# Impact of Nursing Teaching Protocol on reduction of Complications for Patient with Permanent Artificial Pacemaker:

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**Abstract:** A cardiac pacemaker is an electronic device that delivers direct stimulation to the heart, the purpose of the pacemaker is to initiate and maintain the heart rate when the heart's natural pacemaker is unable to do so. The aim of this study is three-fold; the first is to determine the educational needs of patients with permanent artificial pacemaker, the second is to design a nursing teaching protocol and the last is to evaluate the impact of the nursing teaching protocol on patient's reduction of pacemaker's complications among a study group as compared to control group. Quasi-experimental research design was utilized to fulfill the aim of this study. The sample comprised 60 male and female adult patients having permanent artificial pacemaker (30 patients for each study and control groups) four tools were utilized for data collection; socio-demographic and medical data sheet, pre-post test questionnaire sheet, observational checklist for radial pulse measurement, and complication assessment sheet. Structured interview and direct observation techniques were utilized for data collection. The mean knowledge scores of both study group was significantly increased post protocol application. Related to patient's ability to count their own pulses improved through it doesn't reach the level of statistical significance. About one third of the control group subjects (30%) developed pacemaker complications as compared to one subject (3.3%) in study group. Establishment of an in-service training center and a hot line contact in additions provision of pamphlets and simple booklet are recommended.

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**Key words:** Cardiac pacemaker, Nursing teaching protocol

## 1. Introduction

Permanent pacemakers have significantly increased survival and improved quality of life for many patients with bradyarrhythmia. Worldwide, approximately 400.000 pacemakers are implanted each year and approximately 500.000 people in the United States have pacemakers currently **Finkelmeier (2000), Hatchett and Thompson, (2002)**.

Pacemakers initially were developed and remain the primary modality for maintaining an adequate ventricular heart rate in patient with life-threatening bradycardia. However, technologic advances in the 1990s have resulted in increasingly complex systems capable of pacing the heart in a more physiologic manner **Finkelmeier (2000)**. These include a rate responsive feature that allows the pacemaker to modify the pacing rate in response to changes in a person's activity level or metabolic demands and an automatic mode switching feature that allows the pacemaker to switch from one type of pacing mode to another when the patient's heart rhythm changes. In addition, pulse generators have gotten smaller and more compact in size, and battery life and reliability have improved markedly **Boyle and Rost (2000)**.

A cardiac pacemaker is an electronic device that delivers direct stimulation to the heart, the purpose of the pacemaker is to initiate and maintain the heart rate when the heart's natural pacemaker is unable to do so **Nettina (2001)**. On the same hand, **Jackson (2002)** mentioned that a pacemaker is an artificial device that electrically stimulates the myocardium to depolarize, which begins a contraction. The device may be temporary or permanent, depending on the patient's condition.

**Wallace, (2001)** stated that, implantation of a pacemaker is a common and relatively simple surgical procedure and most pacemakers are implanted to prevent symptomatic bradycardia.

Candidates for permanent pacemakers include patients with myocardial infarction and persistent bradyarrhythmia and patients with complete heart block or slow ventricular rates stemming from congenital or degenerative heart disease or cardiac surgery. Patients who suffer from Stokes-Adams syndrome as well as those with sick sinus syndrome may also benefit from permanent pacemaker implantation. Furthermore, permanent pacemakers are used in patients with hypertrophic obstructive cardiomyopathy, dilated cardiomyopathy, atrial fibrillation, neurocardiogenic syndrome, and long-QT syndrome **Bartelmo (2003)**.

