Permanent pacemaker implantation: Effect of intervention protocol on nurse's knowledge, practices, and patient's outcomes.

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Abstract

Background: Pacemaker may be a supportive therapeutic modality won't to control long-term cardiac rhythm problems to save patients' lives from complications as sudden death. Nurse plays an important role for caring cardiac pacemaker patients.

Aim of the study: To evaluate the effect of intervention protocol on nurses' knowledge, practices, and patient's outcomes.

Subjects and methods: Quasi experimental pre–post assessment study was performed on 40 nurses working at cardiology intensive care unit, and Department, and outpatient clinics at Zagazig University Hospitals, and 40 patients with implantable pacemaker in the setting.

Tools for data collection: A self–administered questionnaire and an observational checklist. The researcher integrated intervention protocol focused on analysis data collected in the assessment phase in order to provide nurses with intervention protocol guides for caring patients with permanent pacemaker implantation. The intervention protocol evaluation had effects on nurses' knowledge, and practices and based on patient adherence with pacemaker care practice and performing activity daily living was carried out immediately after implementation (post – test).

Results: The results showed statistically significant improvements in the knowledge and practice of nurses at the post test ($p<0.001$), with statistically significant strong positive correlation ($r=(r=0.567)$ between them. Also, across all aspects of patients adherence care practice and performing activity daily living after implementation there were also, statistically improvement ($P=0.000^*$). In multivariate analysis, the intervention was a statistically significant positive independent indicator of the improvement in nurses' knowledge and practice, and patient's outcome.

Conclusion: Implementing nursing intervention protocol for caring patients with implantable pacemaker is efficient in improving the knowledge and practice of nurses, which is a better adherence with pacemaker care activities and increase independency for performing activity daily living. Therefore this protocol can be used in specific settings. Further research is proposed to examine the effect of the implementation of this protocol on reducing the incidence of complications due to non-adherence after implantation of pacemaker.

Keywords: Permanent pacemaker, Intervention protocol, Patients outcome.

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Introduction

The normal, healthy heart contracts by an electrical impulse then passes to the muscles of the lower chambers of the heart via "wires", telling them to contract and cause a heartbeat. This system assists the heart to contract at an effective rhythm. A slow heart rate can be caused by any problem with this system. An artificial pacemaker may be needed to help the heart to pump in right way and make sure that the blood and oxygen are pumped to all parts of the body [1].

Cardiac rhythm disorder is one of the major cardiovascular problems. During an arrhythmia, the heart may beat too quickly, too slow, or with an irregular rhythm. Most arrhythmias are harmless, but some can be serious or life threatening [2]. The effect of dysrhythmias has on ability the heart's to pump an adequate volume of blood. When cardiac output is reduced, the amount of oxygen reaching the tissues and vital organ is reduced. This decreased oxygenation is responsible for the signs and symptoms associated with dysrhythmias. If these signs and symptoms are sever or if they occur frequently, the patient will experience significant pain and disturbance of daily life, a pacemaker may be necessary to help the heart to beat normally and to maintain its health [3].

Cardiac pacemaker may be used to treat chronic and life threatening dysrhythmias and are used to support heart rate when bradycardia occurs it can be used to regular heart rate. Advances in pacemaker technology have resulted in units programmable for single- and double chambered control. If the heart rate is less than 60 beats (30-40 beats) per minute and the heart fails to meet The tissue oxygen requirements will be inserted into the atrial

or atrioventricular sinus node to compensate for tissue hypoxia and irregular heart rhythm, and patients with this system will be able to continue their life [4,5].

Apace maker is a small device that allows more regularly heart beats: it operates with a small electric stimulation. Pacemaker mainly placed under the skin on chest, just under collarbone. It hooked tiny wires up to the heart [1]. A cardiac pacemaker electrically stimulates myocardium layer of heart to depolarize or/and induce a contraction, when heart's Sino atrial node isn't functioning properly. Pacemakers are of two types i.e. temporary and permanent, which implanted with an abnormality according to the type of conduction system [6].

