Impact of Educational Program among Open Heart Surgery Patients on Minimizing the Incidence of Post Operative Infections

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Abstract: The present study aimed to investigate the impact of educational program among open heart surgery patients on minimizing the incidence of post operative infections. Data were collected from cardiothoracic surgery department, intensive care unit, and outpatient clinic at Assiut University Hospital. The study was conducted on 60 adult patients with open heart surgery (30 - study group and 30 - control group) who have been selected randomly. Data were collected through: four tools; (cardiac surgery patient needs assessment sheet, cardiac teaching program based on individualized patient needs assessment, cardiac post operative observation checklist sheet, and cardiac post operative wound site infection evaluation sheet). Results of this study concluded that, more than half of the patients in study group 53.3 % were females, 70 % were married, and 40 % their ages ranged from 18 - 29 years. While the majority of the patients in the control group 63.3 % were male, 46.7 % were married, and 33.3 % from 30 - 39 years. Conclusion; Significant differences for improvements throughout educational program phases among study group regarding total score of knowledge and practice about open heart surgery. The study recommended that, pamphlets and simple illustration booklet should be available for patients illiterate to with simple explain how to safely live after open heart surgery. The patients must understand the importance of oral hygiene and visiting a dentist regularly because dental infections can affect the valve prosthetic.
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Key Words: Educational Program; Heart Surgery; Patient Post Operative Infection

1. Introduction:

Cardiac surgery is surgery on the heart and/or great vessels performed by a cardiac surgeon. Frequently, it is done to treat ischemic heart disease (for example, coronary artery bypass grafting), correct congenital heart disease, or treat valvular heart disease created by different causes including endocarditis. It also includes heart transplantation (htt: //en.wikipedia. org, 2007).

Postoperative surgical site infections (SSIs) are a major source of morbidity in the United States. Wound infections rates are; clean surgery infection rate typically 1-2 %, clean-contaminated infection rate usually < 10 %, contaminated infection rate 15-20 %, and dirty infection rate 40% (http://www.worldwidewounds.com/2005).

Nurses play a vital role in the prevention of SSIs in patients with open heart surgery. By managing disease processes, through education and assessment (Harrington *et al.,* 2005). The unique challenge for the critical care nurse is to integrate theoretical knowledge, assessment skills, and problem solving ability to provide optimal nursing care and maintain high quality outcomes (Morton & Fontaine, 2009).

Pre operative preparation for cardiac surgery includes physiological and psychological components. Physiological preparation includes history, physical examination, chest radiography, and an ECG. Effective pre operative teaching, which reduces anxiety and physiological responses to stress and after surgery, is an important aspect of psychological preparation. The surgical procedure, the Intraoperative, and postoperative experiences are explained to the patient (Morton & Fontaine, 2009).

Post operative phase patients are transported directly to the intensive care unit (ICU), where they recover from anesthesia and usually remain for 24 hours after surgery. Patients arrive in the ICU with numerous lines and tubes (e.g., endotracheal tube and hemodynamic monitoring lines). Immediate postoperative care involves cardiac monitoring and maintenance of oxygenation and hemodynamic stability (Rosborough, 2006).

Discharge instructions for heart surgery patients includes observe appetite of the patient, signs and symptoms of swelling, sleeping condition, gastro intestinal problems as constipation, diet, care of incision, instruction about medication used, activity, shower daily if he/she is strong enough to stand and wash the incision with a mild antimicrobial soap. Using a clean towel, the patient should pat dry the

incision. No lotions, creams, oils, or powders are to be used. The patient also should avoid sun exposure, sexual, driving, lifting heavy objects, work, stress management and follow exercise program given to the patient by physical therapist in the hospital (Society of Thoracic Surgeons, 2006).

Significance of the study:

Wound site infections are a major source of post operative complications, accounting for approximately a quarter of all nosocomial infections. Many international studies have defined the patients at highest risk for infection in general and in specific operative procedures (Abd El Aziz *et al.,* 2007). However, there is a scarcity of local studies dealing with this problem. It is hoped that, data generated from this study could help in educating the patient and managing care for patients with open heart surgery as well as training adequately the patients to decrease incidence of infection and complications. Complications increase morbidity, inpatient stay, hospital cost, and increase mortality of patients. So, this study will be carried out to investigate the impact of educational program among open heart surgery patients on minimizing the incidence of post operative infections.

Aim of the study:

To investigate the impact of educational program among open heart surgery patients on minimizing the incidence of post operative infections.

Research hypothesis:-

Open heart surgery patient attending educational program will exhibit a positive effect on minimizing surgical site infections post operatively.

