

Effect of Self Care Management on Nursing-Sensitive Patients' Outcomes after Permanent Pacemaker Implantation

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ABSTRACT

Context: Nursing is striving to build a knowledge base that supports the professional practice and improves the quality of care.

Aim: This study aimed to evaluate the effect of self-care management guidelines on nursing-sensitive patients' outcomes after permanent pacemaker implantation.

Methods: A quasi-experimental design was utilized in this study. A purposive sample of 50 patients was admitted to the cardiac catheterization unit at Ain Shams University Hospital after permanent pacemaker implantation during their follow-up visit. They are divided into two matched groups, study and control groups. Their mean age \pm SD was 45.37 ± 5.76 , and 48.75 ± 4.27 successively. Patient socio-demographic characteristic and medical data sheet, self-care management level assessment scale, and nursing-sensitive outcomes measuring scale were utilized to achieve the study aim.

Results: The study results revealed positive outcomes for patients of the study group compared to the controls and their pre-implementation level of self-care guidelines.

Conclusion: The study concludes that implementing self-care management guidelines positively enhances all dimensions of nursing-sensitive patients' outcomes, recommending that it be applied in all cardiac catheterization units and should be updated periodically to enhance self-care management for those patients based on nursing-sensitive outcome classification.

Keywords: self-care management, nursing-sensitive patient outcomes, permanent pacemakers

1. Introduction

Nursing is striving to build a knowledge base that supports the professional practice and improves the quality of care provided by nurses in various settings across the health care continuum (Kautz, Kuiper, Pesut, & Williams, 2006). The unique role of the nurses is to help patients and their families learn new behaviors that have a positive impact on their health and their lives. Success is primarily achieved when patients accept responsibility for their quality of life, actively participate in the care plan, and are self-determined to manage health care needs at home. The process of taking responsibility for developing one's health potential is called self-care (Linton & Meaebius, 2010).

Self-management based on nursing-sensitive patient outcomes addresses daily problems management for patients with chronic conditions. It emphasizes three self-management tasks to regain control over daily life: take care of the medical aspects of the disease (medical management); carry out normal activities to remain socially active (role management), and manage emotional changes because of being chronically ill (emotional management) (Iliou, Blanchard, Lamar-Tanguy, Cristofini & Ledru, 2016).

Patients with pacemaker implantation faced many challenges after the operation due to a lack of knowledge, preoperative preparation, and postoperative management. So, those patients were suffering from direct and indirect

complications, which may be related to pacemaker implantation itself, or related to profound changes in their life: physical and psychological disorders, loss of bodily function, change in personal hygiene, restrictions in social life, and sexual functioning impairment (Yarlagadda and Lange, 2014). In addition to the physiological and psychological problems, there is an additional economic impact on both the patient and the community (Hwang, Moser & Dracup, 2016).

Patient education is an essential component of self-care promotion and is the primary domain of nursing. Nurses encounter clients during times of major health changes and are in critical positions to help them make decisions and adopt behaviors that significantly alter health. To assist others effectively in making healthy decisions and changes, nurses must teach about healthy behaviors, function as role models, and understand the concept of motivation (Scott, Srivathsan, Byrne and Appleton, 2011).

2. Significance of the study

Patients with implanted cardiac devices constitute a growing segment of contemporary healthcare practice. About 3 million people worldwide with a pacemaker, and each year 600,000 pacemakers were implanted (Kirk, 2012). Taking care of such a rapidly growing patient population constitutes a challenge for all health care providers working in a cardiology ward, operating room, or primary care practice. The medical records of the cardiac outpatient clinic at Ain Shams University hospital documented 152 patients who underwent permanent pacemakers in

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years (2013/ 2014) (*Ain Shams Medical Statistic and information department, 2014*).

Educating patients with pacemakers about their diseases and treatment plans is a must if the nurse wants them to follow through with medication, exercise, and other lifestyle changes. However, the best results come when the nurse combines education with behavior modification strategies and emotional support. This study will add to the body of knowledge that supports the professional practice and improves the quality of care provided by nurses to support patients with permanent pacemakers to live the best possible quality of life with their chronic condition.

3. Aim of the study

This study aims to evaluate the effect of self-care management guidelines on nursing-sensitive patients' outcomes after permanent pacemaker implantation.

3.1. Research hypothesis

The current study hypothesized that the self-care management guidelines would positively reflect nursing-sensitive patients' outcomes after permanent pacemaker implantation.