Implantation of the pacemaker is a vital event in one's life. Pacemaker Implants saves the patient from life threatening arrhythmias. Cardiac pacemakers are life saving for patients but pacemaker implantation does change the normal activities of the patient. It changes the ADL (activity of daily living) performance of the patient along with there are some serious problems associated with pacemaker that can be prevented by performing pacemaker care practices. Patients needing pacemaker can often be depressed as a result of feeling dependent on an artificial device, fear of device malfunction, fear of death and high cost of pacemaker. The complications associated with permanent implantation of pacemaker can be minimized with adequate care practices [7].

While pacemaker may be associated with some complications, it is attempted within 4-6 weeks after surgery return patients to their normal life. Immediate and precise monitoring is efficient for cardiac arrhythmias reduced and rapid return to the normal life of individuals. The complications can be avoided by teaching patients the necessary points relating to pacemaker management, will avoid the complications. Patients' education has become an integral part of the therapeutic approach for helping patients with pacemakers [8].

Caring for these patients requires knowledge about the device, its complications, and the related factors. Also the patient's hemodynamic state, nurse's information and knowledge can be crucial and constructive in patient's training and enhance the reduction of complications during the life with the device. Providing nursing care and proper nursing processes for these patients can prevent complications and defects in the device performance [9]. Permanent pacemaker can greatly improve quality of life and can be lifesaving and preventing death for some people. Optimum outcome can be only achieved after permanent pacemaker insertion, if patients are supported in compliance to a lifelong with permanent pacemaker. One of the most significant issues facing healthcare today is that patients do not have knowledge regarding permanent pacemaker [10].

Study significance

Implantation of pacemaker saves many lives and allows patients improved health and full productive life. It implies physical, psychological, social and spiritual issues, even though the pacing is a complete success [11]. Patients with cardiac devices implantation from an increasing segment of current healthcare practice. There are about 3 million people worldwide, and 600,000 pacemakers are implanted every year. Care for such a rapidly increasing population of patients is a challenge for all health care providers working in cardiology wards, operating rooms or primary care practices [12]. Caring for patients with permanent pacemakers needs knowledge about the device and its risks and guidelines for homecare and long term follow up. Nurses' knowledge and practice is crucial and constructive in achieving appropriate post pace maker implantation outcomes. Thus there's serious need for nursing intervention protocol to provide and improve basic nurses' knowledge and practice for the care of patients with permanent pace maker and improve outcomes of patients.

Aim of the Study

The study aim was to: Evaluate the effect of intervention protocol on nurse's knowledge, practices and patient's outcomes with permanent pace maker's implantation at Zagazig University Hospitals through the following objectives:

Objectives

Assess Knowledge and practice for nurses caring patients with permanent pace maker implantation.

Plan and implement nursing intervention protocol for nurses caring patients with permanent pace maker implantation.

Evaluate nursing intervention protocol on nurses' knowledge, practices, and patients' outcomes with permanent pace maker implantation.

Research hypotheses

H1: The mean knowledge scores of nurse's post-intervention protocol will be higher than those of their scores for the pre-intervention protocol.

H2: The mean practice scores of nurses' post-intervention protocol should be improved than that of their pre-intervention protocol scores.

H3: Nursing intervention protocol has positive effect on patients' outcomes.

Subjects and Methods

The methodology section consists of two parts. The first part described sources of data and variables. Second section described empirical model adapted to examine the relationship between working capital management and company performance in Jordan. The third section described the statistical tools.

Research design

A Quai experimental design was used.

Study setting

The study was carried out in Cardiac Intensive Care Unit, Cardiology Department, and outpatient clinics at Zagazig University Hospitals.

Participants

A group of nurses, and another group of patients involved in the study. The group of nurses consisted of convenient sample of all nurses available (40) working in the cardiology intensive care unit and study setting department dealing with patients

with permanent pace maker implantation. The group of patient included 40 patients in the study setting chosen by purposive sampling following permanent pacemaker implantation before the nursing intervention protocol implemented. It has excluded patient with mental disorders and other who cannot communicate.

Data collection tool

The researcher prepared three tools for data collection, namely a self-administered questionnaire and an observation checklist for knowledge and practice of nurses, and patients interview questionnaire.