Material and Methods:

Research design:

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

Materials:-

Setting:-

Cardiothoracic surgery department, intensive care unit, and outpatient clinic for follow up at Assiut University Hospital.

Subjects:

Patients admitted in cardiothoracic surgery department (60 patients) were included in the study, (31) male and (29) female their ages ranged between 18 and 60 years. The patients classified inrolled randomly (convenience sample) into two groups (study and control group). The study group (30 patients) who were received nursing instruction (educational teaching nursing program), while the control group (30 patients) who were received routine hospital care.

Tools of the study:

Four tools were used to investigate the impact of educational program among open heart surgery patients on minimizing the incidence of post operative infections. These tools were deducted by the researcher based on reviewing of related literatures (Horan & Gaynes, 2004; Williams & Wilkins, 2006; Smeltzer *et al.,* 2008; Berman *et al.,* 2009; Morton & Fontaine, 2009; Proehi, 2009).

Tool I:

Cardiac surgery patient needs assessment sheet (Annex 1):

This tool was developed to assess open heart surgery patients needs. It contains 23 items and will be developed by the researcher and it includes 5 parts:

Part I: Assessment of the sociodemographic patients' profile: To assess the patients profile as patient's name, age, sex, marital status, diagnosis, family size, housing condition…ect).

Part II: Patients nursing needs pre cardio surgery: This part includes structured items to identify patient's pre cardiac surgery nursing needs.

1. Present, Past, and family history

Scoring system:

For body mass index (BMI) = $\dfrac{\textbf{Weight (kg)}}{\textbf{Height (in meters)}^2}$

This equation and classification of BMI were adopted from (Davis and Sherer 2000; Syed *et al.,* 2000).

2. Physical examination.

3. Psychological needs: assess psychological state of patient such as fear, irritable, insomnia, and apprehensive.

Part III: Laboratory investigation.

Part V: Diagnostic procedure.

Part IV: This part carry out pre/ post test questionnaire and observation checklist sheet was used prior to implementation of the teaching program to measure the exact knowledge level and assessment practice for patient about open heart surgery. The same part used after implementation of the teaching program and after 2 weeks later to evaluate the gain in knowledge after the intervention. It consists of 2 main parts: Patient assessment knowledge and practice about open heart surgery.

Scoring system:

As regard patient assessment knowledge about open heart surgery which includes 18 items, each item was assessed, categorized, and scored into either yes = 1 or no = 0 on all items. Patient assessment practice about open heart surgery. Which includes 14 items, each item was observed, categorized, and scored into either yes = 1 or no = 0 on all items.

Tool II:

Cardiac teaching program based on individualized patient needs assessment (Annex2)

The educational program was designed to minimizing the incidence of post operative infections

with open heart surgery patients through individualized session of educational program. It developed by the researcher based on the review of relevant literature, available resources, and the patient needs assessment. Number of session; a total 9 educational sessions will be conducted for each patient in addition to the pre assessment session. Preparing of educational training place, teaching aid and media (pictures, Arabic handout; the content of program modified in Arabic language and give it to the patient, and models) to help and facilitate the implementation of the educational program for the patient. Prepare the contents of training program, based on the assessment and the available equipment in the unit for its application.

The first session; included information about the heart and its function, meaning of heart disease**.**

The second session; provided information about open heart surgery and importance of surgery.

The third session; included information about teaching skills related to preparation before surgery.

The fourth session; included information about daily activity and exercises.

The fifth session and sixth session; included information about wound care schedules.

The seventh session; included information about specific nutrition for post cardiothoracic surgery.

The eighth sessions; included information about wound infection: local and systemic signs and symptoms, and medication used.

The ninth session; included information about discharge instructions for heart surgery patients. The duration of each session about 15 – 20 minutes according to patient tolerance. The end of each session makes discussion and feedback, except for the session for discharge instruction, which take 60 minutes

Tool III:

Cardiac post operative observation check list sheet (Annex 3):

An observation checklist was designed based on reviewed related literature Serna & Cathy (2006); Bonnie & Barnard (2007). The observation was performed to evaluation of effectiveness of the educational nursing program related to postoperative wound management on minimizing infection before discharge and follow up post discharge.

As regard cardiac post operative observation check list sheet, each item was observed, categorized, and scored into either present or not present on all items of local wound manifestation of infection and systemic manifestation schedule of observations.