3.2. Operational definitions

Self-care management: It referred to the decisions and behaviors that patients with a permanent pacemaker and their families engage in to help them understand their central role in managing their health.

Nursing-Sensitive Patients' Outcomes: It referred to patient outcomes responsive to nursing interventions covering bio-psycho-socio-educational dimensions of patient care.

4. Subjects & Methods

4.1. Research design

A quasi-experimental design was utilized to meet the aim of this study.

4.2. Research setting

The study was conducted at the Cardiac Catheterization unit at Ain Shams University Hospital. It is composed of three big halls for waiting patients. Each hall included six beds in addition to two operating theaters for emergency intervention.

4.3. Subjects

A purposive sample of 50 patients was admitted to the above-mentioned clinical setting after permanent pacemaker implantation during their follow-up visit. The study subjects were divided into two matched groups: the study group who had the self-care management guidelines and routine care, and the control group who had only the routine care. Both groups were homogenous, with their mean age \pm SD was 45.37 \pm 5.76 for the study group and 48.75 \pm 4.27 for the control group. The sample size was determined statistically by power analysis considering the total number of patients after permanent pacemaker implantation admitted to Ain Shams university hospital (2013/2014). Type I error with significant level α = 99% and type II error by power test β = 95%

Inclusion criteria

The study sample was selected according to the following criteria: Adult patients, from both genders, after one month from pacemaker implantation, with no critical condition or psychotic disorders, able to comprehend instructions, not exposed before for any related educational or learning experience and agree to participate in the study.

4.4. Tools for data collection

4.4.1. Patient's Socio-Demographic Characteristics Questionnaire

It was designed by the researcher to assess the socio-demographic characteristics of the patients under study, such as age, gender, marital status, level of education, residence, living, employment status, and income.

4.4.2. Patient's Clinical Record

The researcher designed it after reviewing the related literature (*Collins, 2011; Pellico, 2013; Hinkle & Cheever, 2014*) to assess patients' clinical data such as signs and symptoms on admission, past medical and family history.

4.4.3. Self-Care Management Level Assessment Scale

It was designed by the researcher aimed at assessment of patients' level of self-care after reviewing the related literature (*Smeltezer, Bare, Hinkle, and Cheever (2010); Lewis, Dirksen, Heitkemper, Bucher, and Camera, (2011); Morton and Fontaine, (2013); Perry, Potter, and Ostendorf, (2014); Catherine, Edward, John, and Robert, (2015)*). It consisted of 59 assessment statements describing different self-care domains for a patient with a permanent pacemaker (PPM), such as maintaining the efficiency of PPM (14 statements for men & 13 statements for women), taking medications (6 statements), regular follow up (2 statements), wound care (5 statements for women & 4 statements for men), exercise regularly (12 statements), nutrition (12 statements) and relaxation techniques (9 statements). The patient valued each statement against 3 points scale of (all the time, two scores; sometimes, one score; and never, 0 scores). Each subgroup was summed separately with a total score starting from 0 to 118. A patient score below 80% is considered to have an unsatisfactory level of self-care and vice versa. Alpha Cronbach reliability test was (0.845).

4.4.4. Nursing Sensitive Patient Outcomes Measuring Scales

It was adopted from Moorhead, Johnson, Maas & Swanson (2008) and modified by the researcher (guided by the Nursing Outcome Classification System developed by Iowa University Project). It was used to measure nursing-sensitive patient outcomes related to bio-psycho-socio-educational dimensions.

The scale composed of (95) outcomes as following; *physiological* health outcomes (17 outcomes) included cardiac pump effectiveness (6 indicators), peripheral tissue perfusion (4 indicators), circulation status (3 indicators) & vital signs status (4 indicators); *functional* health outcomes (11 outcomes) included activity tolerance (4 indicators) & self-care ADLs (7 indicators); *psychosocial* outcomes (19 outcomes) included body image and self-

esteem (6 indicators), anxiety control (3 indicators), coping (6 indicators) & social interaction (4 indicators); health *knowledge and behaviors* (43 outcomes) included compliance behavior (7 indicators), symptom control (1 indicator), health beliefs and perception (4 indicators), illness care (22 indicators), cardiovascular risk control (3 indicators) & risk detection (6 indicators); and *family health* (5 outcomes) included family adaptation (5 indicators). Alpha Cronbach reliability test was (0.826).

A three-point Likert scale is used with all outcomes and indicators to measure patient status. Each statement had three responses ranging from 1-3; a rating of '3' is always the best possible score, and '1' is always the worst possible score. Each outcome class is summed separately with a total score ranged from 95 to 285; A score from 95 to 158 marks was considered extremely compromised, from 159 to 221 marks was considered moderately compromised, and a score from 222 to 285 marks considered mildly or not compromised.