Self-administered nurses' questionnaire: It was structured in Arabic by the researcher and based on pertinent literature and content-validated through opinions of medical-surgical nursing and cardiology experts. It included a section for nurse's personal characteristics such as age, marital status, education, experience years, training courses. It consisted of 44 questions (20 true and false, 24 questions of multiple choice (MCQ), covering 5 major areas: 1) the physiology and anatomy of heart, conduction system of the heart, pace maker device, nursing care after permanent pace maker implantation, predischarge instruction for patient and family regarding identification data, wound care, physical movement, medication, diet, follow-up, and precautions which patient should be followed. For scoring of knowledge, Nurse's responses were checked with model answers and given 1 point if correct and 0 if incorrect. The points were summed up and converted into percent score. A total score of 60% or more was considered as satisfactory knowledge.

The nursing practice observation checklist was developed by the researchers based on related literature [13,14]. It assessed nurse's practice regarding permanent pacemaker patient's care. It includes: Nursing care in 1st 24 hr after surgery (9 steps), Nursing care in 48-72 hr after surgery which included the following items: Connect patient to cardiac monitor (20 steps), Measuring Radial Pulse (10 steps), Caring Incision Wound (14 steps), and Recording 12-lead Electrocardiogram (24 steps). The observed practice was compared with standardized procedures. Accordingly, the nurse was given 1 point if the step or item was done, and zero if not done. The points were summed up and converted into percent score. A total score of 75% or more was considered satisfactory practice.

Patient interview questionnaire sheet

This sheet was developed by the researcher to assess patient's outcomes after pace maker implantation. This contained a section for patient's personal characteristics such as age, sex, marital status, occupation, educational level, smoking, income, etc. It also included Medical History of studied patients such as: symptoms of disease (tachycardia, bradycardia, dizziness, and chest pain), previous chronic disease, comorbid disease, positive family history of cardiac disease, and type of pace maker used (single, double chamber, and biventricular).

The second section: A checklist was prepared for assessment of adherence with pacemaker care practices. It included total 15 items like monitoring pulse rate daily, avoiding pressure over pacemaker site, keeping cell phone opposite side of pacemaker, wearing loose cotton clothes, performing light exercises like walking daily, performing follow up visits as advised, caring pacemaker card always, keeping pacemaker site dry and clean, eating high fiber food and vegetable diet, not lifting weights by pacemaker implanted side arm, staying away from electromagnetic interference, performing shoulder exercises, not performing exertion physical activities and not lifting arm above shoulder level. Each item contains 1 mark for performing right activity and 0 marks for not performing appropriate activity. No negative scoring was done. Scores was classified in poor (0-5), average (6-10) and good (11-15) adherence with pacemaker care practices.

The Third section assessed patient's activity daily living by using Barthel Index Scale which includes 10 personal activities i.e eating, dressing, toileting, bathing, transfer, mobility, stairs climbing, bowel, and bladder [15]. Each item is scored as to whether the patient can perform the task independently, with some assistance, or is dependent on help based on observation (0=unable, 1=needs help, 2=independent) the final score is x5 to get a number on a 100 point score. Total scores ranging from 0-100 with lower scores indicate increased disability.

Pilot study

A pilot study was carried out on 10% of nurses and patients to assess the applicability of the tools. It helped in detection of difficulties in some items. This led to omission of certain items and addition of others. Therefore, the patients and nurses who shared in the pilot study were not included in the main study sample.

Content validity and reliability

The face and content validity of the tools was established by a panel of seven experts in medical/surgical nursing and in medicine who reviewed them for clarity, relevance, comprehensiveness, understanding, applicability, and ease for administration. Minor modifications were required. The reliability of Barthel index scale showing excellent reliability with a Cronbach's alpha coefficient of (r=0.93).

Administrative design and ethical considerations

Necessary approvals to conduct the study were secured using official channels. The research and ethics committee at the Faculty of Nursing, Zagazig University approved the protocol. At the initial encounter with each patient or nurse, the researchers explained the aim and process of the study and its benefits in obtaining an informed oral consent. Confidentiality and anonymity of any information obtained was assured by coding all data. The researcher reassured participant that the data will be used only to improve their health and for the purpose of the study.

Fieldwork

The study was conducted during the period from January 2019 to November 2019, through four phases of assessment, planning, implementation, and evaluation.