Pacemakers are described by using 3 to 5 letters. The first letter describes which heart chambers can be paced, A for atrium, V for ventricle, or D for double

of dual (both the atrium and the ventricle). The second letter refers to the chamber in which the pacemaker is able to sense intrinsic cardiac events. The third letter indicates the pacemaker's mode of response to intrinsic cardiac events. I stands for inhibit, which means the pacemaker will not pace after it senses intrinsic depolarization. Another mode of response is triggered or T. triggered applies to dual-chamber pacemakers and single-chamber ventricular pacemakers that can sense the atrium (e.g., DVT). When an intrinsic atrial mode depolarization is sensed, ventricular pacing is triggered. The final mode of response of a pacemaker to intrinsic cardiac events is given the symbol D, for double, meaning the pacemaker is both inhibited and triggered by intrinsic cardiac events **Wallace (2001)**. The last two letters of the code describe specific features such as antitachycardiac pacing and rate responsive pacing **Phipps, et al (2003)**. Today these devices are inserted almost exclusively under local anaesthetic. The pacing electrode is introduced through the cephalic vein (using a cutdown procedure) or by a direct subclavian puncture (using a stylet, introducer and internal vessel dilator to introduce the lead **Hatchett and Thompson (2002)**.

The placement of pacemakers generally is safe. However, as with any invasive procedure, complications can occur. These include: infection, excessive bleeding, perforation of the heart muscle, stroke or myocardial infarction (hear attack), punctured lung, formation of hematoma (blood clot) inside the skin pocket. Also there are long-term risks of; dislodging of the pacemaker electrodes, fracture of an electrode tip, broken insulation on a pacemaker lead, a loose connection between a pacemaker lead and the pulse generator, in appropriate firing of the pacemaker and erosion (Wearing away of the skin) of the skin pocket **Jacobson, C. and Gerity, (2005)**.

Cardiothoracic surgical nurse play a major role in preparing patients and families for operation **Finkelmeier (2000)**. As the pacemaker will become as integral part of the patient's life so assessment of the patient's and carer's knowledge and subsequent education is of major importance. This will aim to primary ensure that any complication or pacemaker malfunction are quickly and effectively managed **Hatchett and Thompson (2002)**. On the same scope, some patients become very anxious when a pacemaker system is first inserted. The fact that they are now relying on an electrical device to make their heart work can lead to great anxiety about the consequences of it failing to work correctly. Both patients and their families will need someone to talk to regarding such concerns. It is useful to give them contact details for the cardiology nurse specialist so that they may discuss any concerns and questions as they arise **Brooker and Nicol, (2003)**.

**Significance of the study:**

In Assiut University hospital, a new catheterization lab. For cardiac catheterization and pacemaker implantation has been established 10 years age. About 5940 patients with permanent pacemaker has been operated upon sice then without organized educational program for the patients either before or after the procedure. Therefore, this study will be the first in this geographical location which will help such group of patients to maintain proper functioning of the pacemaker, identify and report symptoms indicative of pacemaker complications as well to maintain his/her wellness. Furthermore, results of this study could be helpful for patients, health professionals specially nurses in planning and implementing care for such group of patients in the future as well as for cost effective care.

## 2. Subjects and Methods

**Research design:**

Quasi-experimental research design was utilized to fulfill the aim of this study.

**Setting:**

The study was conducted at the cardiac catheterization unit, the pacemaker out patient clinic as well as the medical and critical care units at Assuit University Hospital.

**Subjects:**

A convenience sample of 60 adult males and females patients with permanent artificial pacemaker 30 for control group which have already implanted a permanent artificial pacemaker previously and another matched 30 subjects representing the study group who are undergoing a permanent artificial pacemaker implantation with the following matching criteria; age, sex, education, type and mode of pacing:

**Tools:**

Four tools were utilized to collect data pertinent to the study, these tools were developed by the researcher the revised by a panel of critical care and medical-surgical nursing experts and piloted on five patients. It includes:

1- **Socio-demographic and medical data sheet:** It consists of 17 items cover the following; patient's age, sex, marital status, level of education, place of residence, presenting symptoms, medical diagnosis, ……etc.

2- **Pre-post test questionnaire sheet:** It consists of 59 questions covering four main parts;

a- Patients' knowledge about the heart (1 to 8 questions) including definition, site, function of natural pacemaker…….etc.

b- Patient's knowledge about artificial pacemaker (9 to 17 questions) including; types, parts, how it works, site in the body and fear.

c- Patients knowledge about pacemaker implantation (18 to 39 questions) including; pre-operative preparation and post-operative instructions. In addition to place and time of the follow-up visit and signs and symptoms of pacemaker complications that might occur.

d- Patients knowledge about modifications of daily living activities as in house works, type of jop dietary and smoking habits and adherence to the follow-up care etc.(questions from 40 to 59).

