- *Basic Research*

The Effect of Nursing Discharge Practical Adherence Tips on Optimizing Patients' Living Throughout Permanent Pacemaker Installation

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Abstract

Background: Permanent pacemaker installation is an emerging lifesaving practice; Therefore, it is considered vital for the patients to have knowledge and experience practical adherence throughout the permanent pacemaker installation to get maximum quality all over their life day-to-day. This study **aimed** to evaluate the effect of nursing discharge practical adherence tips on optimizing patients' living throughout permanent pacemaker installation. **Design:** A quasiexperimental research design was utilized. **Setting:** The study was conducted at the cardiology unit, coronary care unit, intermediate coronary care unit, and outpatient pacemaker programming clinic affiliated to Al Batinah Specialized University Hospitals. **Subject:** A purposive sample of 92 adult patients was selected and equally divided into the study and control groups, (46) patients for each one. **Tools:** three tools were used for data collection; patients' structured interview questionnaire, knowledge questionnaire, and self-care practical observational checklist. **Results:** There was a highly statistically significant difference between study and control group regarding total mean scores of knowledges and all dimensions of patient self-care practical adherence scores for pre/post and follow up phases at (p < 0.001). There were highly statistically significant positive correlation between total knowledge and total practical adherence for post-test and follow-up phases at p > 0.01. **Conclusion:** There was an improvement in patients' optimization of living with permanent pacemaker throughout installation based on practicing written adherence tips. **Recommendation:** Designing a written Arabic discharge practical adherence tip for patients and procedure checklist for nurses in all cardiac units and outpatient clinics for optimization of patients' living with a permanent pacemaker.
Key words: Nursing, Permanent pacemaker, Discharge Practical adherence tips.

Introduction

Permanent pacemaker installation (PPI) is an emerging lifesaving practice that is being extensively used in the contemporary whiles. Therefore, it is considered vital for the patients to be aware of knowledge and experience practical adherence and activity

performance after permanent pacemaker installation which support living with a pacemaker throughout their day-to-day life. Patients with implanted permanent cardiac devices should originate a developing segment of up-to-date health practice. These patients should have a unique education regarding practical adherence and activity performance which support living with pacemaker (**Snegalatha et al., 2019**).

Permanent pacemaker installation plays a key role in the management of heart rhythm disorders which is an electronic device, approximately the size of a pocket watch that senses intrinsic heart rhythms and provides electrical stimulation to control and regulate heart beats for patients with slow heart rate or symptomatic heart blocks and in patients with heart failure. The cardiac pacemakers are generally composed of two components as a pulse generator which is a small battery-powered unit connected to the heart through tiny wires and one or two electrodes or leads which deliver the electrical impulse from the generator to the myocardium for myocardial stimulation. At present, there are three approaches to permanent cardiac pacing including single-chamber pacemaker, dual-chamber pacemaker and biventricular pacing (**Yarlagadda, 2020; Mehmood & Goyal, 2020**).

Guidelines for the installation of cardiac pacemakers have been established by a commission formed by the American College of Cardiology (ACC), the American Heart Association (AHA), and the Heart Rhythm Society (HRS). Additionally, The European Society of Cardiology has established similar guidelines (**Kosztin et al., 2018; Boros, Geller & Merkely, 2018; BobManuel et al., 2018**). ACC/AHA/HRS divided indications of pacemaker installation into three specific classes which are divided as the following: Class I and II; these are conditions where installation of a pacemaker is considered necessary and beneficial. Class I where benefits much greater than risks; However, Class II consists of Class IIa where benefits greater than risk, while in class IIb, the benefits are greater than or equal to the risks. On the other hand, Class III which permanent pacing is not recommended, and it may be harmful for some cases, risks greater than the benefits (**Proclemer et al., 2018; Tarun & Bashar, 2020**).

Patients who need a permanent pacemaker have warning signs included a slow or abnormal heart rate that causes fainting, dizziness, tiredness, shortness of breath, palpitations, or loss of consciousness. The pacemaker can be programmed by the physician in order to either send out a pulse or to wait for the heart to beat on its own in order to provide appropriate support for a wide range of medical, lifestyles needs and activities. A pacemaker normally lasts from five to ten years, it lasts depending on the type of battery, how often it sends a pulse, the patient's medical condition follow up, adherence to healthy lifestyles needs and activities (**Olshansky, Ganz & Dardas, 2021**).

Pacemaker installation is only the primary stage in the long-lasting management of the patient with a permanent pacemaker. The challenge of this management is deceit in the wide-ranging devices follow-up. As the quantity of embedded maneuvers has been increasing year on year. This is compounded by increasing data provided by devices and increasing complexity in programming therapy and discharge practical adherence, so put the burden of follow-up. There were both general national and international guidelines set out clear criteria on pacemaker follow-up, but very little were provided in the way of detail. Both locally and globally, patient must be redirected in the massive difference in the routine of pacemaker follow-up care. Like most therapeutic intermediations pacemaker follow-up has to be personalized to the individual **(Lim & Prabhu, 2019)**.

Nurses have a vital role in the provision of crucial health services and are essential in reinforcing the health system, throughout improving health outcomes and the overall cost-effectiveness of services. The quality of communication in interactions between nurses and patients has a major influence which made a difference in positive patient outcomes **(Sibiya, 2018)**. Effective patient education has been shown to improve the patients' hospitalization experiences and the ability to care for themselves post-discharge, thus reducing morbidity and mortality. Available nursing discharge practical adherence tips for optimizing patients' living with a permanent pacemaker are relevant to the patient's level of understanding and comprehension, delivered at the appropriate time, as well as it can be one of the prerequisites for the patient to increase knowledge, practice, motivation, and awareness of the importance of co-responsibility to make decisions about medical treatment and improving the patient's outcomes, resulted in the future medical interventions may be needed less frequently **(Koren & Sharaf, 2016; Allarakha, 2020)**.