Assessment phase: The researchers started to recruit the

sample according to eligibility criteria. The nurses' knowledge was assessed using the self-administered questionnaire. This was followed by observing their practice for patients after permanent pacemaker implantation in different shifts using the observation checklist, then the patient questionnaire completed by the researcher. The information obtained served as baseline data or pretest, and guided the researchers in the preparation of the intervention protocol.

Planning phase: Using the assessment data and related literature, the researchers created an intervention protocol to educate nurses and improve their knowledge about patient care following pacemaker implantation. Theoretical and practical part involved an intervention protocol. The researcher prepared an illustrated booklet for guidelines in plain Arabic language to help nurses for updating their knowledge to achieve aim of the study.

Implementation phase: The researcher delivered the nursing intervention protocol in nine sessions which took 30-45 minutes. The first three sessions were theoretical covering the knowledge regarding anatomy and physiology of heart, conduction system of the heart, pace maker device, nursing care after permanent pace maker implantation, predischarge instruction for patient and family regarding identification data, wound care, physical movement, medication, diet, follow-up, and precautions which patient should be followed. This was followed by six practical sessions which covered nursing care in 1st 24 hr after surgery, nursing care in 48-72 hr after surgery which included the following items connecting patient to cardiac monitor, Measuring Radial Pulse, Caring Incision Wound, and Recording 12-lead Electrocardiogram. An orientation toward the intervention protocol and its purpose was provided at the beginning of the first session. Every session began with summary of what had been learned in the previous session and the objective of the new one, the researcher used simple language to suit the level of nurses with motivation and affirmation to enhance learning. Each nurse and patient was offered a copy of the protocol for to use it as future reference.

Evaluation phase: The evaluation of the effect of intervention protocol on nurses' knowledge and practice, and thus on patients' outcomes were carried out. Each nurse was evaluated two times using the same data collection. This is done upon recruitment (pretest) immediately after the end of intervention protocol guidelines. For patients, the evaluation was conducted by contrasting the evaluation that was provided with the pre-intervention protocol following implementation of it. Adherence with pacemaker care practices, and Barthel index scale for ADL measured during follow-up visit at outpatient clinic

Statistical analysis

The collected data were analyzed by computer using Statistical Package of Social Services version 24 (SPSS), Data were represented in tables and graphs, Continuous quantitative variables were expressed as mean ± SD and median (range), for example age, and categorical qualitative variables were expressed as absolute frequencies (number) and relative frequencies (percentage). The arithmetic mean (X) defines as the central tendency of measurement as average. The Standard Deviation (SD) is a function of dispersion around the mean of the results. Range lies from the lowest to the highest observation. After testing for normality appropriate statistical measures of significance were used. Wilcoxon Signed Ranks Test: was used for comparing paired categorical and numeric variables. Paired t test: was used for comparing paired quantitative variables. The results were considered statistically significant when the significant probability was less than 0.05 ($P<0.05$). P-value<0.001 was considered to be Highly Statistically significant (HS), and P-value $\geq$ 0.05 was considered to be statistically Non-Significant (NS).

Results

In Table 1 showed that the age of studied nurses ranged between 23-47 years with Mean ± SD (30.7 ± 7.08). About 77.5% of them were married, and 47.5% of them had diploma and specialty in nursing. Also, it showed that studied nurses had years of experience ranged between 3-27 years with Mean ± SD (11.25 ± 7.04), while 92.5% of them didn't attend any previous training courses regarding caring of patients with pace maker implantation.

Table 1: *Personal characteristics data of the studied nurses (n=40).*

Age	**Mean ± SD**	30.7 ± 7.08	
	(Range)	23-47	
		N	%
Marital	Single	6	15
	Married	31	77.5
	Widow	3	7.5
Education	Diploma	20	66.7
	Nursing technical institute	8	20
	Diploma + specialty	19	47.5
	Bachelors	6	15
Experience	Mean ± SD	11.25 ± 7.04	
	(Range)	3-27	
Experience in cardiology /ICU	Mean ± SD	8 ±4.7	
	(Range)	1-20	
Training for cardiac surgery	Not	24	60
	Trained	16	40
Training for pacemaker	Not	37	92.5
	Trained	3	7.5

In Table 2 Demonstrated that there was a statistical significant increasing in mean score of nurses knowledge about anatomy, physiology, and conduction system of the heart, knowledge about pace maker device, knowledge about nursing care of patients after pacemaker implantation, and knowledge about predischarge instructions post intervention protocol than before with statistical significant difference (P=0.000*). The total satisfactory knowledge significantly increased among studied nurses after intervention protocol implementation (P=0.000*).