Tool V: Cardiac post operative wound site infection evaluation sheet:

Used evaluation tool sheet for wound site infection (Southampton Wound Assessment Scale) The

wounds were graded before discharge and after 10 – 14 days postoperatively into one of four categories; normal healing, minor complication, wound infection , and major haematoma (Pudner, 2005).

Southampton scoring system:

Grade	Appearance
0	Normal healing
1. Normal healing with mild bruising or erythema: A B C	 Some bruising Considerable bruising Mild erythemia
2. Erythema plus others signs of inflammation: A B C D	 At one point Around suture Along wound Around wound
3. Clear or haemoserous discharge: A B C D	 At one point only ($<$ 2 cm) Along wound ($>$ 2 cm) Large Volume Prolonged ($>$ 3 days)
4. Major complication (Pus): 0 A B	 Normal At one point ($<$ 2 cm) Along wound ($>$ 2cm)
5. Deep or severe wound infection with or without tissue breakdown; haematoma requiring aspiration	

Scoring system:

As regard cardiac post operative wound site infection evaluation sheet, each item was observed, categorized, and scored into either present or not present on all items of Southampton scoring system for study and control groups.

2. Methods:-

Techniques for data collection:

• Official approval and administration permission were obtained from the head of internal cardiothoracic surgery department and post operative ICU to collect the necessary data.

• The consent from the patients who will be participating in the study will be taken.

1. The tools 1, 2, 3 and 4 used in this study was developed by the researcher based on reviewing the relevant literature (Bonnie & Barnard, 2007).

2. Jury of programs tested by 5 expertise's from the field of staff thoracic surgery and nursing educators for content validity of program.

• A pilot study was conducted during September 2009. It included 5 patients, in order to test the clarity and applicability of the tools.

• The data collection covered a period of one year starting from October 2009 till the end of October 2010.

3. Confidentiality and anonymity were assured.

Description of the nursing intervention program:

This program included three major parts;

1- The first was concerning the cognitive skills, i.e. knowledge about; The heart and its function, meaning of heart disease, definition and indications of open heart surgery, wound care schedules, knowledge about preoperative preparation, and postoperative instructions as regards open heart surgery, information about specific nutrition for post cardiac surgery, wound infection; local and systemic signs and symptoms, and medication used and discharge instructions for post cardiac surgery patients, and the importance of follow-up instruction of care.

2- The second was concerning the practical skills, i.e. deep breathing and coughing exercise, leg exercise, activities of daily living.

3- The third was related to carry out (implementation) the educational program practice among open heart surgery patients on minimizing the incidence of post operative infections.

Procedure:

The study was carried out in three phases: 1st, 2nd and 3rd phases:

1- Preparatory phase (Assessment and planning phase), involved the following: Review of relevant literature (Berman *et al.,* 2009), (nursing textbooks, journals, internet resources, etc), about nursing care for cardiac patient, jury for program by 9 expertise nurses and doctors, arrange for the training program schedule, based on the contents of the program, each patient was interviewed and counseled individually, time availability and the resources available.

2-The second phase (implementation phase): This phase comprised the preoperative, postoperative, and during this phase the exercise training program was implemented.

Pre-operatively:

– Patients were equally enrolled in the study as control and study groups sequentially. The 1st patient's interview was used to explain purpose and nature of the study as well as patient agreement for voluntary participation was obtained.

– The 1st 3 sessions from educational nursing program were carry out in 2nd interview with study group and take break 10 minutes between every session.

– The 4th, 5th, and 6th sessions from educational nursing program were carry out in 3rd interview with study group and take break 10 minutes between every session.

– The last 3 sessions from educational nursing program only were carry out in 4th interview with study group and take break 5 minutes between every session.

Postoperatively:

– The 5th interview with study group was at 1st day post-operatively, and then once time daily during hospitalization for base line data was obtained from study and control groups patients to fill tool 3.

– Before discharge the investigator emphasized the importance of follow up visit for all subjects (study and control) and arranged with study group the time and place for follow up which were 2 weeks postoperatively in out patient cardio thoracic surgery clinic at Assiut University Hospitals.

3-The last phase of proposed teaching program is the evaluation phase. After implementation as well as after 2 weeks the patient knowledge and practices has been evaluated by the researcher through filling the tool (1). Also local wound and systemic manifestation of infection was assessed utilizing tool 3 during hospitalization before discharge and after 2 weeks post discharge (follow up). A line of contact was established between the investigator and subjects of both groups for feed back, monitoring, and provision of needed consultation and help.

Analysis of data

Data collected by computer program SPSS" version. 17" Chicago. USA. Data expressed as "mean ± standard deviation" "number, percentage". Using T.test to determine significant for numeric variable. Using Chi.squire test to determine significant for non-parametric variable. Using person's correlation for numeric variable in the same group.

 n.s $P > 0.05$ no significant.