Provide evidence about the permanent pacing, comprising the intention for pacing; explanation of the equipment; what to expect during permanent pacing; precautions and restrictions in activities of daily living; signs and symptoms of complications; instructions on when to call the medical staff and information on expected follow-up. Accepting of operational pacemaker and discharge expectations contributes to the patient and family in developing representative observations of permanent pacing treatment. Nursing discharge practical adherence tips may improve compliance with restrictions and promote effective lifestyle management after discharge. Provide information about practical adherence and activity of daily living, required device follow-up, including in-clinic evaluation and monitoring **(Spotts & Wiegand, 2017; Turan & Amr, 2020)**.

Mainly patient management is focused on improving patients' health and enabling better outcomes across the health continuum from healthy living and prevention, to diagnosis, treatment, and home care. So consultations and monitoring patients with an implantable pacemaker should be observed in a committed Implantable Cardioverter-Defibrillator

clinic. Patients are seen more frequently after installation as the following; one week post-implant for a wound check, one-month post implant for device cross-examination, and three months post-implant for repeat device reexamination. Then follow-up intervals commonly can be extended to every six months in patients who are clinically stable (**Beyerbach, 2019; Gururaj, 2020)**.

Significance of the study

The number of pacemakers globally is expected to increase significantly between 2016 and 2023. Pacemakers are an essential live-saving implantable device for individuals living with certain heart conditions. As of 2016, it was appraised that there were approximately 1.14 million pacemakers universally. By the year 2023, that number is expected to increase to 1.43 million units, there were 8.89 million deaths from ischemic heart disease **(Stewart, 2020; Elflein, 2021)**.

According to the latest World Health Organization Rankings data published the heart disease deaths in Egypt reached 271.69 per 100,000 of population ranks which is about 29.38% of total deaths rate and Egypt considered number 15 in the world rank (**World Health Organization Rankings, 2021)**. In Egypt, data about pacemaker installation was very rare till recently. Meanwhile, according to the Statistical Office of Al Batinah Specialized University Hospital affiliated to Mansoura University revealed that the number of patients who had undergone permanent pacemakers in years (2019/2020) were184 patients.

Aim of the study: This study was conducted to evaluate the effect of nursing discharge practical adherence tips on optimizing patients' living throughout permanent pacemaker installation through:

1. Assessing the patients' knowledge and practical adherence throughout permanent pacemaker installation.
2. Designing nursing discharge practical adherence tips for patients with permanent pacemaker, according to their needs.
3. Implementing nursing discharge practical adherence tips for patients with permanent pacemaker.
4. Evaluating the effect of nursing discharge practical adherence tips on level of patients' knowledge and practical adherence.

Research hypotheses:

H1. Patients in the study group will have a statistically significant improvement of knowledge post nursing discharge practical adherence tips implementation as compared to the control group.

H2. Patients in the study group will have a statistically significant improvement of practical adherence post nursing discharge practical adherence tips implementation as compared to the control group

H3. There will be correlation between total patients' knowledge and total practical adherence among the study group.

Operational definition:

Nursing discharge practical adherence tips: Set of planned activities, practical adherence instructions designed to improve both patients' knowledge and practice level at the initial acute phase of treatment, following hospitalization and help patients to manage their care for optimizing living with permanent pacemaker installation.

Subjects and Methods:

Research design: Quasi-experimental research design was used to conduct this study.

Setting: The study was conducted at cardiology unit, coronary care unit, intermediate coronary care unit and outpatient of pacemaker programming clinic at Al Batinah Specialized University Hospital affiliated to Mansoura University Hospitals.

Subjects: A Purposive sample of (92) adult patients undergoing permanent pacemaker installation, divided into two similar groups (46 for the control group and 46 for the study group). The sample size is determined by statistical analysis (power analysis) where it represents the total number of patients who have applied PPM in the hospital in the year 2019 which were (184) patients. Those who were to be followed at the outpatient cardiac clinic at the hospital were eligible for screening.

Inclusion criteria:

Adult patients of both sexes (age ≥ 18 years), without critically or psychotic disorders, first time for pacemaker installation, and not exposed before for any educational or learning experience related to the pacemaker.

Tools for data Collection:

Data for this study were collected using the following tools:

Tool I: Patients' Structured Interviewing Questionnaire: This questionnaire was designed by the researchers in an Arabic language after reviewing the related literature **(Mohammed, Abd Elstar & Mohamed, 2020).** It included the following parts:

Part 1: Demographic Characteristics: It included; age, sex, marital status, level of education, occupation, income, and residence.
Part II: Past Medical History: It included; duration of illness and comorbidities.

Tool II: Interview Patient's Knowledge Questionnaire: This questionnaire was designed by the researchers in an Arabic language after reviewing the related literature and the items on this sheet were adapted from **Swerdlow, Wang and Zips (2019)** and **Mohammed, Abd Elstar, and Mohamed (2020)**, to assess patients' knowledge regarding pacemaker installation and its complications, it included 13 items (Basic structure and function of the heart, the normal pulse rate and sites of measuring pulse, pulse measurement methods, basic structure and the mechanism of pacemaker, indications, locality, battery replacement, expected sign of pacemaker complication, preventive measures of expected complications, importance of medications compliance, signs of pacemaker malfunction, medical follow-up dates of pacemaker examination after discharge and precautions that the patient must follow it).

Scoring system: The total score of patients' knowledge was (13) grades, 1 grade were given to the complete correct answer and zero to the wrong answer or not answer. A total score was considered as the following:

□ ≥ 80% was considered satisfactory level knowledge □ < 80% was considered unsatisfactory knowledge.