4.5. Procedures

The study goes through three phases: *first* is the preparatory phase that includes tools development, validation, and reliability testing, in addition to the official permission attaining and piloting on 10% of patients who were later excluded from the study. The *second* phase includes selecting study subjects who met the inclusion criteria taking their approval to participate in the study, and explaining the purpose of the study. The researcher obtained their telephone number for follow-up. They were assigned into two equal groups (study and control groups), the control group was recruited first to prevent sample bias/contamination.

The experimental group was recruited later. Self-care guidelines applied through six consecutive sessions, including awareness of the cardiac conduction system, its impairment, aim, and indications of pacemaker implantation, types, and central parts of the pacemaker. Description of the permanent pacemaker implantation process, aftercare, and possible complications were introduced in the first session. Follow up-schedule, the importance of ID card, wound care precautions, dressing, and signs of infection were explained in the second session. The third session included medication regimen, dietary and weight management. The fourth session focused on exercise management (goal of the exercise, precautions, allowed and restricted exercises, and performing prescribed arm exercise).

Stress management and relaxation techniques were presented in the fifth session. Self-care activity regarding pulse counting, checks on pacemaker function, and precautions were applied in the last session. The self-care guidelines were conducted through small group discussion, role play, and demonstration/re-demonstration, supported by using posters and a booklet. Data were collected over ten months from Sept 2015 to June 2016. The *third* phase included evaluating patient health outcomes after three months post-implementation of the self-care guidelines compared to pre-assessment data for both study and control groups. The researcher obtained approval from the ethical committee of the faculty of nursing Ain Shams University before initiating the study work. The researcher clarified the objectives and aim of the study to study

patients before their participation. Patients' oral consent to participate in the study was obtained. The researcher assured maintaining anonymity and confidentiality of the subjects' data. Patients were informed that they are allowed to withdraw from the study without giving any reasons and without penalties.

4.6. Limitations of the study

- The time available for data collection during the follow-up was not enough, as most of the patients come from far towns and need to leave the hospital as early as possible.
- The literacy and lack of reading skills limit the ability of patients to access and use written information. So, the researcher depended on assistive personnel or caregiver to provide this information for them.

4.7. Data analysis

The data were collected, coded, and entered into a suitable excel sheet. Data transferred into SPSS version (17). Quantitative data presented as a mean, standard deviation; the comparison was done using *the* χ^2 test. Qualitative data were presented as percentages. The observed differences and associations were considered as follows: Non-significant at $P > 0.05$, significant at $P \leq 0.05$, and highly significant at $P < 0.001$.

5. Results

Regarding socio-demographic characteristics of the study and control groups, table 1 shows that the mean age of the studied patients was 45.37 ± 5.76 , 48.75 ± 4.27 for the study and control group successively. Regarding patients' gender, the table shows, 76% of patients in the study group were males, compared to 60% of the controls. About their level of education, the table indicates that 52% and 72% of the study and control groups respectively were not educated. In addition to 72% and 64% of the study and control group were from the rural area, with a non-significant difference between both groups regarding all socio-demographic characteristics.

Concerning the patient clinical presentation on the admission of the study and control groups, table 2 shows that all of the patients in both groups presented with chest pain on admission, as well, 72% of patients in the study group had a history of cardiac diseases other than conduction abnormalities, compared to 80% of the controls. Most of the patients in both groups reported a positive family history of different cardiac problems. Coronary heart disease represented 64% and 60% of study and control groups, with no significant difference between the two groups.

Table 3 shows no statistically significant difference between the number of patients who have a satisfactory level of self-care items regarding all self-care behaviors pre-implementation of self-care guidelines. In contrast, post-implementation of the guidelines, there was a statistically significant difference between the number of patients who have a satisfactory level of self-care behaviors in study and control groups regarding taking medications, attending follow-up visits, caring for the wound, and following the prescribed diet as well as there was a highly statistically significant difference between them regarding maintaining the efficiency of PM, doing physical exer-

cise, and relaxation techniques post-self-care guidelines implementation.

Table 4 shows different levels of nursing-sensitive patient outcomes for study and control groups pre-implementation of self-care guidelines with a non-statistically significant difference between them regarding all outcome classes except functional health outcomes.

Table 5 compares study and control groups regarding the total score of self-care behaviors and nursing-sensitive patient outcomes after implementing self-care guidelines with a highly significant difference between them.