    $P < 0.05$ significant.

 ** $P < 0.01$ moderate significant.

*** $P < 0.001$ highly significant.

Limitations of study:

1- Time available for follow up not enough as many patients were coming from far town and need to leave hospital early.

2- The patient's anxiety and feelings of vulnerability may interfere with the ability to learn information provided.

3- Participants suffered from transportation and financial problems.

3. Results:

Distribution of the biosciodemographic variables in study and control group subjects: the data reveals the more than half of the patients' in study group 53.3 % was female, 70 % were married, were 40 % from (18 to 29 years), 33.3 % were illiterate, 50 % were non working, family size 70 % from 4 to 8 persons and 56.7 % were moderate housing condition.. While the patients' in control group 63.3 % were male, 46.7 % were married, were 33.4 % from (30 to 39 years), 26.7 % were read & write, 43.3 % were non working, family size 66.7 % from 4 to 8 persons and 46.7 % were low housing condition. With no statistical significant difference between study and control groups as regards biosociodemographic variables.

Distribution of the sample according to vital signs means scores preoperative assessment for both study and control groups: There are highest mean scores as regard to temperature and pulse rate in control group than in study group (37.04 ± 0.37, 36.92 ± 0.457 and 85.53 ± 15.38, 83.43 ± 11.55, respectively). Table show that highly statistical difference between control and study group related to respiratory rate (P = 0.005).

Distribution of the sample according to preoperative risk factors for study and control group: the high percentage in both study and control groups (80 % and 73.3 %, respectively) have non smoking. As regards body mass index the highest percentage (63.3 % and 40%, respectively) in study and control groups have standard level of weight. As regard percentage of chronic obstructive pulmonary disease and use of antibiotics they were equally in both groups, while highest percentage in study group have used of anticoagulant (80%) and one third of patients in control group have hypertension (33.3 %).

Distribution of the sample according to hereditary diseases & medical history for both study and control group: more than half percentage (60 %) in study group have diabetes and 40 % have hypertension and in control group were 80 % of patients have diabetes and 76.7 % hypertension. As regard the medical history streptococcal infections it was found that 86.7 % and 96.7 % in study and control groups, respectively. There was significant difference related to hypertension between both groups.

Table (1): This table shows that the cardiovascular preoperative and health habits clinical assessment for both study and control groups. The findings indicated that 96.7 % and 100 % of the patients in the study and control groups had palpitation preoperatively, while half of the sample in both study group and control had equal percent of leg edema. Concerning of extremity pain of both study and control groups

preoperative assessment; the findings indicated that there were significant differences between the study and control groups in preoperative period (p < 0.05).

The data reveals that cigarette smoking the majority of the patients' in study group had smoked cigarette more than control ones (83.3 %, 62.5 % respectively). The result also revealed that, there were highest mean scores of smoking index was found in study group than control ones (310 ± 65.21, 120.23 ± 20.25, respectively). The data reveals that the patients' in control group as performing exercise more than study ones (33.3 %, 26.7 % respectively). Difference was statistically significant (p<0.01) for smoking index, and common symptom.

Table (2): This table demonstrates that significant difference was found between study and control groups as regard magnesium studies finding (P = 0.042).

Table (3): This table demonstrates that, significant difference was found between study and control groups as regard coagulation factories and blood glucose studies.

Table (4): The highest percentage (33.33 and 26.67 %) in study group and in control groups were has knowledge about rest and sleep. As regards percentage of knowledge about define of surgical site infection, sources and predisposing factors for surgical site infection, health teaching activities after discharge, notify the physician if patient have any abnormal, and daily activities to infection control they are equally in both groups and they have not any knowledge about this items.

Table (5): As regards pre operative nursing care practice the highest percentage (73.33 % and 66.67 %) in study and in control groups were have about foot and leg exercises, while they have not any knowledge about how to use incentive spirometry and elastic stocking. Also the table shows that assessment of level of practice about post operative nursing care among patients in study and control group, approximately an equal percentage in study and control groups (73.33 % and 70 %) were have knowledge about nursing care of urinary catheter, activities and exercises in intensive care unit. As regards discharge instructions for open heart surgery patients the highest percentage (60 % and 43.33 %) for study and control groups have had knowledge about how perform walking exercises.

Table (6): The above table shows that, there were significant differences improvements throughout the educational program phases among study group regarding total score of knowledge and practice with P = 0.000, 0.000 about open heart surgery.