Tool III: Patient Self-care Practical Observational Checklist: It was developed by researchers and written in an Arabic language based on the related literature (**Swerdlow & Friedman, 2018; Swerdlow, Wang & Zipes, 2019; Santucci &Wilber, 2020**) to assess patients' ability to perform skills related to self-care during pre and post pacemaker installation and their post-discharge practical adherence and follow-up care. The observational checklists were composed of two main sections:

Section I: The observational checklists during hospitalization: it was used to assess patients' skills related to self-care at pre and postpacemaker installation during hospitalization. It included 2 main items related to (practical tips pre-pacemaker

installation (5 questions) and practical tips post-pacemaker installation (10 questions)

Section II: The observational checklists post-discharge and follow-up care: it was used to assess patients' practical adherence related to self-care at post discharge and follow up care. It included 7 main items related to (Early warning sign (9 questions), activity and functional status (13 questions), patient safety (9 questions), medication compliance (3 questions), healthy diet (4 questions), smoking cession (2 questions) and sign of devices failure (4 questions))

 Scoring system: The total score of patients' self-care practice observational checklists was (59) grades, 1 grade was given to the step which was done correctly and zero to the step which was done incorrectly or not done. A total score was considered as the following:

- $\geq 80\%$ was considered competent practical adherence level
- $< 80\%$ was considered incompetent practical adherence level

Operational Design:

 The operational design included preparatory phase, pilot study, validity of the modified tool and reliability, ethical consideration, and field work.

Preparatory Phase:

It included reviewing current and past available literature and theoretical knowledge of various aspects of the study using the booklet, articles, internet, periodicals, and magazines in order to develop the data collection tools.

Validity:

Face and content validity means the instrument that measure what is intended to be measured (**Borgstede, Buntins & Eggert, 2017; Middleton, 2021**). It was conducted to test the tool for appropriateness, relevance, correction, and clearance through a jury of seven experts, from the MedicalSurgical nursing staff at the Faculty of Nursing, Helwan University. Juries were from different academic categories (professors and assistant professors). Their opinions were elicited regarding the tool format layout, consistency and scoring system.

Testing reliability:

It is a degree to which the used tools measure what was supposed to be measured in the same way each time & under the same condition with the same subjects (**Borgstede, Buntins & Eggert, 2017; Middleton, 2021**). It tested by using Cronbach alpha test the reliability scores of study tools including Arabic version for knowledge questionnaire and patient self-care practical observational checklist (section I and section II) which were (0.80, 0.81 and 0.95, respectively).

Ethical Considerations:

An informed consent was taken from patients who agree to participate in the research process after the aim of the study has been simply explained to them prior to data collection. They were assured that anonymity and confidentiality would be guaranteed and the right to withdraw from the study at any time without giving any reason. Values, culture, and beliefs would be respected.

Pilot Study:

A pilot study was applied on a group of 10 patients (10% of the sample) to test the applicability and clarity of the designed questionnaire, as well as to estimate the time needed to fill them. Patients included in the pilot study were also included in the main study subject, because there were no modifications in the tools.

Field Work:

- The researchers selected patients before permanent pacemaker installation who met the inclusion criteria and explained basically the aim and nature of the study as well as taking their acceptance to participate in the study prior to the data collection.
- The patients' telephone numbers were obtained at the first time for contacting them to determine the other appointments in order to complete the data collection process (post-discharge follow-up).
- Patients were randomly assigned into two matched equal groups. The control group was recruited first from the cardiology unit, coronary care, and intermediate coronary care unit and exposed to the routine hospital nursing intervention, while the study group was recruited later from the same settings and not exposed to previous or other educational programs.
- Data collection was started and completed within 10 months. It was conducted in the morning and afternoon shifts started from January 2020 until October 2020.

- Data were collected through four phases: Assessment, Planning, installation, and evaluation phase

Phase I: Assessment phase:

In this phase, the researchers collected data from both groups (study & control). It was begun by the patient's demographic characteristics sheet, medical history, and patient's interview knowledge questionnaire were filled in by the researchers or by patients for each patient according to their level of education; it had taken about (20-30) minutes to be filled in for every patient.

Patients were observed and interviewed by the researchers using practical observational checklists to assess their self-care practical adherence regarding (Hospital practical pre/post permanent pacemaker installation instructions, early warning signs, activity, and functional status, patient and pacemaker safety, medication compliance, healthy diet, smoking cession and sign of devices failure), the researchers were noting down what they saw and what the patients said as it was happening. It had taken (30-40) minutes for every patient.

Phase II: Planning phase:

Based on patients' knowledge prerequisites and identifying needs after the assessment phase the researchers developed the nursing discharge practical adherence tips based on the assessment phase results. It was designed to improve patient's knowledge and self-care practices.

Proposed nursing discharge practical adherence tips: It was designed to improve patients' knowledge and practical adherence level at the initial acute phase of treatment, following hospitalization, and help patients to manage their own care for optimization of living with permanent pacemaker post-installation. It was designed by the researchers in the Arabic language including the following contents (Basic structure and function of the heart, the normal pulse rate and sites of measuring pulse, pulse measurement methods, the basic structure and the mechanism of the pacemaker, indications of a permanent pacemaker, locality of the pacemaker installation, pacemaker's battery replacement, expected sign of pacemaker complication, preventive measures of expected complications, the importance of medications compliance, signs of pacemaker malfunction, medical follow-up dates of pacemaker examination after discharge and precautions that the patient must follow it).

Phase III: Implementation phase:

The nursing discharge practical adherence tips were carried out at the cardiology unit, coronary care, intermediate coronary care unit, and outpatient in pacemaker programming

clinic, over two days for every 2 to 3 patients together according to their level of education and understanding. The nursing discharge practical adherence tips were conducted through small group discussion, role play, and demonstration, supported by using of the brochure. Patients were allowed to ask questions in case of misunderstanding while listening and expressing interest to them. At the end of these sessions, the researchers emphasized the importance of the follow-up visits and informed them that they will be followed by the researchers after three months via telephone contact for meeting at pre-scheduled hospital visits.

Phase IV: Evaluation phase

Post implementation of the nursing discharge practical adherence tips, all tools except patient's demographic characteristics sheet were refilled in again after 3 months to evaluate the effect of the nursing discharge practical adherence tips on the patients' outcomes and their optimization of living with the permanent pacemaker by comparing the results pre and post installation of the discharge practical adherence tips which were done to control and study groups after 3 months post-pacemaker installation at the outpatient clinic of pacemaker programming.