Table 2: *Total satisfactory nurses' knowledge and practice (pre-post).*

Item		Pre	Post	test¥	p-value
Satisfactory nurse's knowledge					
Total anatomy and physiology, conduction system	Mean ± SD	4.8 ± 1.92	19.78 ± 0.66	-5.52	0.000*
	Range	1-8	17-20		
Total knowledge about pace maker device	Mean ± SD	0.27 ± 0.55	7 ± 0	-5.85¥	0.000*
	Range	0-2	7-7		
Total nursing care of patients after implantation	Mean ± SD	0.05 ± 0.31	7 ± 0	6.25¥	0.000*
	Range	0-2	7-7		
Total predischarge instructions	Mean ± SD	1.13 ± 1.04	10.88 ± 0.33	-5.56¥	0.000*
	Range	0-4	10-11		
Total knowledge score	Mean ± SD	6.25 ± 2.9	44.6 ± 0.83	-5.51	0.000*
	Range	2-12	41-45		
Satisfactory nurses practice					
Nursing care in 1st 24 hrs	Mean ± SD	2.69 ± 0.97	13.7 ± 0.90	-5.50	0.000*
	Range	0-5	9-14		
Nursing care in 48-27 hrs					
Connecting patient to cardiac monitor	Mean ± SD	10.44 ± 2.57	25.3 ± 1.2	-5.45	0.000*
	Range	3-14	22-25		
Measuring radial pulse	Mean ± SD	6.03 ± 0.92	9.7 ± 0.57	-5.60	0.000*
	Range	2-8	7-10		
Caring of incision wound	Mean ± SD	6.10 ± 1.3	14 ± 0	-5.47	0.000*
	Range	3-9	14-14		
ECG practice	Mean ± SD	16.4 ± 2.08	33.6 ± 0.84	-5.47	0.000*
	Range	9-19	29-34		
Total practice score	Mean ± SD	41.79 ± 6.04	96.6 ± 1.98	-5.44	0.000*
	Range	22-52	91-98		
*Statistically significant at p ≤ 0.0;¥:Wilcoxon Signed Ranks Test.					

Similarly, the table indicated that a statistical significant increasing in mean score of satisfactory nurses' practices through nursing care in 1st 24 hrs. After implantation, nursing care in 48-27 hrs. which included connecting patient to cardiac monitor, measuring radial pulse, caring of incision wound, Recording 12-lead of ECG post intervention protocol than before statistical significant difference (P=0.000*). Also there was a statistical significant improvement of total nurses' practices regarding patient after pace maker implantation post intervention protocol than before with statistical significance difference (P=0.000*).

In Table 3 Correlation matrix between total satisfactory nurses' knowledge and practice in relation to years of experience and age pre/post intervention protocol.

Table 3: *Reflected that total nurse's knowledge score significantly correlated with total practice score(r=0.567, p-value<0.001) pre intervention protocol, while after intervention there was positively correlation between total knowledge score and total practice. Also there was negative significantly correlation between total knowledge and age, years of experience after intervention protocol (r=-0.530 and r=-0.533, p<0.01).*

Variables	Pearson correlation coefficient			
	Knowledge	Practice	Experience	Age
Pre intervention Knowledge score Practice score Experience (total) Age Experience in (cardiology)	1.00 0.567** 0.030 0.035 -0.044	1.00 -0.162 -0.128 -0.044	1.00 0.990** 0.935**	1.00 0.927**
Post intervention Knowledge score Practice score Experience (total) Age Experience in (cardiology	1.00 0.477** -0.530** -0.533** -0.546**	1.00 -0.433** -0.423** -0.394**	1.00 0.990** 0.935**	1.00 0.927**
Pre vs. post scores Knowledge score Practice score	0.205 0.360*	0.399* 0.156	…….	…….
**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).				