Table (7): The above table shows that, there were statistical significant differences improvements of throughout the educational program phases among

study group while non statistical significant differences were noticed throughout the educational program phases among control group regarding level of knowledge and practice.

Table (8): This table shows that, Non significant difference were existed between infection scoring system at three phases for both group in all items except normal healing in pre discharge (P = 0.06). Also table enumerate that significant difference in post discharge for all items except major complication (P = 0.015), deep or severe wound infection (P = 0.03*), and clear wound discharge (P = 0.009).

Table (9): This table demonstrates that, non significant difference between study and control groups as regard to hospital stay and ICU stay.

Figure (1): The table mentioned that, statistical significant differences of study groups was exited between housing condition & incidence of namely fever(p=0.005), delayed wound healing (p=0.027)and pneumonia (p=0.027).

Figure (2): The table shows that, statistical significant differences was exited for study group between ICU stay & incidence of fever, delayed wound healing, endocarditis, myocarditis, pericarditis and pneumonia.

Figure (3): The table mentioned that, a statistical significant difference was exited for study group between hospital stay & incidence of endocarditis, myocarditis, and pericarditis (p < 0.01).

Table (1): Distribution of the sample according to preoperative cardiovascular clinical assessment and health habits for study and control group.

Variable	Group				X^2 Test	P-value
	Study group (n=30)		Control group (n=30)			
	No.	%	No.	%		
Common symptoms for cardiovascular:						
– Chest pain	27	90	29	96.7	1.735	0.306
– Palpitation	29	96.7	30	100	1.515	0.500
– Dyspnea	27	90	28	93.3	0.228	0.500
– Cough	21	70	21	70	0.738	0.611
– Oedema	15	50	15	50	1.02	0.602
– Extremity pain	21	70	28	93.3	8.05	0.021*
– Nocturnal Dyspnea	28	93.383.3	30	100	0.651	0.246
– Fatigue	25		28	93.3	0.735	0.212
Health habits:						
– Use of tea and coffee	7	23.3	14	46.7	0.041	0.082
– Use of alcohol	1	3.3	1	3.3	0.392	0.754
– Smoking	6	20	8	26.7	0.483	0.381
Type of smoking:						
– Cigarette	5	83.3	5	62.5	0.931	0.417
– Shisha	0.0	0.0	2	25		
– Both	1	16.7	1	12.5		
Degree of smoking:						
– Mild	1	16.7	6	75	0.925	0.061
– Moderate	3	50	2	25		
– Heavy	2	33.3	0.0	0.0		
Smoking Index :						
– Mean ± SD	310 ± 65.21		120.23 ± 20.25		37.43	0.01*
Exercise:						
– Yes	8	26.7	10	33.3	0.397	0.389
– NO	22	73.3	20	66.7		

(*) Statistically significant P < 0.05.

Table (2): Comparison between pre and post operative electrolytes disturbance finding among open heart surgery patients for both study and control group.

Variable	Group								X² Test		P-value	
	Study (n=30)				Control (n=30)							
	Pre		Post		Pre		Post					
	No	%	No	%	No.	%	No.	%	Pre	Post	Pre	Post
Serum sodium (Na+):									0.083	0.521	0.694	0.180
− Normal	28	93.3	25	83.3	28	93.3	21	70				
− Abnormal	2	6.7	5	16.7	2	6.7	9	30				
Serum potassium (K +):									0.071	0.081	0.365	0.50
− Normal	26	86.7	27	90	24	80	26	86.7				
− Abnormal	4	13.3	3	10	6	20	4	13.3				
Calcium (Ca++):									0.028	0.904	0.50	0.144
− Normal	25	83.3	21	70	24	80	16	53.3				
− Abnormal	5	16.7	9	30	6	20	14	46.7				
Magnesium (Mg++):									0.34	15.93	0.50	0.042*
− Normal	26	86.7	25	83.3	25	83.3	18	60				
− Abnormal	4	13.3	5	16.7	5	16.7	12	40				

Table (3): Comparison between pre & post operative as regard coagulation factors, renal function studies & glucose among open heart surgery patients for both study and control group.