Administrative Design

An official approval has been obtained from the hospital director of Al Batinah Specialized University Hospital and the Nursing Director. An official letter was issued to them from the Faculty of Nursing –Helwan University explaining the aim of the study to obtain permission for the collection of data.

Statistical Design:

The collected data were analyzed using (SPSS) version 24. Qualitative data were presented as number and percentage, mean and standard deviation. A Chisquare and paired sample t-test test was used to detect the relation between the variables. Relations between different qualitative variables were tested using correlation coefficient (person correlation). Probability (p-value) ≤ 0.05 was significant, < 0.001 was highly significant and > 0.05 was non-significant **(Salcedo & McCormick, 2021)**

Results

Table (1): Percentage distribution of demographic characteristics between the study and control group patients, this table revealed that (47.8% & 45.7%) of control and study group respectively were between 41-60 years with the mean age (48. 5 ± 11.7 & 50. 5 ± 11.2) for control and study group respectively, and 54.3% in both groups were males. Regarding the

marital status, the same table shows that 58.7% of the control group were married, compared to 39.1% of the study group. As regards educational level, (54.4% &45.5%) of the control and study group respectively were read and writes. Also; this table shows that (52.2%, 54.3% & 60.9%) of the control group were working with sufficient income and existing in a rural, respectively. Likened to 60.9% of the study group was working with 82.6% of them had sufficient income and 52.2% of them were existing in rural area.

Table (2): Percentage distribution among the study and control group regarding medical health history this table indicated that (37. 0% & 41.3%) of the control and study group respectively had a duration of illness between >1 year - 3 years. Regarding co-morbidities, (41.3%, 39.1%, 32.6% & 30.0%) of the control group had hypertension, coronary artery disease, kidney diseases and diabetes mellitus respectively. As well, (63.3, 41.3, 37.0% & 37.0%(of study group had hypertension, coronary artery disease, diabetes mellitus and arrhythmia respectively.

Table (3): Percentage distribution among the study and control group regarding knowledge related to a permanent pacemaker installation brought to light that, there are (34.8%, 58.7% & 63.0%) of the control group had a satisfactory score of knowledge regarding the heart information, (45.7%, 84.8% & 80.5%) regarding the pulse information and (43.5%, 67.4% & 82.6%) regarding the artificial pacemaker information at pre, post and follow up phases, respectively. Compared to there are (30.4%, 93.5% & 63.0%) of the study group had satisfactory score of knowledge regarding the heart information, (26.1%, 97.8% & 97.8%) regarding the pulse information and (26.1%, 100% & 100%) regarding the artificial pacemaker information at pre, post and follow up phases, respectively.

As well, this table reveals that there were highly significant statistical differences interrelated to pre/post-test for the study and control group related to (The heart information, the pulse information, and artificial pacemaker information) at $P < 0.01$. Additionally, there were statistically significant differences interrelated to post/follow-up phase for the study and control group regarding the same items at $P < 0.05$.

Figure (1): Percentage distribution among the study and control group regarding hospital practical instructions this figure illustrates that (9856% & 45.3%) of study and control group had a satisfactory score of hospital practical instructions pre-permanent pacemaker installation, which increased to 91.3% for control group and 100% for the study group post-permanent pacemaker installation. As well as, there were highly significant statistical differences between the study and control groups related to total hospital practical instructions pre/post-permanent pacemaker installation at $P < 0.00$.

Table (4): Percentage distribution between the studied patient regarding practical adherence instructions throughout discharge and follow-up care this table conveyed that, the most of study group (91.3, 100%), (95.7, 100%), (93.5,

95.7%), (80.4, 93.5%), (95.7, 95.7%), (93.5, 97.8%), and (91.3, 91.3%) had competent practice about warning signs following discharge, activity (follow this instruction 2 weeks to 3 months), safety instruction, medication, health diet, smoking and signs of device failure at post and follow up phases, respectively. While, (9856%, 91.3%), (60.9%, 82.6%), (45.7%.5, 71.7%), (50.0%, 60.9%), (73.9%, 80.4%), (73.9%, 82.6%) and (63.1%, 41.3%) of control group had competent practice regarding the same practical tips at post and follow up phases. Additionally, there were highly statistically significant differences were found between both group post and follow-up phases of the implementation regarding all items of practice.

Table (5): Comparison of mean scores among the study and control group regarding the level of total knowledge and total practical adherence related to instructions throughout discharge and follow-up care this table displayed that, there was a highly statistically significant difference between both group at the post and follow-up implementation regarding total mean score of knowledge related to permanent pacemaker installation and total practical adherence level related to instructions throughout discharge and follow-up care for pre/post-test and post/follow up phases at $p > 0.01$.

Table (6): Correlation between the study and control group regarding the level of total knowledge and total practical adherence tips throughout discharge and follow-up care this table divulged that there were highly statistically significant positive correlation between total knowledge and total practical adherence for post-test and follow-up phases at $p > 0.01$.

Table (1): Percentage distribution of demographic characteristics among the study and control group subjects (n=92)

Variable	Control group		Study group		X^2	P value
	N	%	N	%		
Age: ≤ 40 years 41-60 years 61>80 years	12 22 12	26.1 47.8 26.1	01 60 18	605: 785: 6659	**1.143**	**0.474**
Mean ± SD	**48. 5 ± 11.7**		**50. 5 ± 11.2**			
Sex: Male Female	25 21	54.3 45.7	28 60	57.6 48.:	**0.696**	**0.404**
Marital status: Single Married Widowed/Divorced	8 27 11	17.4 58.7 23.9	16 1; 19	6950 3<.1 37.;	**1.083**	**0.832**
Education level: Illiterate Read and write Secondary level University education	9 25 6 6	19.6 54.4 13.0 13.0	9 21 ; ;	19.6 45.5 0:57 0:57	**1.171**	**0.356**
Occupation: Working Not working	24 22	52.2 47.8	2; 1;	61.< 3<50	**1.560**	**0.212**
Income Sufficient Insufficient	25 21	54.3 45.7	6; ;	;659 0:57	**7.348**	**0.007**
Residence: Rural Urban	28 18	60.9 39.1	67 62	8656 7858	**1.244**	**0.265**

