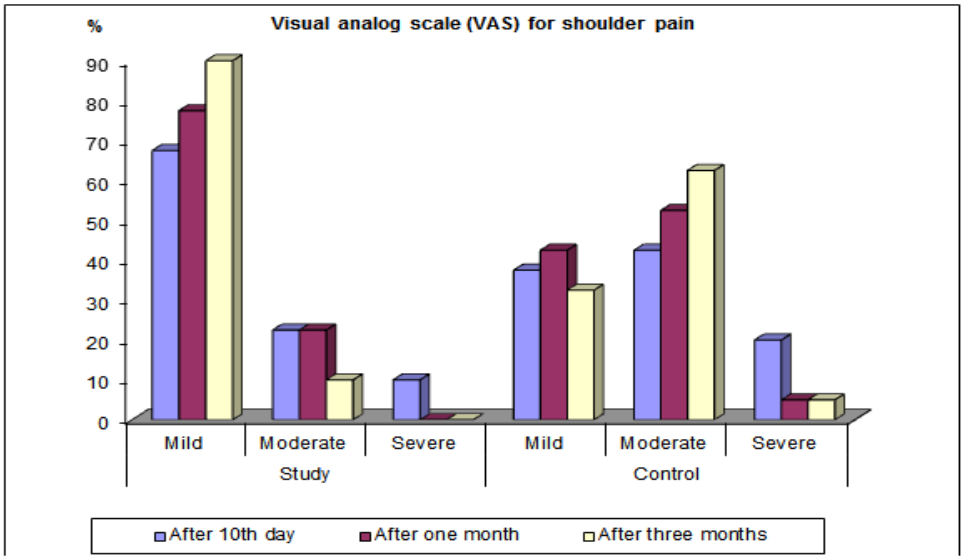

Figure (3): Distribution of the Studied patients According to Visual analog scale (VAS) for shoulder pain in Both Study and Control Groups After 10th day, one month and three months post implementation of Nursing care Guidelines (n=80).

Table (3): Correlation between Total Level of Knowledge and Total level of adherence to care practice and Clinical outcomes.

	Total level of Knowledge		Total Adherence to care practice	
	R	P	r	P
Total Adherence to care practice	0.378	0.012*	-	-
Activity of daily living	0.312	0.027*	0.287	0.038*
Pain	- 0.405	0.005*	- 0.485	0.001*

Discussion

A permanent pacemaker can significantly improve the quality of life and, in many cases, may be lifesaving. Optimal outcomes are achieved when patients comply with lifelong adaptations required by a permanent pacemaker **Khalil, Soliman, Ahmed, & Hamza, (2020).** Although the surgery is generally low risk, about 3% of recipients may experience complications, ranging from mild to potentially life-threatening.

The current study shows that implementing nursing care guidelines improved patients' knowledge about the pacemaker implantation process and its function. Additionally, these guidelines enhanced patients' adherence with pacemaker care practices and their ability to perform daily activities. There was also a reduction in pain levels throughout period of the study following the application of nursing care guidelines so, the aim of this study is to evaluate efficacy of nursing care guidelines on clinical outcomes for patients undergoing permanent pacemaker.

Regarding Socio-Demographic Characteristics: The study showed that, More than half of the patients were in late middle age, which aligns with findings by **Chiao et al. (2016) and North and Sinclair (2012)** that aging significantly affects the heart and blood vessels leading to an increased incidence of cardiovascular diseases (CVDs). However, **Khawaja et al. (2011)** noted a significant increase in pacemaker implantation around age 40, likely due to increased cardiac incidents and life stressors in younger adults.

Regarding gender: The majority of patients in both groups were male, as men are at higher risk for heart diseases and hypertension. Men also experience more stress from physical activities and have fewer ways to express emotional stress, making them less likely to seek medical help. This is reinforced by **Smith (2015),** who found that men's coping mechanisms for stress are less adaptive, contributing to their higher risk for chronic heart diseases.

Education: Approximately half of the patients in both groups were illiterate, likely due to low social standard of patients at the new Main University Hospital. This finding is consistent with **Nasr, El Ganzory, and Ahmed (2015),** who found an inverse relation between educational level and CVD incidence; this is attributed to the high incidence of smoking and un healthy habits among patients with lower levels of education.

Occupation: More than one third of the study group were employees, while more than one third of the control group had manual jobs. This is explained by the physical demands of labor work. **Rahmawati et al. (2013)** found that short episodes of physical exertion

increase the risk of cardiovascular events

Income: The study showed that more than two-thirds of patients in both the study and control groups reflected their income insufficient. This may be due to high living costs, expensive medications, and the unavailability of many heart medicines at state expense. These findings are consistent with **Mohamed, Shreif, Mohamed, and Maaty (2016),** who reported that most patients with pacemakers had inadequate income for treatment costs and faced high transportation and medication expenses.

The study revealed that the study group showed significant improvements in knowledge about the permanent pacemaker process and its function after implementing nursing care guidelines. This improvement was observed at the 10th day, one month, and three months post-implantation. The patients' enthusiasm to learn and the clear, concise presentation of information in simple Arabic, along with the availability of the researcher for clarification, contributed to this improvement. This aligns with findings by **Mohamed & Abd El-Lateef (2014) and Ruzzalian (2020),** who reported similar improvements in patient knowledge following educational programs.

The study also revealed a significant difference between the control and study groups in adherence to pacemaker care practices after implementing nursing care guide lines. The control group showed no significant improvement, while the study group demonstrated high adherence levels at all follow-up periods. This improvement was attributed to the use of colored booklets, audiovisual aids, continuous demonstrations, and better communication facilities. Similar findings were reported by **Sharma & Singh (2018) and Ali et al. (2021).**

Regarding daily living activities, both groups showed improvement, but the study group had a significantly higher level of independence. This was likely due to the positive impact of the nursing care guidelines, which improved patients' skills and confidence in performing daily activities. This finding is in line with **Sharma & Singh (2018).**

The study also found a significant reduction in pain levels among the study group, with patients reporting mild pain at three months post-implantation, compared to moderate pain levels in the control group. This improvement in pain management was supported by **Magnusson and Liv (2019),** who reported high satisfaction among pacemaker patients with their overall condition, including pain management and device functionality.

In relation to Total Level of Knowledge and Total Adherence to care practice: The study found a significant positive correlation

between the total level of knowledge and adherence to permanent pacemaker care practices. This result is supported by **Yossif and Abd El-aal (2017),** who also found a highly significant positive correlation between knowledge and practice scores. Patients with better knowledge tend to perform self-care more effectively. Similarly, **Mohamed, Shreif, Mohamed, and Maaty (2016)** reported a significant relationship between patients' knowledge and their practices regarding pacemaker care in their study on the effectiveness of educational programs. **Wenwen et al. (2016)** also found a significant positive correlation between total knowledge and practice sc**0**res between, study and control group subjects across different assessment periods**.**

Conclusion

Based on the findings of the current study, it can be concluded that:

Nursing care guidelines for patients with permanent pacemakers have been effective in enhancing adherence to care practices and independence in daily activities.

Significant improvements were observed in knowledge, postoperative care, precautions, pain management, and follow-up after implementing nursing care guidelines.

Recommendations:

A simplified and comprehensive booklet with up-to-dated guidelines on pacemaker management should be provided to all patients undergoing permanent pacemaker implantation upon admission. This booklet should contain photos to aid understanding for illiterate patients.

Nursing care guidelines should be a integral part of the overall management for patients with permanent pacemakers.

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