Variable	Group								X² Test		P-value	
	Study (n=30)				Control (n=30)							
	Pre		Post		Pre		Post					
	No.	%	No.	%	No.	%	No.	%	Pre	Post	Pre	Post
Prothrombin time:									0.283	12.43	0.215	0.000 ***
− Normal	16	53.3	2	6.7	20	66.7	14	46.7				
− Abnormal	14	46.7	28	93.3	10	33.3	16	53.3				
Prothrombin concentration:									0.392	8.43	0.098	0.005 **
− Normal	12	40	4	3.3	18	60	14	46.7				
− Abnormal	18	60	26	86.7	12	40	16	53.3				
International normalized ratio:									0.415	0.253	0.396	0.219
− Normal	17	56.7	12	40	19	63.3	16	53.3				
− Abnormal	13	43.3	18	60	11	36.7	14	46.7				
Glucose:									0.273	7.43	0.063	0.029*
− Normal	20	66.7	11	36.7	26	86.7	20	66.7				
− Abnormal	10	33.3	19	63.3	4	13.3	10	33.3				
Urea:									0.415	0.053	0.246	0.253
− Normal	28	93.3	23	76.7	30	100	26	86.7				
− Abnormal	2	6.7	7	23.3	0.0	0.0	4	13.3				
Creatnine:									0.292	0.382	0.353	0.626
− Normal	27	90	24	80	25	83.3	24	80				
− Abnormal	3	10	6	20	5	16.7	6	20				

(***) statistical highly significant P < 0.001.

Table (4): Pre-operative knowledge level for patients' about open heart surgery between study and control group.

Variable	Group								P-value
	Study (n=30)				Control (n=30)				
	Yes		No		Yes		No		
	No.	%	No.	%	No.	%	No.	%	
Definition of the heart.	5	16.67	25	83.33	4	13.33	26	86.67	0.425
Function of the heart.	6	20	24	80	5	16.67	25	83.33	0.561
Definition and indications of open heart surgery	1	3.33	29	96.67	0.0	0.0	30	100	0.623
Complications occur after open heart surgery.	1	3.33	29	96.67	2	6.67	28	93.33	0.745
Define of surgical site infection.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Sources of surgical site infection.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Predisposing factors for surgical site infection.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Complications of surgical site infection.	3	10	27	90	2	6.67	28	93.33	0.582
Guidelines for good diet.	2	6.67	28	93.33	3	10	27	90	0.473
Weight control.	1	3.33	29	96.67	2	6.67	28	93.33	0.498
Health teaching activities after discharge.	0.0	0.0	30	100	1	3.33	29	96.67	0.498
Notify the physician if patient have any abnormal.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Rest and sleep.	10	33.33	20	66.67	8	26.67	22	73.33	0.391
Returning to work.	3	10	27	90	2	6.67	28	93.33	0.425
How to stop of smoking?	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Daily activities to infection control.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
Guidelines for patient when taking medication.	2	6.67	28	93.33	3	10	27	90	0.493
Nursing care for common problems after open heart surgery.	3	10	27	90	2	6.67	28	93.33	0.582

Table (5): Peri-operative knowledge level regarding nursing care practice for open cardiothoracic surgery patient between both study and control group.

Variable	Group								P-value
	Study (n=30)				Control (n=30)				
	Yes		No		Yes		No		
	No.	%	No.	%	No.	%	No.	%	
Pre operative nursing care:									
− Coughing and breathing exercises.	19	63.33	11	36.67	17	56.67	13	43.33	0.431
− Foot and leg exercises.	22	73.33	8	26.67	20	66.67	10	33.33	0.627
− Performing arm and shoulder exercises.	16	53.33	14	46.67	15	50	15	50	0.465
− Used of elastic stocking.	0.0	0.0	30	100	0.0	0.0	30	100	0.0
− Mouth care.	8	26.67	22	73.33	5	16.67	25	83.33	100	0.251
− Incentive spirometry.	0.0	0.0	30	100	0.0	0.0	30		0.0
Post operative nursing care:									
− Patient observation in intensive care unit.	18	60	12	40	17	56.67	13	43.33	0.521
− Nursing care of chest tube.	21	70	9	30	20	66.67	10	33.33	0.602
− Nursing care of urinary catheter.	22	73.33	8	26.67	21	70	9	30	0.584
− Nursing care of nosogastric tube (ryle).	19	63.33	11	36.67	18	60	12	40	0.493
− Activities and exercises in intensive care unit.	22	73.33	8	26.67	21	70	9	30	0.479
Discharge instructions for heart surgery patients:									
− Wound care of the site of operation in home.	13	43.33	17	56.67	12	40	18	60	0.315
− Walking exercises.	18	60	12	40	13	43.33	17	56.67	0.482
− Steps for measuring redial pulse.	8	26.67	22	73.33	9	30	21	70	0.291

Table (6): Comparison of knowledge and practice scores among cardiac surgical patients post implementing educational program at three phase's pre, post and follow up for study group.