Table 6 compares different levels of nursing-sensitive patient outcomes among study group subjects before and after implementing the self-care guidelines. A statistically significant difference revealed regarding physiological

and functional health outcomes, while a highly significant difference was revealed between psychosocial, health knowledge and behaviors, and family health outcomes.

Table 7 shows the relationship between levels of self-care and levels of nursing-sensitive patient outcomes among study group patients. It was clear that a satisfactory level of self-care was associated with a better outcome level with a highly statistically significant difference between all levels at $p (<0.001)$.

Table 8 reveals a statistically significant positive correlation between patients' total self-care level with their nursing-sensitive patient outcomes in the study and control groups pre and post-implementation of self-care guidelines ($P<0.001$).

Table (1): Comparison of the study and control groups according to the socio-demographic characteristics.

Character	Groups				χ^2	P-value
	Study (n=25)		Control (n=25)			
	N	%	N	%		
Age						
20-<40	14	56	6	24	4.82	0.08
40-<50	3	12	10	40		
≥50	8	32	9	36		
Mean±SD	45.37±5.76		48.75±4.27			
Gender					0.32	0.56
Male	19	76	15	60		
Female	6	24	10	40		
Marital status					6.21	0.10
Married	19	76	16	64		
Single	5	20	2	8		
Widow/ Divorced	1	4	7	28		
Level of education					3.55	0.31
Not educated	13	52	18	72		
Read/ Write	9	36	5	20		
High education	3	12	2	8		
Residence					0.36	0.54
Rural	18	72	16	64		
Urban	7	28	9	36		
Living status					0.39	0.52
Alone	8	32	6	24		
Live with the family	17	68	19	76		
Job					4.28	0.11
Require mental effort	6	24	10	40		
Require muscular effort	14	56	7	28		
Usual housing	5	20	8	32		
Income according to the patient's perspective					0.76	0.38
Enough	9	36	7	28		
Not enough	16	64	18	72		

Table (2): Comparison of the study and control group patients' clinical presentation at admission, past medical and family history.

Variables	Groups				χ ²	P-value
	Study (n=25)		Control (n=25)			
	N	%	N	%		
Clinical presentation at admission						
Tachycardia	4	16	6	24	0.50	0.48
Bradycardia	21	84	19	76	0.50	0.48
Dizziness	21	84	19	76	0.50	0.48
Chest pain	25	100	25	100	-	-
Headache & Heaviness	23	92	20	80	1.49	0.22
Co-existing diseases						
Other cardiac diseases	18	72	20	80	1.471	0.225
Hypertension	15	60	19	76	0.439	0.508
Diabetes mellitus	12	48	13	52	0.080	0.777
Kidney diseases	0	0	6	24	6.818	0.009
Liver diseases	0	0	2	8	2.083	0.149
Others	1	4	2	8	0.355	0.552
Family history						
Coronary artery diseases	16	64	15	60	0.725	0.39
Arrhythmia	9	36	6	24	0.857	0.35
Myocardial infarction	8	32	9	36	0.089	0.76
Heart failure	2	8	3	12	0.222	0.63
Hypertension	12	48	16	64	0.000	1.00
Others	1	4	3	12	1.087	0.29

Table (3): Comparison between study and control groups regarding their satisfactory level of self-care behaviors pre and post-implementation of self-care guidelines.

Self-care behaviors	Satisfactory level of self-care behaviors								χ ²	P-value		
	Pre				post							
	Study (n=25)		Control (n=25)		Study (n=25)		Control (n=25)					
	N	%	N	%	N	%	N	%				
Maintaining the efficiency of pacemaker	0	0.0	0	0.0	-	NA	17	68	0	0.0	21.429	<0.001
Taking medications	4	16	0	0.0	1.020	0.312	18	72	2	8	7.674	0.006
Attending follow up visits	5	20	3	12	0.802	0.370	21	84	3	12	9.934	0.002
Caring wound	1	4	2	8	0.355	0.552	14	56	4	16	6.876	0.009
Doing physical exercise	3	12	0	0.0	0.433	0.511	19	76	0	0.0	30.645	<0.001
Following the prescribed diet	2	8	1	4	0.355	0.552	16	64	3	12	8.333	0.004
Relaxation technique	0	0.0	0	0.0	-	NA	19	76	0	0.0	30.645	<0.001

Table (4): Comparison of nursing-sensitive patient outcomes levels among patients of study and control groups' pre-implementation of self-care guidelines.