The questionnaire sheet was completed by the researcher from each patient pre and post protocol implementing

Scoring system:

Each right answer was given 2 scores with a maximum score of 118. those who obtained less than 50 % were considered having an unsatisfactory knowledge level, from 50% to 75% were considered having satisfactory knowledge level, above 75% were considered having good knowledge level.

3- **Observation checklist for radial pulse measurement:** This tool was developed to measure the ability of patients to count their own radial pulse. It comprises 7 items (from 1 to 7).

4- **Complications assessment sheet:** Including signs and symptoms of pacemaker complications such as; site infection, pacemaker failure, frozen sholder, cardiac tamponade, congestive heat failure, pacemaker syndrome, lead fracture (items from 1 to 14)

**Methods:**

1- Official written permission to conduct the study was obtained by the researcher from the director of the cardiac catheterization unit.

2- Verbal permission with an explanation of the nature and aim of the study were obtained from clinical residents and head nurse of the unit.

3- Verbal consent was obtained from each patient to be included in the study. Clarification of the nature and purpose of the study was done on initial interview with each patient.

4- From ethical consideration both study and control group subjects were given the same information and practice in addition to the routine hospital care after the data were collected from the control group.

5- The pilot study on five patients were for testing the applicability of the developed tools and modifications.

6- The tools were developed by the researchers after review of related literature.

7- The implementation of the designed nursing intervention protocol, on subjects of both groups.

8- Techniques for data collection:

a- A structured interview was utilized to fill out the socio-demographic data and questionnaire sheets (tools 1,2) for study and control group.

b- Observation technique was utilized to fill out the check list for pulse measurement and complications assessment (tools 3.4) for both group during hospitalization and after two months post discharge.

9- Nursing intervention protocol: This protocol included three major parts:

a- Knowledge about site, chamber and function of the heart

- Definition, function, parts, types and sits of implantation of artificial pacemaker
- Knowledge about preoperative preparation and postoperative instruction
- Signs and symptoms of complications, that night occur after pacemaker insertion and how to avoid/prevent them and the importance of follow-up care adherence.

b- Practical skills, including steps of radial pulse measurement, safety progression in activity, and exercises cautions taken in travel, and in dealing with electrical appliances.

c- Early detection signs and symptoms of complication as well as the follow-up care.

The subject were exposed to the entire content of the designed protocol on an individual basis in the form of small teaching sessions for both theoretical and practical contents. Each session was about (30-45 minutes) in total of two to three sessions according to their attendance for follow-up care. Then the researcher provided each patient with the designed illustrated booklet.

**3. Results**

Table (1) demonstrates that, majority of both study and control group patients were females, married, illiterate and housewives (with percentages of 63.3%, 63.3%, 90.3%, 76.7%, 63.3%, 63.3%, 60% respectively). As regards to age, majority of study group patients were between 61-80 years as compared to that of control group patients who were between 41-60 years (63.3%, 50% respectively). With no significant statistical difference between study and control groups as regards to sociodemographic variables. As regards to history of chronic diseases about (46.7%, 56.7%) were free of chronic diseases in both groups and majority of them were admitted with complete heart block (76.7%, 7.3.3% respectively). With no significant statistical differences between two groups as regards to these variables.

Concerning eating and smoking habits, it is clear from the table (2) that the highest percentage of study and control groups (33.3%, 46.7%, 43.3%, 46.7% respectively) were consuming mild fat and salt intake. In relation to smoking majority (80%, 76.7% respectively) of both groups were non smokers. With no statistical difference between study and control group subjects.

Table (3) It is obvious that, all subjects (100%) of the study and control group were having an unsatisfactory knowledge level before protocol application, this percentage decreases to (3.3%, 6.7%, 10% respectively) after one and two months of protocol application. A high significant statistical difference was found between three visits (X2= 80.82, 52.50 respectiely P<0.001).