Variable	Program phases						P-Value
	Pre-program		Post-program		Follow up		
	No.	%	No.	%	No.	%	
Level of knowledge:							
- Satisfaction	2	6.67	27	90	26	86.63	
- Unsatisfaction	28	93.33	3	10	4	13.33	0.000***
Level of practice:							
- Satisfaction	13	43.33	25	83.33	24	80	
- Unsatisfaction	17	56.67	5	16.67	6	20	0.000***

Table (7): Knowledge and practice scores among open heart surgery patient for both group throughout three phase's pre, post and follow up.

| Variable	Program phases		
	Pre-program	Post-program	Follow up
	Mean ± SD	Mean ± SD	Mean ± SD
Knowledge (Total score = 18 degree):			
- Study group	2.055 ± 0.92	15.69 ± 1.38	15.46 ± 1.07
- Control group	1.88 ± 0.42	2.16 ± 1.01	2.16 ± 1.01
P-value	0.274 n.s	0.000***	0.000***
Practice (Total score = 14 degree):			
- Study group			
- Control group	6.86 ± 2.38	13.13 ± 0.641	13.00 ± 0.925
	2.26 ± 2.04	2.26 ± 2.04	2.26 ± 2.04
P-value	0.485 n.s	0.001**	0.001**

Table (8): Infection scoring system among open heart surgery patient before and afterdischarge (follow up) for both groups.

| Variable	Group								X^2 Test		P-value	
	Study (n=30)				Control (n=30)							
	Pre		Post		Pre		Post					
	No.	%	No.	%	No.	%	No.	%	Pre	Post	Pre	Post
1. Normal healing	25	83.3	30	100	16	53.3	24	80	24.35	9.25	0.02*	0.03*
2. Normal healing with mild erythema:												
0 Normal	17	56.7	30	100	16	53.3	22	37.3	0.721	7.531	0.06	0.015*
A Some bruising	13	43.3	0.0	0.0	12	40	7	23.3				
B Considerable bruising	1	3.3	0.0	0.0	10	33.3	6	20				
C Mild erythema	7	23.3	0.0	0.0	8	26.6	5	16.6				
3. Erythema with inflammation:												
0 Normal												
A At one point	22	73.3	30	100	22	73.3	24	80				
B Around suture	8	26.67	0.0	0.0	4	13.3	4	13.3				
C Along wound	1	3.3	0.0	0.0	8	26.6	6	20	0.348	9.25	0.403	0.03*
D Around wound	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0				
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
4. Clear discharge:												
0 Normal	28	93.3	30	100	21	70	26	86.7				
A At one point only	2	6.7	0.0	0.0	9	30	4	13.3				
B Along wound	2	6.7	0.0	0.0	1	3.3	0.0	0.0	0.371	27.43	0.259	0.009 **
C Large Volume	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
D Prolonged	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
5. Major complication (pus):												
0 Normal												
A At one point	30	100	30	100	26	86.7	28	93.3	0.092	0.342	0.06	0.246
B Along wound	0.0	0.0	0.0	0.0	4	13.3	2	6.7				
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
6. Deep or severe wound infection:												
0 Normal												
A wound infection	27	90	30	100	26	86.7	25	83.3	0.352	6.93	0.500	0.026
	3	10	0.0	0.0	4	13.3	5	16.7				

Table (9): Comparison between duration of patient's stay among open heart surgery patient at intensive care unit (ICU) and hospital department for both groups throughout three phases of educational program.

Variable	Group		X^2 Test	P-value
	Study(n=30)	Control (n=30)		
	Mean ± SD	Mean ± SD		
Hospital department stay	31.83 ± 16.88	30.60 ± 12.58	0.391	0.749
ICU stay	4.83 ± 2.10	5.43 ± 2.97	0.425	0.371