Domains of nursing-sensitive outcomes	Study (n=25)		control (n=25)		χ ²	P-value	
	N	%	N	%			
Physiologic health outcomes	Mildly compromised	6	24	4	16	1.30	0.521
	Moderately compromised	8	32	12	48		
	Extremely compromised	11	44	9	36		
Functional health outcomes	Mildly compromised	9	36	2	8	6.56	0.038
	Moderately compromised	14	56	22	88		
	Extremely compromised	2	8	1	4		
Psychosocial outcomes	Mildly compromised	0	0	0	0	3.03	0.082
	Moderately compromised	20	80	24	96		
	Extremely compromised	5	20	1	4		
Health knowledge and behaviors	Mildly compromised	0	0	0	0	0.32	0.569
	Moderately compromised	12	48	10	40		
	Extremely compromised	13	52	15	60		
Family health outcomes	Mildly compromised	3	12	0	0.0	3.42	0.180
	Moderately compromised	4	16	6	24		
	Extremely compromised	18	72	19	76		

Table (5): Comparison between study and control groups regarding their total score of self-care behaviors and nursing-sensitive patient outcomes post-implementation of self-care guidelines.

Variables	Study (n=25)		control (n=25)		Total		X ²	P-value	
	N	%	N	%	N	%			
Total Self-care level	Satisfactory	15	60	1	4	16	32	18.015	<0.001
	Unsatisfactory	10	40	24	96	34	68		
Total Outcomes	Mildly	15	60	0	0.0	15	30.0	33.162	<0.001
	Moderately	7	28	2	8	9	18.0		
	Extremely	3	12	23	92	26	52.0		

Table (6): Comparison between nursing-sensitive patient Outcomes among patients of study group pre and post Implementation of self-care guidelines.

Domains of nursing-sensitive outcomes		Pre		Post		X ²	P-value
		N	%	N	%		
Physiological health outcomes	Mildly compromised	6	24	12	48	6.794	0.033
	Moderately compromised	8	32	10	40		
	Extremely compromised	11	44	3	12		
Functional health outcomes	Mildly compromised	9	36	17	68	6.098	0.047
	Moderately compromised	14	56	8	32		
	Extremely compromised	2	8	0	0		
Psychosocial outcomes	Mildly compromised	0	0	18	72	29.259	<0.001
	Moderately compromised	20	80	7	28		
	Extremely compromised	5	20	0	0		
Health knowledge and behaviors	Mildly compromised	0	0	15	60	23.867	<0.001
	Moderately compromised	12	48	8	32		
	Extremely compromised	13	52	2	8		
Family health outcomes	Mildly compromised	3	12	15	60	19.532	<0.001
	Moderately compromised	4	16	7	28		
	Extremely compromised	18	72	3	12		

Table (7): Relation between patients' total self-care level and total nursing-sensitive patient outcomes post-implementation of self-care guidelines in the study group (N = 25).

Outcome level	Total self-care level						X ²	P-value
	Satisfactory		Unsatisfactory		Total			
	N	%	N	%	N	%		
Mildly	15	60.0	0	0.0	15	60.0	25.000	<0.001
Moderately	0	0.0	7	28.0	7	28.0		
Extremely	0	0.0	3	12.0	3	12.0		
Total	15	60.0	10	40.0	25	100.0		

Table (8): Correlation between patients' total nursing-sensitive patient outcomes and total self-care level in the study and control groups pre and post-implementation of self-care guidelines.

Variables	Total outcomes							
	Study (n=25)				control (n=25)			
	Pre		Post		Pre		Post	
	r	p-value	r	p-value	r	p-value	r	p-value
Total self-care level	0.736	0.00	0.899	<0.001	0.677	0.00	0.677	0.00

6. Discussion

Having a permanent pacemaker can significantly improve the quality of life, and for some people, it can be life-saving. Optimal outcomes after permanent pacemaker insertion can only be obtained if patients are supported in compliance with a lifelong therapeutic regimen (Lauck, 2013). Therefore, the present study was carried out to determine the effect of self-care management guidelines on nursing-sensitive patients' outcomes after permanent pacemaker implantation.

Two matched groups were recruited in this study. Concerning their demographic characteristics, the present study results reveal that the mean age of the study group was 45.37±5.76, while the mean age of the control group was

48.75±4.27, with a non-significant difference between them. In recent years, the proportion of patients undergoing permanent pacemaker implantation around 40 years has increased. These results agree with Youssef (2014), who studies the effect of an educational program on the patient's quality of life with pacemakers. The mean age of the patients was 43.48±13.24. Khawaja et al. (2011) also reported significant increases in the incidence of PPM implantation over 30 years old. It can be explained by the increased incidence of cardiac diseases and persistent exposure to life stressors, smoking at a younger age which is a critical indicator for cardiac diseases.