Figure (1): Shows that about (16.67%, 13.33% respectively) among study and control groups were able to count radial pulse post protocol implementation. With no significant statistical difference between the pre-and post protocol tests.

It is clear from the table (4) that only one patient (3.3%) of the study group developed complications after pacemaker implantation and application of intervention protocol in comparison to nine subjects (30%) of the control group. A high significant statistical difference is found between the two groups(P=0.011).

Table (5) demonstrates that the knowledge was found to be negatively correlated with age among control group before and after application of the intervention protocol (r = -368, P<0.05, r = -673, P<0.001 respective). While no significant statistical difference was found between study group subjects as regards age and knowledge scores all through the assessment period.

The previous table (6) shows no significant statistical relationship between incidence of complication and smoking, chronic diseases, type or mode of implanted pacemaker among study and control group subjects.

**Table (1):** Frequency distribution of the socio-demographic variables between study and control group subjects.

| Group / variables | Study group = 30 | | Control group = 30 | | $X^2$ / t | P value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Age**: | | | | | | |
| ≤ 20 years | 1 | 3.3 | 0 | 0 | - | - |
| 21- 40 years | 2 | 6.6 | 4 | 13.3 | 1 | NS |
| 41-60 years | 8 | 26.7 | 15 | 50 | 2.130 | NS |
| 61>80 years | 19 | 63.3 | 11 | 36.7 | 2.133 | NS |
| X ± SD | 64.07 ± 13.07 | | 57.8 ± 14.47 | | t=1.761 | NS |
| **Sex:** | | | | | | |
| Female | 19 | 63.3 | 19 | 63.3 | 0.000 | NS |
| Male | 11 | 36.7 | 11 | 36.7 | 0.000 | NS |
| **Residence:** | | | | | | |
| Rural | 11 | 36.7 | 6 | 20 | 1.471 | NS |
| Urban | 19 | 63.3 | 24 | 80.0 | 1.125 | NS |
| **Marital status:** | | | | | | |
| Married | 27 | 90 | 28 | 93.3 | .018 | NS |
| Single | 1 | 3.3 | 0 | 0 | - | - |
| Widowed | 2 | 6.7 | 2 | 6.7 | .000 | NS |
| **Education:** | | | | | | |
| Illiterate | 23 | 76.7 | 19 | 63.3 | .381 | NS |
| Basic | 5 | 16.7 | 9 | 30 | 1.143 | NS |
| Secondary | 2 | 6.7 | 2 | 6.7 | .000 | NS |
| **Occupation:** | | | | | | |
| Farmers | 8 | 26.7 | 5 | 16.7 | .692 | NS |
| House wife | 19 | 63.3 | 18 | 60 | .027 | NS |
| Employee | 0 | 0 | 2 | 6.7 | - | - |
| Retired | 3 | 10 | 5 | 16.7 | .405 | NS |
| **History of chronic disease:** | | | | | | |
| DM | 3 | 10 | 5 | 16.7 | | |
| Hypertension | 8 | 26.7 | 4 | 13.3 | | |
| DM and Hypertension | 2 | 6.7 | 3 | 10 | | |
| Bronchial asthma | 1 | 3.3 | 0 | 0 | | |
| IHD | 2 | 6.7 | 0 | 0 | | |
| Hypertension and IHD | 0 | 0 | 1 | 3.3 | | |
| No Chronic disease | 14 | 46.7 | 17 | 56.7 | .295 | NS |
| **Medical diagnosis:** | | | | | | |
| Intermittent CHB | 2 | 6.7 | 3 | 10 | 2 | NS |
| CHB | 23 | 76.7 | 22 | 73.3 | .022 | NS |
| Symptomatic sinus | 1 | 3.3 | 1 | 3.3 | .000 | NS |
| Bradycardia | 3 | 10 | 3 | 10 | .000 | NS |
| Incomplete heart block | 0 | 0 | 1 | 3.3 | - | - |
| CHB, IHD& renal impairment | 1 | 3.3 | 0 | 0 | - | - |
| Very slow atrial fibrillation | | | | | | |