Highly Significant p <0.01   Significant (NS) p = 0.05   Not significant (NS) p < 0.5

Table (2): Percentage distribution among the study and control group regarding medical health history (n=92)

Variable	Control group		Study group		X²	P value
	N	%	N	%		
Duration of illness						
≤ 3 months-1 year	17	37.0	9	0<59		
>1 year-3 years	18	39.1	1<	7056	**4.036**	**0.045**
>3 years	11	23.9	0;	6<50		
Mean ± SD	**1.87 ± .778**		**2.00 ± .794**			
Co- morbidities (past medical history)						
Coronary Artery Disease	18			41.6	**3.522**	**0.500**
Hypertension	19	39.1 41.3	1<	9656	**2.130**	**0.144**
Diabetes mellitus	14	30.4 32.6	6< 1:	6:51	**1.686**	**0.197**
Kidney diseases	15	30.4	< 1:	1<56	**2.029**	**0.235**
Arrhythmia	14	21.7	00	6:51	**1.686**	**0.197**
9. Respiratory disease	10			63.9	**3.166**	**0.119**

**Highly Significant p <0.01 Significant (NS) p = 0.05   Not significant (NS) p < 0.05

Table (3): Percentage distribution among the study and control group regarding knowledge related to permanent pacemaker installation (n=92).

Items	Pre- test					Post- test				wolloF- ts u pu			
	Study group	Control group	t	p value		Study group	Control group	t	p value	Study group	Control group	t	p value
	Satisfy %	Satisfy %				Satisfy %	Satisfy %			Satisfy %	Satisfy %		
The heart information	30.4	34.8	0.212	0.832		93.5	58.7	4.236	0.00**	87.0	63.0	2.726	0.008
The pulse information	26.1	45.7	0.932	0.354		97.8	84.8	5.262	0.00**	97.8	80.5	5.223	0.00**
Artificial pacemaker information	26.1	43.5	1.210	0.229		100.0	67.4	3.954	0.00**	100.0	82.6	2.242	0.027
Total Knowledge	47.8	67.5	1.709	0.91		100.0	87.0	3.869	0.00**	100.0	84.8	2.696	0.008

**Highly Significant p <0.01 Significant (NS) p = 0.05   Not significant (NS) p < 0.05
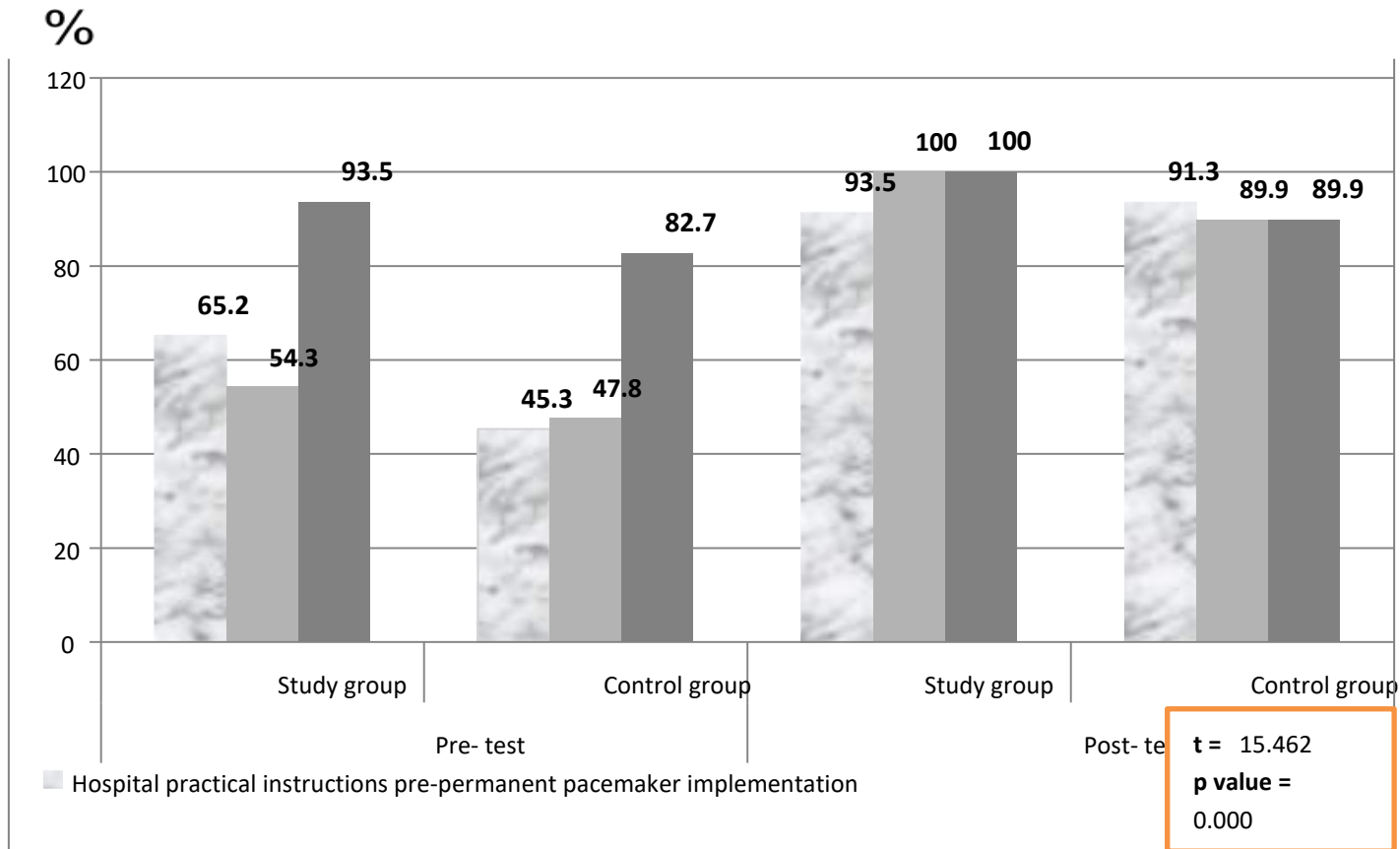
Figure (1): Percentage distribution among the study and control group regarding practical tips pre/post permanent pacemaker installation throughout hospitalization (n=92)

Table (4): Percentage distribution between the studied patient regarding practical adherence instructions throughout discharge and follow-up care (n=92).