Regarding gender, the present study result clarifies that male patient constitute more than three-quarters of the study

group and more than half of the control group. This result corresponding with *Figueroa, Alcocer and Ramos (2016)* in their study about psychological intervention to modify anxiety, depression, and quality of life in a patient with implantable pacemakers; and *Youssef (2014)*, they reported that more than half of their study subjects were males. These findings may be because heart diseases and hypertension are more prevalent in males than females, as well as men significantly have a more active life and more stressed than women. This opinion is supported by *Smith (2015)*, who revealed that men's coping with stressful events could lead to physiologically, behaviorally, and emotionally increase their risk of chronic heart diseases.

One of the study's notable findings are that more than half of the patients in the study group were not educated, and slightly less than three-quarters of the control group were not educated. This finding is inconsistent with what was reported by *Nasr, El Ganzory, and Ahmed (2015)*, who revealed that slightly less than two-thirds of their study patients were not educated. These findings may be represented by the low social standard for patients attending Ain Shams University hospital as a governmental hospital to get medical treatment moreover, as evidenced by their report about their income that was not enough. Regarding residence, the current study showed that less than three-quarters of the patients in the study group and slightly less than two-thirds of the control group were from rural areas, and their family income was not enough for the costs of treatment. These findings may be interpreted as the unavailability of specialized hospitals affording pacemaker insertion in rural areas.

As regards patient clinical presentation, the current study reveals that all patients in study groups with a similar finding among controls suffered from chest pain on admission, as well, nearly about three-quarters of patients in the study group had a history of cardiac diseases, three-fifths of them had hypertension and more than two-fifths of them had diabetes mellitus. These findings are inconsistent with *Buellesfeld et al. (2012)*, who reported that the most common co-morbid conditions among PPM recipients were congestive heart failure, myocardial infarction, diabetes, and hypertension. These findings may be interpreted as; the accompanying chronic diseases may enhance the complications, so it is a must to equip such a group of patients with the necessary knowledge through the counseling program to be competent with their therapeutic regimen and prevent complications. This finding was in harmony with *Kajanova, Bulava, Eisenberger, (2014)* findings.

On the same scope, the study results declares that about three-fifths of the patients in study and control groups had a family history of coronary artery diseases, as well, more than one-third of the study group and more than two-fifths of the controls had a family history of arrhythmia, in addition, slightly less than half of them had a family history of hypertension. These findings may be due to a genetic family predisposition for cardiovascular disease, one of the risk factors for cardiovascular-related illnesses. This opinion agrees with *Hinkle and Cheever (2014)*, who concluded that traditional risk factors for cardiovascular-related illnesses include the non-modifiable factors of sex, race, age, genetic family history for cardiovascular disease, and DM.

The present study reveals an improvement in self-care satisfactory level in study group patients compared to the controls regarding all self-care activities, namely maintain-

ing the efficiency of the pacemaker, taking medication, attending follow-up visits, caring for the wound, doing physical exercise, and following the prescribed diet. This finding may be referred to correction of many misconceptions shown by the patient during self-care guidelines' implementation. Almost all of both groups of patients had some misconception and wrong information, especially about electromagnetic interference (EMI) effect on a pacemaker, also on activities and foods allowed for them after pacemaker implantation which lead some of them to stop many activities as working, practicing in all kinds of sports (even walking), avoiding all electrical appliances at home (even cell telephone), visiting relatives or neighbors, climbing stairs or even pray.

All these affect their physical, social, psychological, and spiritual condition (their quality of life), which joins forces to develop complications among those patients. Thus, all of these misconceptions were counteracted for the study group patients as they have been included in self-care management guidelines just after pacemaker implantation, which helps in clearing up a lot of misunderstanding and misconceptions with the explanation of needed information around pacemaker device and answering the concerns of patients and their relatives.

This finding was emphasized by *Mohamed and Mohamed (2014)*. They revealed that most of the study sample having wrong information about electromagnetic interference (EMI) effect on pacemakers, allowed activities and foods after pacemaker implantation, which might be the underlying cause for the development of complications after pacemaker implantation. In the same line, physical activities after implanting pacemakers helped patients to take precautions to prevent unfavorable outcomes and adhere to follow-up care and visits. This result asserts that meeting the educational needs of the patients would help fulfil the compulsory changes in daily living activities.