NS Not Significant * Significant at 0.05 ***Significant<0.001
DM Diabetes mellitus IHD Ischemic heart disease CHB Complete heart block

**Table (2): Frequency distribution of eating and smoking habits between study and control group subjects.**

| Group / variables | Study group = 30 | | Control group = 30 | | $X^2$ | P value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Dietary habits** | | | | | | |
| Fat intake: | | | | | | |
| - Low | 8 | 26.7 | 7 | 23.3 | 0.067 | NS |
| - Mild | 10 | 33.3 | 14 | 46.7 | 0.667 | NS |
| - High | 12 | 40 | 9 | 30 | 0.429 | NS |
| Salt intake: | | | | | | |
| - Low | 6 | 20 | 11 | 36.7 | 1.471 | NS |
| - Mild | 13 | 43.3 | 14 | 46.7 | 0.037 | NS |
| - High | 11 | 36.7 | 5 | 16.7 | 2.250 | NS |
| **Smoking habit:**-Yes | 6 | 20 | 7 | 23.3 | 0.077 | NS |
| - No | 24 | 80 | 23 | 76.7 | - | - |
| **Degree of smoking** | | | | | | |
| Moderate | 1 | 3.3 | 5 | 16.7 | - | - |
| High | 5 | 16.7 | 2 | 6.7 | - | - |

NS = Not Significant

**Table (3): Frequency distribution for the knowledge score levels of study and control groups subjects before and after intervention protocol implementation.**

| Tests / Score levels | Unsatisfactory | | Satisfactory | | Good | | Total | | $X^2$ value | P value |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | | |
| **Study group** | | | | | | | | | | |
| B | 30 | 100 | 0 | 0 | 0 | 0 | 30 | 100 | | |
| P1 | 1 | 3.3 | 19 | 63.3 | 10 | 33.3 | 30 | 100 | | |
| P2 | 3 | 10 | 20 | 80 | 3 | 10 | 30 | 100 | | |
| | | | | | | | | | 80.82 | 0.000 |
| **Control group** | | | | | | | | | | |
| B | 30 | 100 | 0 | 0 | 0 | 0 | 30 | 100 | | |
| P1 | 2 | 6.7 | 26 | 86.7 | 2 | 6.7 | 30 | 100 | | |
| | | | | | | | | | 52.50 | 0.000 |

**Table (4): Percentage distribution for the occurrence of complications among study control group subjects.**

| Group / variables | Study group= 30 | | Control group= 30 | | $X^2$ | P value |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Development of complications:** | | | | | | |
| Yes | 1 | 3.3 | 9 | 3.0 | 6.400 | ** |
| No | 29 | 96.7 | 21 | 70.0 | | |
| **Total** | 30 | 100 | 30 | 100 | | |
| **Complications:** | | | | | | |
| Pacemaker syndrome | 0 | 0.0 | 2 | 6.7 | | |
| Pacemaker failure | 0 | 0.0 | 1 | 3.3 | | |
| DVT | 0 | 0.0 | 3 | 10.0 | | |
| Pacemaker site infection | 0 | 0.0 | 1 | 3.3 | | |
| DVT and pacemaker infection | 1 | 3.3 | 0 | 0.0 | | |
| Sudden end of battery & with hematoma formation | 0 | 0.0 | 1 | 3.3 | | |
| Pacemaker failure & CVS | 0 | 0.0 | 1 | 3.3 | | |

** Significant at 0.01 DVT Deep vein thrombosis CVS Cerebrovascular stroke

**Table (5):** Correlation between age and knowledge scores for both study and control group subjects.

| r value / age & knowledge | r value | P Value |
|---|---|---|
| **Age and knowledge in study group:** | | |
| B | -.118 | NS |
| P1 | -.308 | NS |
| P2 | -.324 | NS |
| **Age and knowledge in control group:** | | |
| B | -368 | .046 |
| P1 | -673 | *** |

Ns Not Significant *** Significant <0.001

**Table (6):** Relationship between complications and smoking, chronic diseases, type and mode of implanted pacemakers among study and control group subjects.