Items	Pre- test				Post- test				wolloF- ts u pu			
	Study group Comp. %	Control group Comp. %	Chi square	p value	Study group Comp .%	Control group Comp .%	Chi square	p value	Study group Comp .%	Control group Comp .%	Chi square	p value
Warning signs following discharge	26.1	17.4	32.935	0.623	91.3	9856	54.935	0.001	100.0	91.3	47.435	0.00**
Activity (Follow this instructions 2 weeks to 3 months)	21.8	15.2	41.043	0.595	95.7	60.9	31.804	0.00**	01151	82.6	39.478	0.006
Safety instruction	17.4	17.4	72.935	0.813	93.5	45.7	8.696	0.00**	95.7	71.7	21.913	0.00**
Medication	28.3	30.4	7.848	0.340	80.4	50.0	16.957	0.036	93.5	60.9	35.739	0.002
Health diet	47.8	56.5	40.391	0.150	95.7	73.9	30.283	0.018	<85:	80.4	51.370	0.003
Smoking	63.0	60.9	25.717	0.580	93.5	73.9	12.804	0.00**	97.8	82.6	25.717	0.001
Signs of device failure	43.5	43.5	14.522	0.945	91.3	63.1	35.391	15113	91.3	41.3	20.935	0.003
Total practical adherence instructions throughout discharge and follow-up care	4.3	2.2	37.043	0.162	97.8	60.9	27.783	0.00**	100.0	82.6	22.674	0.00**

**Highly Significant p <0.01 Significant (NS) p = 0.05   Not significant (NS) p < 0.05

Table (5): Comparison of Mean scores among the study and control group regarding the level of total knowledge and total practical adherence related to instructions throughout discharge and follow-up care (n=92)

Items	Pre- test		Post- test		Follow up test		Pre/post-test		Post/Follow up test	
	Study group	Control group	Study group	Control group	Study group	Control group	Study group	Control group	Study group	Control group
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	T p value	t P value	t p value	t P value
Total Knowledge	1.21± 0.14	1.30± 0.11	1.81± 0.12	1.57± 0.13	1.87± 0.11	1.61± 0.16	25,412 0.000**	13.550 0.000**	2.413 0.02*	1.062 0.294
Total practical adherence	1.37 ± 0.09	1.34 ± 0.65	1.77 ± 0.14	1.51 ± 0.77	1.83± 0.08	1.62± 0.092	17.788 0.000**	0.00 0.258	4.000 0.00**	7.314 0.000**

**Highly Significant p <0.01 Significant (NS) p = 0.05   Not significant (NS) p < 0.05

Table (6): Correlation between the study and control group regarding the level of total knowledge and total practical adherence tips throughout discharge and follow-up care (n=92)

Items	Total practical adherence pre- test		Total practical adherence post-test		Total Practical adherence follow up test	
	Study group	**Control group**	**Study group**	**Control group**	**Study group**	**Control group**
	r p value	**r p value**	**r p value**	**r p value**	**R p value**	**r p value**
Total knowledge pre-test	0.042 0.692	0.119 0.257	0.215 0.040	0.024 0.873	0.220 0.037	0.265 0.075
Total knowledge post-test	0.126 0.286	0.084 0.579	0.684 0.000	0.243 0.104	0.686 0.000**	0.390 0.007
Total knowledge follow up test	0.329 0.017	0.028 0.853	0.520 0.000**	0.173 0.250	0.668 0.000**	0.293 0.048

**P < 0.01 High Significant,   *P < 0.05 Significant,   P > 0.05 Insignificant

Discussion

A permanent pacemaker can significantly improve quality of life, and for several people, it can be lifesaving and prevent death. After a permanent pacemaker insertion, the optimal outcome could be obtained if patients are supported in compliance with a lifelong adaptation with a permanent pacemaker **(Timby & Smith, 2019)**.

Concerning the age of studied patients, the results of the present study revealed that near than half of the studied patients were between 41-60 years with the mean age (48. 5 ± 11.7 and 50. 5 ± 11.2), respectively for the control and the study group, these results were in agreement with **Adel et al., (2017)** in a study entitled "Effect of self-care management on nursing-sensitive patients' outcomes after permanent pacemaker implantation" who revealed that the mean age of the study group was 45.37±5.76 with the mean age of control group was 48.75±4.27. On the other hand, the study results were in disagreement with **Gonçalo et al., (2020)** who studied "Health-related quality of life of patients with permanent cardiac pacing" and reported that the participants were older, with an average age of 60 years old. This finding may be due to recurrent exposure to life stressors and responsibility.

Regarding sex, the present study showed that more than half of the studied patients were males at both groups. This result was supported by **Bhat, Kumar and Parimoo (2018)**, in a study titled "Characteristics, indications and complications in patients undergoing permanent pacemaker implantation" and reported that two-thirds of the study samples were males. This result might shed light on the gender difference in heart disease. This result may be due to that heart diseases and hypertension were more prevalent in males than females, as well as men significantly have a more active life, and were more stressed compared to women.