In Table 4 Cleared that the mean age of the studied patients was (49 ± 7.6), ranged between 35-60 years. About 62.5% of them were male, while 92.5% were married. In relation to educational level 47.5% of the studied patients were illiterate, in addition to 77.5% resident of rural area. Despite of that only 20% of them required mental effort in work, and also income was not enough in 70% of the studied patients.

Table 4: *Sociodemographic characteristics of the Studied patients (No=40).*

Age	**Mean ± SD**	49 ± 7.6	
	(Range)	35-60	
		N	%
Sex	Male	25	62.5
	Female	15	37.5

Marital	Married	37	92.5
	Widow	3	7.5
Education	Illiterate	19	47.5
	Read and write	8	20
	Secondary	9	22.5
	University	4	10
Residence	Rural	31	77.5
	Urban	9	22.5
Occupation	Intellectual effort	8	20
	Muscular effort	20	50
	Usual house work	12	30
Income	Enough	12	30
	Not	28	70
Smoking	Yes	20	50
	No	20	50

In Table 5 Clarified that chest pain and dizziness were the commonest symptoms among patients when admitted to hospital (100% and 80% respectively, while 80% of them suffered from other comorbidities in the form of cardiac diseases, hypertension, Diabetes Mellitus (30.4%, 21.8%). Regarding family history 95% of the studied patients had cardiac family history. Also it was found that, 55.0% of the studied patient underwent single chamber pace maker.

Table 5: *Medical History among the Studied patients (No=40).*

Item		**N**	**%**
Clinical presentation at admission	Tachycardia	22	55
	Bradycardia	20	50
	Dizziness	32	80
	Chest pain	40	100
Previous chronic disease	Yes	8	20
	No	32	80
Comorbid disease (N=32)	Other cardiac disease	10	30.4
	Hypertension	7	21.8
	DM	7	21.8
	Renal disease	7	21.8
	Hepatic disease	1	3.2
Family history		38	95
Family cardiac disease	Coronary heart disease	16	42.1
	Arrhythmia	8	21.1
	Cardiac stroke	7	18.4
	Heart failure	7	18.4
	Hypertension	4	10.5
Type of pacemaker	Single chamber	22	55
	Double chamber	13	32.5
	Biventricular	5	12.5

‡Multiple cardiac diseases were found.

In Table 6 Illustrated that adherence with pace maker care practices significantly increased among the studied patients before intervention protocol, adherence was poor and average (85.0% and 15.0%)respectively, while adherence improved to be average and good (17.5% and 82.5%) after implementation of intervention protocol with statistical significant difference (P=0.000*).

In Table 7 Indicated that there was a significant improvement in Barthel index scale to assess ADL for patient with implantable pacemaker through decrease dependency from sever to be moderate and slight (85% and 15%) respectively post intervention protocol than before with statistical significant difference(P=0.000*).

In Table 8 showed that there was positive significantly correlation between adherence and dependency preprogram (r=.418**), also positive significantly correlation between adherence preprogram and post program(r=.479**).

Table 6: *Adherence with pacemaker care practices among the Studied patients (No=40).*

Item		**Pre**		**Post**		**test¥**	**p-value**
		No	%	No	%		
Adherence score	Mean ± SD	3.73 ± 1.4		12.5 ± 1.7		20 -32.900‡	0.000*
	Range	2-8		8-15			
Adherence	Poor	34	85.0	0	0.0	-5.719¥	0.000*
	Average	6	15.0	7	17.5		
		0	0.0	33	82.5		

‡Paired t –test; ¥Wilcoxon Signed Ranks Test; *statistical significance.

Table 7: *Barthel Index scale to assess ADLs for patient with implantable pace maker among the Studied patients (n=40).*

Item		**Pre**		**Post**		**test¥**	**p-value**
		No	%	No	%		
Barthel index Scale	Mean ± SD	55.12 ± 14.1		84.75 ± 7.2		-14.778‡	0.000*
	Range	35-85		65-95			
Dependency	Sever dependency	28	70.0	0	0.0	-5.507¥	0.000*
	Moderate dependency	12	30.0	34	85.0		
	Slight dependency	0	0.0	6	15.0		

‡Paired t-test; ¥Wilcoxon Signed Ranks Test; *statistical significance.