| Goroup / Variables | Study group | | Control group | |
|---|---|---|---|---|
| | $X^2$ | P value | $X^2$ | P value |
| Smoking | 0.259 | .611 | 0.719 | .397 |
| Chronic diseases | 1.182 | .277 | 0.006 | .936 |
| Type of pacemaker | 3.399 | .183 | 5.007 | .082 |
| Mode of pacemaker | - | - | 5.111 | .078 |

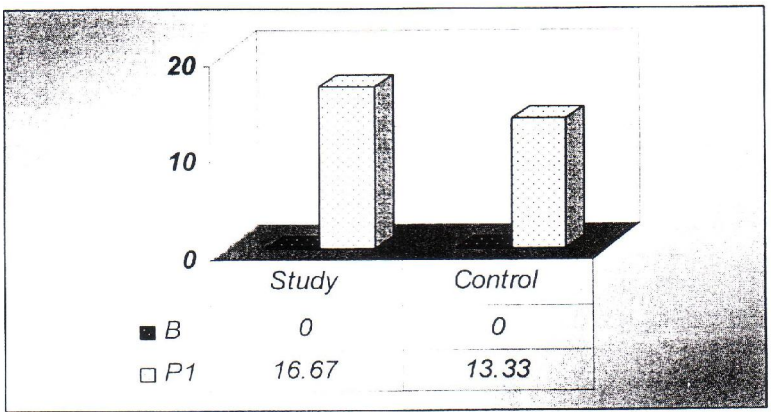


**Figure (1): Frequency distribution of patients learned radial pulse counting among study and control group.**

## 4. Discussion

The aim of the present study was three-fold; the first was to determine the educational needs of patients with permanent artificial pacemaker, the second was to design a nursing intervention protocol and the third was to evaluate the impact of implementing the designed nursing intervention protocol on patient's knowledge, skills and on prevention/reduction of pacemaker's complication among study group compared to control one.

The survival rates of patients with bradyarrhythmias was radically altered by the arrival of pacemaker technology **Hatchett and Thompson (2002)**. Technological developments in device therapy for bradyarrhythmias have benefited hundreds of thousands of patients over the past several decades **Eagle (2001)**. With the growing number of device implants and expanding indications for device therapy, the number of patients affected by device advisories will likely continue to increase **Maisel et al., (2001)**. While these devices are life saving in many instances, they may occasionally malfunction In addition, **Eagle (2001)** proved that pacemakers are complex devices and therefore require careful follow-up after they are inserted **Christensen and Kockrow (2003)** concluded that public awareness, modification in lifestyle, and improvements in medical treatment have contributed to a decline in overall deaths in the past 20 years.

Regarding socio-demographic data of the study subjects, the majority of study group patients were aged between 61-80 years, females, married illiterate and house wives with no significant statistical difference between study and control groups as regards to sociodemographic variable. As regarding to history of chronic disease were free of chronic diseases in both groups and the majority of them were admitted with complete heart block

This consistent with Apple, **Harrell and Deng (2002)** 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 the multiple metabolic syndrome, DM, smoking, sedentary lifestyle, obesity high levels of blood lipids, and diet high in fat.

In relation to dietary and smoking habits finding of this study revealed that, the highest percentages of both groups were found to having the habit of high fat intake, with mild salt intake and were smokers and no statistical difference between study and control group subject. In this view, **Christensen and Kockrow, (2006)** reported that, a diet high in saturated fat, cholesterol, and calories contributes to hyperlipidemia which is a risk factor associated with cardiovascular disorders. On the other hand, **Woods et al (2005)** proved that, individuals who smoke have a two ( aged 60 years and older) to three (aged 30 to 59 years) times greater risk of developing coronary heat disease. **Black and Hawks (2005)**, **Brunner et al, (2004)** explained that, the nicotine content of cigarettes causes vasoconstriction and the production of carbon monoxide, which place a demand on the heart and interfere with oxygen supply. **Williams et al (2004)**

recognized that lifestyle measures that reduce risk of cardiovascular disease include smoking cessation, reducing intake of total saturated fats, increasing the consumption of fish, reducing salt intake to less that 100 m mols/day and engaging in aerobic physical exercise for 30 min or more on at least three days a week.