Concerning marital status, the results revealed that more than half of the control and more than two fifth of the study group were married. According to researchers' opinion, marriage increases the patients' responsibility regarding the family and children. Also, they always face the psychological stressors of their social role which increase the risk of cardiac diseases more than single. This opinion was supported by the **American Heart Association (2018)**. In the same line, this result was congruent with **Snegalatha et al., (2021)** who studied "Knowledge and attitude regarding permanent pacemaker and the quality of life of patients after permanent pacemaker implantation" and mentioned that near than two thirds of studied sample were married.

As regards educational level, the present study results show that more than half the control group were read and write, and more than one-third of the study group had a secondary level. This result was in disagreement with **Khalil et al., (2020)**, in a study of "Effect of

educational program on outcomes of patients undergoing permanent pacemakers' implantation" who stated that half of the patients had a secondary education and one-third of them just read and write. Additionally, the study result was in disagreement with **Gonçalo et al., (2020)**, who stated that the patients reported a low educational level.

Correspondingly, occupation, income and residence ; the study result showed that more than half of the control group were not working with insufficient income and existing in rural, likened to more than half of the study group were working with the majority of them had sufficient income and more than half of them existing in rural area.

These findings were in agreement with **Khalil et al., (2020)**, who stated that around two-thirds of them residing in the rural areas and had labor work with inadequate monthly income. This finding could reflect the patients' socioeconomic standard in the area served by the study setting, with the unavailability of specialized hospitals affording pacemaker insertion in rural areas, so the patients have to be transported to the central city for seeking the proper treatment.

On the same line **Sharma et al., (2018)**, in a study entitled "Assessment of Effectiveness of Permanent Pacemaker Care Guidelines on Patient Activity and Adherence" clarified that more than half of study and control group were unemployed as well more than half of them lived at village.

Regarding the duration of illness, the study result indicated that more than one-third of both the study and control group had the duration of illness between 1 and 3 years. This study result was in disagreement with **Snegalatha et al., (2021)**, who reported that more than two thirds of the studied patients had duration of illness of more than 3 years.

Regarding comorbidities the study results showed that two-fifth of study and slightly less than two-fifth of the control group had coronary artery disease. Additionally, slightly more than two-thirds of the study group and one-fifth of the control group had hypertension. This result was in agreement with **Irfan, Khan and Bacha (2020)**, in a study of "Delays in temporary and permanent pacemaker's causes and in-hospital outcomes" who stated that coronary artery disease was prevalent in more than one-third of the patients, one-fifth had diabetes, and more than one-third had hypertension. On the same line, **Jayaram et al., (2019)**, who studied "prevalence of coronary artery disease and its risk factors in patients undergoing permanent pacemaker implantation" and reported that two-thirds of patients had hypertension.

According to practical tips throughout hospitalization which provided by researchers in the study group and provided by nurses for the control group regarding direct instructions at pre/post-permanent pacemaker implementation; subsequently, the study findings illustrated

that about two third of the study group and less than half the control group had a competent practice in preinstallation, which increased to most of the control group and all of the study group had competent practice in post- installation. This result concluded that nurses had satisfactory level of knowledge regarding care of patient during hospitalization which reflected on control group result.

This result inconsistent with the study done by **Mohammed, Abd Elstar and Mohamed (2020)** who found that about eighty percent of studied nurses had unsatisfactory level of knowledge regarding pacemaker and about seventy seven percent of studied nurses had unsatisfactory level of practice regarding patient with permanent pacemaker.

Regarding the level of studied groups knowledge, the result of the current study revealed that there were highly significant statistical differences between the study and the control group at the total mean score of knowledge, total knowledge and individually related to (the heart information, the pulse information, and artificial pacemaker information), respectively throughout posttest at $P < 0.00$. In the same line, there were statistically significant differences related to the same items throughout follow-up phase at $P < 0.05$.

These results were supported by **Andrew (2018)**, who studied the "Influence of written information on patient's knowledge of their diagnosis on 64 patients at Oxford University" and found that patients receiving an information sheet had increased knowledge along with practice regarding previous medical problems.

Likewise, the previous result was supported by the **Coronary Heart Disease Team (2019)**, which was emphasized that educational program always keeps and, maintain the patients' speed and efficiency in carrying out their respective activities and so the quality of life will be improved. This may be attributed to the need of the studied patients to protect their lives through gaining knowledge about pacemaker.

The previous results in the same line **Yossif and Abd El-aal (2017),** in a study entitled "Home Care for Patients with Permanent Pacemaker Insertion" clarified that there was improvement post-program in studied sample knowledge regarding (basic structure and function of the heart, pulse, and artificial pacemaker) with statistically significant differences regarding all knowledge items. Additionally, **Faltas (2017)**, in study about "Effect of Self-learning on Performance of Nurses Centered Collaborative Care" mentioned that the patients were positively affected by the written information specially; the patients who received the booklet had increased knowledge and were more satisfied with information concerning their diagnosis than the control group.

Similarly, this finding was in agreement with **Nasr, El Ganzory and Ahmed (2015),** who studied "The Impact of Counseling Program on Knowledge and Self-efficacy of Patients

with Implanted Permanent Pacemaker" and mentioned that there was a statistically significant improvement in the post-test compared to the pre-test related to studied participants' knowledge.

Moreover, **Orly and Orna (2018)**, in study about "Promoting Patients' Knowledge for Disease Management and Self-care and Utilization of Health Services" found that the level of knowledge was low before the education session, which was higher after the sessions. Knowledge levels increased in all patients, young and old, and they stated that the patient who obtains knowledge had an active life after permanent pacemaker implantation.

According to researchers' point of view, this result may be attributed to the effect of the provision of the educational booklet with clear and simple written information which given to them. In addition, the curiosity of the study patients to know how to deal with permanent pacemaker make them more satisfied with the information given to them about their diagnosis when compared with the control group.

Regarding total practical adherence instructions throughout discharge and follow-up care the present study results indicated that there was a highly statistically significant difference between both groups regarding total practical adherence level throughout discharge and follow-up care for pre/post-test and post/follow-up phases.

According to researchers' point of view this may be related to the need of the studied samples to acquire skills to keep the pacemaker devices functioning well.