Table 8: *Correlation Coefficient between Barrthel index to ADL and adherence care practice among studied patients with Implantable Pacemaker.*

Item		Adherence/pre	Barthel index/ pre dependency	Adherence/Post
Barthel index/pre dependency	r	.418**	…….	…….
	p	0.007	……..	…….
Adherence/post	r	.479**	.497**	……..
	p	0.002	0.001	……..
Barthel index/post Dependency	r	0.244	.445**	.466**
	p	0.13	0.004	0.002

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Discussion

IAccording to the Potterand Perry, nurses need a deep understanding of nursing priorities for patients with pacemaker. Nurses are responsible for a complex performance that implies specific set of knowledge and practice needed for providing specific nursing implementation. To ensure best practice in the nursing sector, knowledge and use of evidence-based practice is important. To help clinical practice towards improved patient outcomes, nurses need to be aware of this intuitive.

The finding of this study showed that age of studied nurses was ranged between 23-47 years old with Mean ± SD (30.7 ± 7.08). Also, the majority were married. Concerning level of education about half of them had diploma degree+ specialty with years of experience in cardiac ICU and department ranged from 1-20 years. This result difference with who found in thesis entitled" Assessment of Nurses' Knowledge and Practices Regarding Temporary Pacemaker Patient's Care at Assuit University Hospital [16]. In Egypt, that the majority of nurses their age were from 18-23 years and more half of them have nursing institute. While nearly third quarters of them were single.

In the current study the most of the studied nurses didn't receive any training courses on patient care with implantable pace maker. This may be due to the lack of special hospital policies that regulate the continuous training for nurses who work at cardiac ICU and department resulting in lack of nurses' knowledge and complex assessment needed for caring patient with implantable pace maker. This was similar to study of who announced that in the study titled " Nurses' Knowledge regarding Nursing Care of Adult patient with pacemaker at Medani Heart" that the most of the nurses didn't receive training courses about caring patient with pace maker [17].

According to the study results, mean score of total satisfactory nurses' knowledge about pacemaker was decreased before implementation of intervention protocol, indicated lack of educational program, and training session of new nurses to improve and update their knowledge in addition to disseminated poster's, and guidance in the work area of nurses. The finding is in line with who concluded that critical and coronary care nurses lack knowledge and practice about implantable cardiac devices [18].

The intervention protocol implementation led to significant improvements in knowledge of nurses in all areas evaluated. This indicates the positive effect of the intervention protocol on the knowledge of nurses, and this was further supported by multivariate analysis which established the intervention as a significant independent positive predictor of the nurses' knowledge gained. A similar impact of an intervention on changes on nurses knowledge about caring for patients with pacemaker was demonstrated in a study in Ain Shams University who reported that self-learning package had statistically significant positive effect on nurses performance(Knowledge and Practice) regarding caring for patients with pacemaker [19].

The present research has also shown a decline in nurses' practice for caring patients after implantable pacemaker before intervention protocol introduced. This finding comes in the same line as who revealed that approximately three quarters of nurses surveyed had an unsatisfactory level of practice regarding caring for patient with permanent pace maker [20].

The nurses' practice following implementation of intervention protocol shows significant improvement. Such results indicated the positive effect of the intervention, and there were verified again in the multivariate study which showed that both intervention and knowledge score was significant independent positive predictors of the practice score, and together explained almost all the improvement in this score. Thus, besides the theoretical part, the practical training element of the intervention has been effective in modulating the practice of the nurses. Furthermore, a strong positive correlation between nurses' knowledge and the practice scores has been revealed, really what emphasizes the importance of the theoretical element of the intervention protocol. In accordance with Thabet, et al. whose indicated in their study that there was positive correlation between total nurse`s knowledge scores and their total practice scores about caring for patient with temporary pacemaker [16].

Regarding characteristics of patients under study it was found that the mean age of the studied patients was 49 ± 7.6 at age ranging from 35-60 years. This may be due to recurrent exposure to life stressors and responsibility abnormalities of impulse generation and conduction increased with advancing age [21]. This finding consistent with what Khawaja, et al. reported that the incidence of Permanent Pacemaker Implantation has increased significantly over 30 years [22].