As regards knowledge score levels among study and control groups, all patients were having an unsatisfactory knowledge level before protocol application (despite the exposure of the control group subjects to the routine hospital care and experiencing the presence of permanent pacemaker in their bodies for a time period ranged between few months to eight years. After protocol application, nearly all patients of study and control groups were having satisfactory and good knowledge levels.

Beyond this, **Jackson (2002)** reported that, a patient who gets a pacemaker needs to be educated about its uses. Preoperative education is one type of patient education in which the patient is instructed regarding a planned operative procedure and the projected postoperative course **Finkelmeier (2000)**. On the same scope **Hatchett and Thompson (2002)** stated that, it is crucial to assess the patient's individual needs before pacemaker insertion and highlight any particular issues, for example working with industrial magnets, which will impact on their lifestyle.

On this regards, **Finkelmeier (2000)** illustrated that patients usually are very apprehensive during the preoperative period. Although motivation for learning is high because of life-threatening nature of cardiac surgery, learning capacity ofter is inversely diminished by anxiety. The nurse should encourage the patient to verbalize fears and concerns about the underlying rhythm disorder, the need for a pacemaker, changes in lifestyle, and pacemaker management **Canobbio (2000)**. On addition, many persons fear depending on a pacemaker for their life or fear dying from pacemaker failure, which may affect their ability to learn **Lopez, and Goldman (2002)**.

As regards to teaching the patients how to count their own radial pulse accurately, findings showed that only few numbers (5,4 respectively) of study and control groups caught the skill of counting their own pulse. This might be related to many reasons; nearly all patients of both groups were illiterate or having basic level of education, majority of tem were from urban and rural areas (Which is faraway from Assiut University Hospital), Also they were elderly (≥ 60 years) which might impair their abilities to learn this very special skill, on addition to time limitation contributed to hamper the learning of this sophisticated skill which need more time bested awareness of some associated skills as know how to count and know to use an wristwatch (most of them do not have an wristwatch). This skill seems to be difficult event for young students. Time was also limited for study group as all patients were admitted to the unit in the day or the night before pacemaker insertion which is a very critical time to all patients and they (most of them) were discharged after one day of pacemaker implantation. As regards the control group, they come to follow up visit one time every four to six months and sometimes did not come except when developing a health problem.

**Jacobson and Gerity (2005)** concluded that, patient teaching includes information about pacemaker function, how to count the pulse, and importance of follow-up visits to the physician and because patients are discharged soon after the procedure, they should be told take their temperature and monitor the insertion site for signs of infection. While **Hubbard (2003)** mentioned that patient care management include teaching the patient and family to check pulse daily for 1 minutes. **Thompson et. al, (2002)** emphasizing that pulse rate monitoring in lithium pacemakers needs to be done once a week or when symptoms occur.

Furthermore, **White (2002)** concluded that, retention of material is reinforced with practice, repetition, and presentation of the same material in a variety of ways. The more often the learner hears or sees the material, the greater the chance that the material will be retained.

**Timby (2005)** reported that, the patient's attention and concentration affect the duration, delivery, and teaching methods employed, the best teaching and learning take place when both are individualized. Because teaching time is limited, content should be relevant to the patient's current problem. Studies demonstrate that patients remember only 29% to 72% of information provided to them, and that the more information presented, the lower the recall rate, information that is immediately applicable is of most important **Finkelmeier (2000)**.

Findings showed a statistically significant difference between the study and control group subjects regarding the frequency of post pacemaker complications as only one patient (3.3%) from the study group as compared to nine patients (30%) from the control group developed post pacemaker complications and some of these complications were fatal as battery end of life, pacemaker failure, cerebrovascular stroke, and pacemaker syndrome. This might be related to the application of the intervention protocol to the study group patients on time of pacemaker implantation while the control group exposed to the same protocol after implantation in time ranged from month to 8 years.