In the same context, this finding is supported by *Shahrbabaki, Nouhi, Kazemi and Ahmadi (2016)*; *Refaii (2010)* reported that the improvement level of the study group self-care scores post-implementation of the educational program as compared to control group with highly statistically significant differences between the two groups during the post-assessment. Moreover, this study is consistent with *Zafari, Ghadrdoost, Hanifi, and Khaleghparast (2012)*, who reported that learning leads to increase the awareness and change self-care performance behaviors that improved in the experimental group in 1 to 3 months after performing the learning program and improved their quality of life.

Concerning nursing-sensitive patient outcomes, the findings of the present study display highly statistically significant differences between the study and the control groups regarding all aspects of health outcomes post-implementation of self-care guidelines, in addition to a statistically significant improvement of all health outcomes among the study group patients compared to their baseline assessment before implementation of the self-care guidelines. These findings can be explained as after exposing the study group to the self-care guidelines, their self-care knowledge and practice improved, which affect their nursing-sensitive patient outcomes positively. This finding is evidenced by about two-thirds of the mildly compromised patients getting a satisfactory self-care level with a highly

statistically significant difference between total self-care and total outcomes among the study group patients that support the study hypothesis.

In this view, *Bolse (2009)*; *Sreelekshmi (2011)* mentioned that patients should have appropriate and adequate information to avoid post pacemaker complications and improve their outcomes. Also, *Buellesfeld et al. (2012)* stated that patients who are oriented about their disease and treatment plan are more positive and changing their behaviors that promote their physical, social, psychological, and functional outcomes as well their compliance improved more than those who were not oriented.

Regarding patient's physiological health outcomes, the current study revealed that the study group's outcomes were improved after implementing self-care guidelines with a statistically significant difference between the two phases. This finding may be attributed to the effect of the daily living modifications, taking precautions to prevent unfavorable complications, and adhere to follow-up visits, which improve physiological outcomes associated with arrhythmia and implanted pacemaker device. This result asserts the assumption by *Kanjilal, Goswami, Kumer, and Chatterjee (2014)*, who stated that meeting the educational needs of the patients with implanted permanent pacemakers improves their physical function.

Concerning patient's functional health outcomes, the current study detects that the study group's functional ability was improved after implementing self-care guidelines compared to the pre-assessment, with a statistically significant difference between the two phases. These findings can be interpreted as, in the follow-up period, the healing process became nearly completed, the programming of the device became settled, and patients became more familiar with the new living restrictions taught in the educational sessions.

This interpretation is supported by *Hasian, Gersha, and Al Hamdi's (2009)* study for investigating the effectiveness of nursing interventions in patients undergoing pacemaker implantation in which they were comparing the hemodynamic measurement before and after the exercises. The study also illustrated an increase in the ventricular pacemaker rates during the exercise, so their study showed an improvement in the hemodynamic and exercise tolerance.

From the other scope, some patients still not confident to function well. This finding may be because they may be still restless about their life, so they prefer not to do activities and keep resting. The current study finding is congruent with *Wenwen, Yuzhen, Yuejuan, and Shujuan (2013)*, who stated that such patients need more and more support to gradually return to their usual activity level and become independent. Also, *Conelius (2015)* stated that counseling patients with pacemakers helped improve their health status and quality of life, strengthened patients' self-efficacy and perception, and helped them cope with their implanted pacemakers.

One of the notable findings of the study regarding psychosocial outcomes was a highly significant improvement of psychological status post-self-care guidelines implementation compared to pre-self-care guidelines implementation. This finding may be attributed to the stress on interpersonal communication through group discussion, which made patients ventilate their feelings and stressors to help them cope with their life transitions period.

So, the promotion and maintenance of patients' social and mental health positively impacted their overall health and wellbeing and played a significant role in improving their coping and adaptation with the new modifications in life. This finding is supported by *Nasr, El Ganzory, and Ahmed (2015)*, who concluded that patients who received nursing interventions demonstrate improvement in their psychological status compared to control group patients.

Furthermore, *Lampert (2013)* explained that knowing the details of a patient's abilities and difficulties, weaknesses, and strengths providing the bridge by which the patient's mental, physical and social needs are met. *Wong, Sit, Wong, and Choi (2014)* contradicting that the prevalence of poor psychological and physical wellbeing and high level of depression was somewhat increased in patients with pacemaker implantation even after post counseling intervention. On the other hand, those who are depressed may experience symptoms such as anorexia, palpitations, which may contribute negatively to their state of health.