Additionally, these findings may be as a result of continuous demonstration, re demonstration, follow-up, and practical content of the instructional booklet which was given to the studied patients with continuous explanations, reinforcement and feedback.

These results were congruent with **Sharma et al., (2018)**, who concluded that there were highly statistically significant differences in pacemaker care practices adherence among study subjects in the control and experimental group.

In the same context, these results were in agreement with **Khalil et al., (2020),** who showed that most patients had unsatisfactory practice pre-program, which improved to around three-quarters of them had a satisfactory practice at immediate and the follow-up phase with a statistically significant improvement of total practice.

In addition, the previous results were in accordance with **Adel et al., (2017)**, who stated that there was a highly significant difference between the study and control groups regarding self-care practices post-implementation of the self-care guidelines. Additionally, **Yossif and Abd El-aal (2017)** concluded that there were statistically significant differences

in all studied participants' total practices regarding pacemaker post-program implementation.

Finally, the current study revealed that there was a highly statistically significant positive correlation between the study and control group regarding the level of total knowledge and total practical adherence instructions throughout discharge and follow-up care. The results of the present study were supported by **Yossif and Abd El-aal (2017)**, who concluded that there was a positive highly statistically significant correlation between the studied samples total knowledge score and their total practices score. This may be attributed to order sequences the patient who had good knowledge scores perform care much better for themselves, additionally, this may be due to knowledge being the most important approach to enhance practice to education program.

This result was consistent with **Mohamed et al., (2016),** in a study entitled "Effectiveness of Educational Program on Knowledge and Practice of Patients Undergoing Permanent Pacemaker" who reported there was a statistically significant relationship between patients' knowledge and patients' practice with the pacemaker.

From researchers' point of view lack of information or misinformation in patients may result in self-induced limitations that can undesirably affect ordinary day to day living with the permanent pacemakers. The current study results have brought out the gaps that exist in the patients' knowledge and practical adherence which affected their activity of daily living performance and the effect of having written practical adherence tips throughout the permanent pacemaker implementation which optimizes their living and getting maximum quality all over their day to day life, this will help patients to function maximally and live life to their best capacities in the family and society, this explanation was supported by **(Snegalatha et al., 2019)**, who stated that conscious effort must be taken to help patients cope better and experience good quality of life through systematic teaching after the PM installation.

Conclusion:

There was a highly statistically significant difference between the study and control group regarding total mean scores of knowledge and all dimensions of patient self-care practical adherence scores for pre/post and follow-up phases at (p < 0.001). Additionally, there were highly statistically significant positive correlation between total knowledge and total practical adherence for post-test and follow-up phases at p > 0.01. There was an improvement in patients' optimization of living with permanent pacemaker throughout installation based on practicing written adherence tips.

Recommendations:

Based on the findings of the current study, the following recommendations can be suggested:

- Designing a written Arabic discharge practical adherence tips for patients and procedure checklist for nurses in all cardiac units and outpatient clinics for optimization of patients' living with a permanent pacemaker.
- Periodically follow up schedules should be designed and emphasized for those patients in order to improve their compliance.
- Replication of the current study on a larger probability sample is recommended to achieve generalization of the results.

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الملخص العربى

تأثير الإلتزام العملي بإرشادات الخروج التمريضية علي تحسين حياة المرضي خلال تركيب منظم ضربات القلب الدائم

المقدمة: يعد زرع منظم ضربات القلب الدائم كإجراء طارئ لإنقاذ الحياة، ولذلك من الضروري أن يكون لدى المرضى المعرفة والمهارة العملية في جميع مراحل عملية زرع منظم ضربات القلب الدائم للوصول إلي أقصى كفاءة للعيش طوال حياتهم اليومية. **الهدف:** أجريت هذه الدراسة لتقييم تأثير الإلتزام العملي بإرشادات الخروج التمريضية علي تحسين حياة المرضي خلال تركيب منظم ضربات القلب الدائم. **التصميم:** تم استخدام تصميم بحثي شبه تجريبي. **المكان:** أجريت الدراسة في وحدة أمراض القلب ووحدة العناية التاجية ووحدة رعاية الشريان التاجي المتوسطة وعيادة برمجة أجهزة تنظيم ضربات القلب الخارجية التابعة لمستشفيات الباطنة التخصصية الجامعي. **العينة:** تم اختيار عينة هادفة من 92 مريضًا بالغاً وقسمت بالتساوي إلى مجموعة الدراسة والمجموعة المضبوطة، (46) مريضاً لكل منها. **الأدوات:** تم استخدام ثلاث أدوات لجمع البيانات؛ استبيان المقابلة، واستبيان المعرفة، وإجراء الملاحظة العملية للرعاية الذاتية. **النتائج:** تظهر النتيجة وجود فروق ذو دلالة إحصائية عالية بين مجموعة الدراسة والمجموعة المضبوطة فيما يتعلق بإجمالي متوسط درجات المعرفة وجميع أبعاد درجات الالتزام العملي للرعاية الذاتية للمريض لمراحل ما قبل / بعد ومتابعة عند (0.001 > P). وكذلك وجود علاقة إيجابية ذات دلالة إحصائية عالية بين المعرفة الكلية والالتزام العملي الكلي لمراحل ما بعد الاختبار والمتابعة عند p<0.01. **الخلاصة:** كان هناك تحسين فى حياة المرضى مع جهاز تنظيم ضربات القلب الدائم خلال مراحل تنفيذ البرنامج بناءً على ممارسة نصائح الالتزام المكتوبة. **التوصيات:** تصميم إرشادات الالتزام العملي مكتوبة باللغة العربية للمرضى وقائمة مراجعة للإجراءات للتمريض في جميع وحدات القلب والعيادات الخارجية لتحسين حياة المرضى مع جهاز تنظيم ضربات القلب الدائم.

مفاتيح الكلمات: التمريضي، جهاز تنظيم ضربات القلب الدائم ، أرشادات الخروج العملية .