In the present study, the characteristics of patients showed that

most of them were male and married. This may be due to that heart disease and hypertension are more prevalent in males than females in addition married persons were more likely to suffer from cardiac disease than singles because they always facing psychological stress of their social role. This result is congruent with Elsayed who mentioned that more than three quarter of study group were males and married [23]. In the same context, a noticeable finding from the present study was that nearly half of the patients were illiterate, about three quarters were living in rural area with low income, and half of them had jobs that needed muscular effort. This reflects the low social standards for patients attending at Zagazig university hospitals. Moreover as evidenced by their own report about their income that is not enough. This finding is in consistent with what was reported by Nasr, et al. who revealed that around two thirds of their study patients were illiterate and two thirds of them have jobs [24].

As for clinical presentation on admission of patients. The current study showed that all studied patients suffered from chest pain, and majority of them suffered from comorbidity diseases in the form of other cardiac diseases, hypertension and diabetes mellitus. These findings can be interpreted as: the accompanying chronic diseases that enhance the complications so that improving nurses' knowledge and practice will be futile if not contributing to improve patient care and outcomes is a must. These findings are backed by Buellesfeld, et al. who reported that, the most common co-morbid conditions among permanent pacemaker recipients were congestive heart failure, myocardial infarction, diabetes and hypertension [25].

As regards Barthel index scale to assess activity daily living for patients with implantable pacemaker. The study result illustrated that there was a significant improvement in all items of scale through decreases dependency from sever to moderate and slight post implementation of intervention protocol for nurses. This could have to do with application of intervention protocol which can be reflected with positive patient outcomes. This result agreement with Sharma, et al. who indicated that the independence in performance of activities of daily living like feeding, bathing, grooming, mobility, transfer, toilet use, stair use etc. has been improved in experimental [26].

Regarding adherence with pacemaker care activities, the present study revealed that there was significantly increased among the studied patients before intervention protocol; adherence was poor and average, while adherence improved to be average and good after implementation of intervention protocol with statistical significant difference. This may be due to effect of intervention protocol which increase patients' want to and inspire them to carry out the necessary education after discharge [26]. Patients who are geared towards their illness in all are more likely to participate in behaviors that encourage improvements in their attitudes, enhance physical well-being. This finding is consistent with Kabeel stated that, the nurse supports the patient and his family in setting specific targets. A teaching plan is established with the patient and family which meet the individual needs of the patients. It takes several days prior to discharge to allow enough time for periodic reviewing of the plan and answering of questions. Specific instructions are provided about wound care, identification card, physical movement, medication, precautions and follow-up visits [27].

In the same context, this finding is supported by Mohammed, who concluded from their study that almost all patients of the control group had incorrect information particularly about Electro Magnetic Interference (EMI) implantation activities and foods that could be the underlying cause of complications after pacemaker implantation in addition to lack of pulse counting skills [28].

The present result indicated that there was significantly positive correlation between adherence and dependency preprogram, also positive significantly correlation between adherences preprogram and post program. This may be related to intervention protocol focuses that teaching patient based information about permanent pacemaker care can improve the activities of daily living of patients and increases adherence with pacemaker care practices which allow the patients to adapt more easily to the pacemaker devices [29].

Conclusion

The study concluded that, implementation of nursing intervention protocol for caring patients with implantable pacemaker can significantly improve nurses' knowledge and practice, concerning better adherence with pacemaker care activities and increase independency for performing activity daily living.

Recommendation

• Intervention protocol is used for confirmation of the results and developing guidance in specific setting.

• Provide nurses with periodic training sessions and evaluations to improve and assess their knowledge and practices.

• Updating the already present patient's ID on regular basis to include the most important and lifesaving information.

• Further research is proposed to examine the effect of this protocol on decreasing the occurrence of complications due to non-adherence after pacemaker implantation.

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Conflict of Interest

There are no Conflicts of interest.

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Author Contribution

The first author contributed to the sample collection, provided the pre and posttest, applied the intervention protocol to nurses, prepared videos, color brochures and posters, participated in data collection, and participated in the references collection and analysis of data and administered the intervention protocol. The second author contributed to the conception of the research, development of tools, statistical analysis, commentary on the tables, translation of the tools and booklet into Arabic, participated in the references and data collection, and administered the intervention protocol.

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