Regarding health knowledge and behaviors, the current study presents that the study group's health knowledge and behaviors were improved post-implementation of self-care guidelines with a highly statistically significant difference between pre- and post-assessment phases. This finding may be due to the empowerment of their knowledge and skills with essential information related to PPM, allowed activity with suitable sports, the importance of ID, and regular follow-up care. Also, determining the signs and symptoms of pacemaker failure and complications could be lifesaving and essential to help them lead a relatively normal life without or with minimal complications. This finding is inconsistent with *Kanjilal, Goswami, Kumer, and Chatterjee (2014)*; *Abbasi, Negarandeh, Norouzadeh, and Mogadam (2016)*, who reported that those patients should have appropriate and adequate information after pacemaker implantation to avoid post pacemaker complications.

Concerning family health outcomes, the current study shows that the knowledge and behaviors of the study group's relatives were improved post-implementation of self-care guidelines with a highly statistically significant difference between the two phases. These findings may be interpreted as; the patients' relatives need support and understanding the nature of the pacemaker device and how to deal with it due to the short hospitalization period that makes them in a state of high demands to understand the situation and how to control and handle it at home. So that, the educational program increased their awareness, knowledge, and coping with their patient's condition.

This finding supported by *Malm and Sandgren (2014)*, who concluded that the relatives have an essential role when the patient has a life-threatening condition, through their presence increases the patient's feeling of strength and support that gained by education, which means that the relatives have an important task in dealing with the patients and make them able to regain normalcy.

On the other hand, *Thomson, Niven, Peck, and Evans (2013)* reported that relatives could describe as a hidden patient, and their life satisfaction could be lower than that of the actual patient. It has also been noticed that the stress levels of patient's hospitalized relatives could be higher than the actual patients' levels. In addition to this, due to lack of information, uncertainty regarding the outcomes, emotional turmoil, and need for support, depression and psychosomatic

symptoms may also be experienced. These symptoms may disappear after the relatives being involved in the educational program related to the effect of the pacemaker device on their patient's life.

The correlation between patients' total nursing-sensitive patient outcomes and total self-care in the study and control groups pre and post-implemented self-care guidelines. The present study shows a statistically significant positive correlation between patients' total self-care behaviors and their nursing-sensitive patient outcomes. This finding could be contributed to the fact that higher self-care management levels should have better health outcomes in patients with PPM. This result is in the same line with *Wenwen, Yuzhen, Yuejuan, and Shujuan (2013)*, who reported a statistically significant positive correlation between total knowledge and total practices scores among the study and control group subjects throughout the different assessment periods in their study.

Similar results reported by *Iliou, Blanchard, Lamar-Tanguy, Cristofini, and Ledru (2016)*, who indicated that cardiac educational program for patients with implanted electronic devices as pacemakers, is a unique opportunity to optimize their medical treatment, exercise capacity, clinical condition, and monitoring the functioning of the device. The effects of exercise training maximize the central benefits offered by cardiac implanted devices. Based on these findings, it is necessary to consider the role of nurses in a cardiac rehabilitation program.

Finally, this part supports the stated hypothesis that the self-care management guidelines will reflect positively on nursing-sensitive patients' outcomes after permanent pacemaker implantation. This result agrees with *Nasr, El Ganzory, and Ahmed (2015)* and *Tomzik, Koltermann, Zabel, Willich, and Reinhold (2015)*, who provide various evidence indicating that educational attainment is associated with better outcomes in patients with implanted permanent pacemakers.

7. Conclusion

Implementation of self-care management guidelines positively enhanced all dimensions of nursing-sensitive patients' outcomes (physiological health outcomes, functional health outcomes, psychosocial outcomes, family health outcomes, health knowledge, and behaviors).

8. Recommendations

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

- Studying the possible strategies to generalize using nursing-sensitive patient outcomes based on nursing outcomes classifications (NOC) provides more comprehensive standardized information on patient, family, and community outcomes resulting from nursing interventions.
- Self-care management guidelines for patients after permanent pacemaker implantation should be applied in all cardiac catheterization units and should be updated periodically to enhance self-care management for those patients based on NOC.
- Pamphlets and simple booklets should be available for patients to illustrate and explain how to safely live with such a lifesaving device.

- More intervention research is needed to develop a cohesive and comprehensive body of evidence to base cardiovascular nursing care to improve patient outcomes.

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