Almost all of the control group patients were having some misconception and wrong information especially about electromagnetic interference (EMI) effect on pacemaker and also on activities and foods allowed for them after pacemaker implantation which guide some of them to forsake many activities as working, practicing all kinds of sports (even walking), playing all electrical appliances at home (even usual telephone), visiting relatives or neighbors, climb upstairs or even pray. Again they also deserting many types of foods as they belief that it may interfere with pacemaker work. All this affect on their physical, social, psychological and spiritual condition which join forces to develop complications among this group.

All of these problems were counteracted for the study group patients as they have been included in the proposed nursing intervention protocol after admission and just before pacemaker implantation (or after it directly) which helps in clearing up a lot of misunderstanding and misconceptions with explanation of needed information around this procedure and answering developing questions to patients and their relatives.

A descriptive non-published master thesis was carried out at Al Manial University Hospital by **Ebraheem (2002)** about assessment the quality of life among adult patients with permanent pacemaker, it reported that the quality of life of these patients was significantly improved one month after implantation and recommended to do a teaching program for these patients to improve their coping mechanism and their quality of life with testing its effect.

In this view, **Schmidt and Olschewski, (2003)** reported that, it is important to regularly monitor the patient and the pacemaker system after implantation. Such monitoring has five major goals: evaluation of the electrical function of the pacing system to detect malfunctions or imminent power-source depletion; evaluation of the proper rate-adaptive function if applicable; evaluation of the implant site for possible mechanical difficulties such as erosion or infection; detection of progression of the patient's cardiac problems, which may necessitate reprogramming or revision of the pacing system or accompanying drug regimen; and reassurance of patients that concern and attention is being given their progress and offering of opportunities to discuss concern.

As regarding the correlation between age and knowledge scores, the findings showed that however, the control group patients age was found to be negatively correlated to their knowledge, and the study group patients age and knowledge were not significantly relate.

This was emphasized by educators in **Timby (2005)** who reported that learning takes place differently depending on a person's age and developmental level. And added that for the person to receive, remember, analyze, and apply new information, he or she must have a certain amount of intellectual ability. However **White (2002)** reported that each individual has a unique way of processing information physiological situation affects the patient's ability to learn. It was concluded that sensory deficits, cultural differences, shortened attention span, and lack of motivation and readiness require special adaptations when implementing health teaching.

The results of the present study reveal that no significant statistical relation between in cadence of complication an smoking, chronic disease, type or mode of implanted pacemaker among study and control group subjects. **Williams et al (2004)** concluded that, traditional risk factors for cardiovascular-related illness include the non-modifiable factors of smoking, diabetes mellitus, age, mode of pacing, and sedentary lifestyle. The results of the present study further revealed that all patients of study group and majority of the control group have pacemaker with VVI mode of pacing and almost all patients in study and control group have pacemaker implanted in left subclavicle region. Literatures reported that the most commonly used pacing modes are VVI and DDD **Woods et al, (2005), Jacobson et al (2000) SchillingMcCann (2003)**. In the UK this is still the most common form of permanent pacing **Hatchett and Thompson (2002)**. Standard clinical practice permits the use of either single-chamber ventricular pacemakers or dual-chamber pacemakers for most patients who require cardiac pacing. Ventricular pacemakers are less expensive, but dual-chamber pacemakers are believed to be more physiologic **Walsh and Cecchin (2004)**.

**Conclusion and Recommendation**

It can be concluded from the present study that almost all of the control group patients were having wrong information especially about electromagnetic interference (EMI) allowed activities and foods after pacemaker implantation which might be the underlying cause for development of complications after pacemaker implantation in addition to lack of skills regarding pulse counting. Therefore, empower of their knowledge and skills with essential information related to EMI, allowed activity and suitable sports, importance of ID and also of regular follow-up care with determination of signs and symptoms of pacemaker failure and complications could be lifesaving and very essential to help them lead a relatively normal life without or with minimal complications. Therefore it is recommended to pamphlets and simple booklet should be available for patients to illustrate and simply explain how to safely

live with such life saving device Establishment of an in-service training center that could include data base about such group of patients and provide them with all needed information Establishment of a hot line contact for urgent and non urgent consultations. Updating the already present patient's ID on regular basis to include the most important and life saving information.

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