Fig. (1): Relation between housing condition & incidence of infection in study group
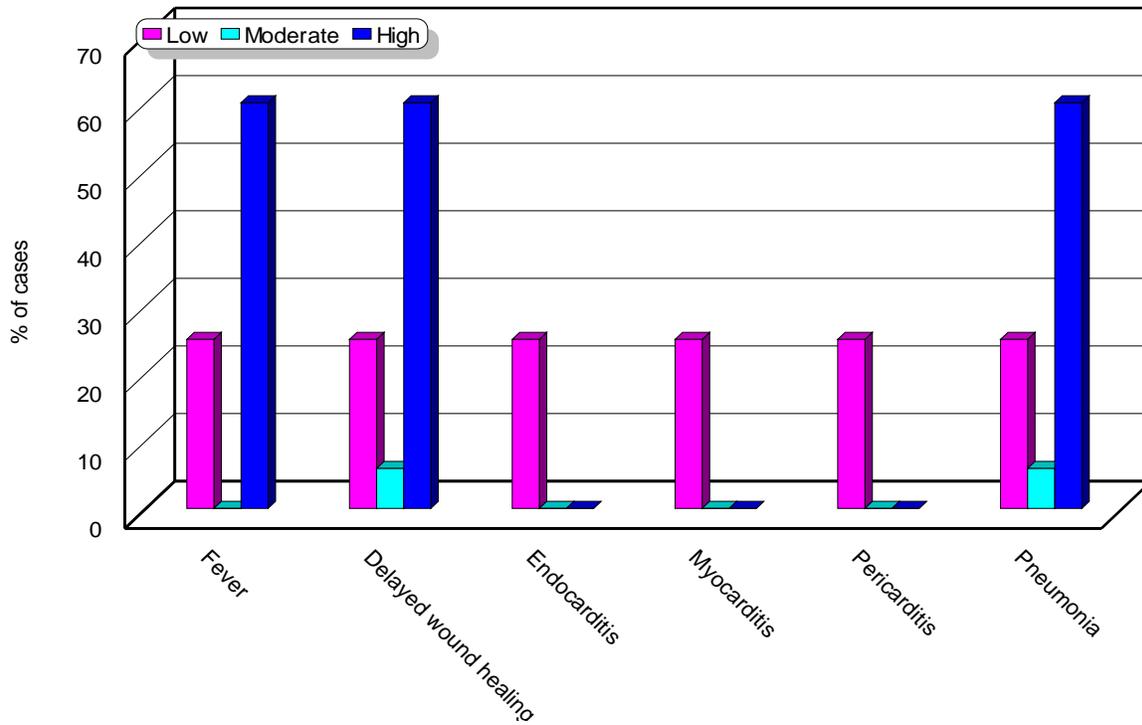
Fig. (2) Relation between ICU stay & incidence infection in study group.
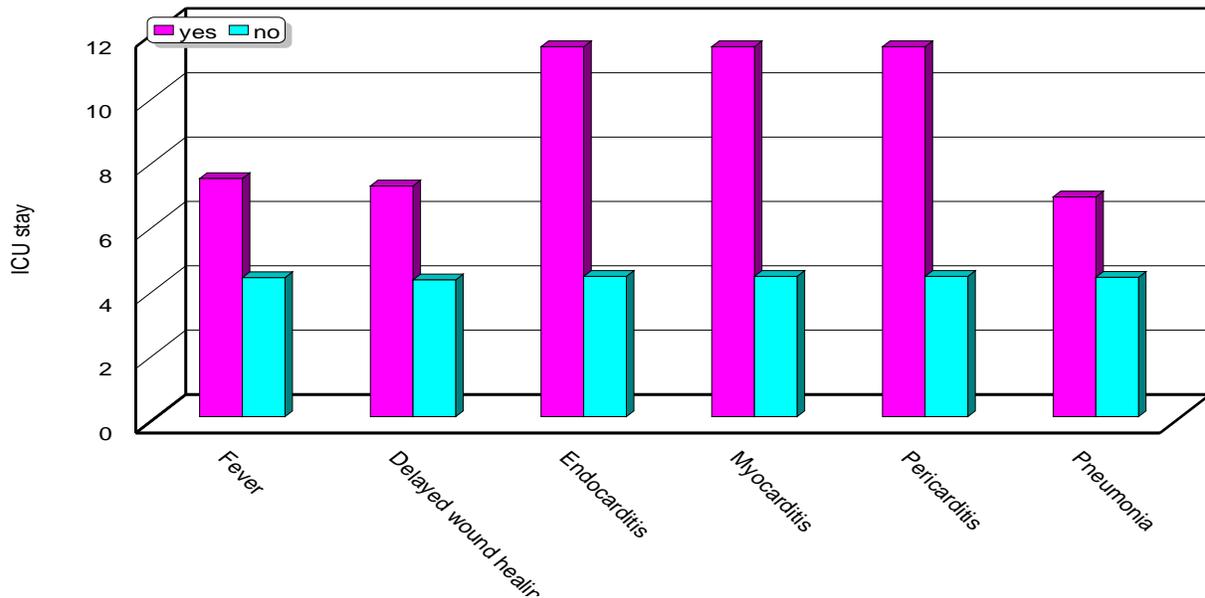
Fig (3): Relation between hospital stay & incidence of infection in study group
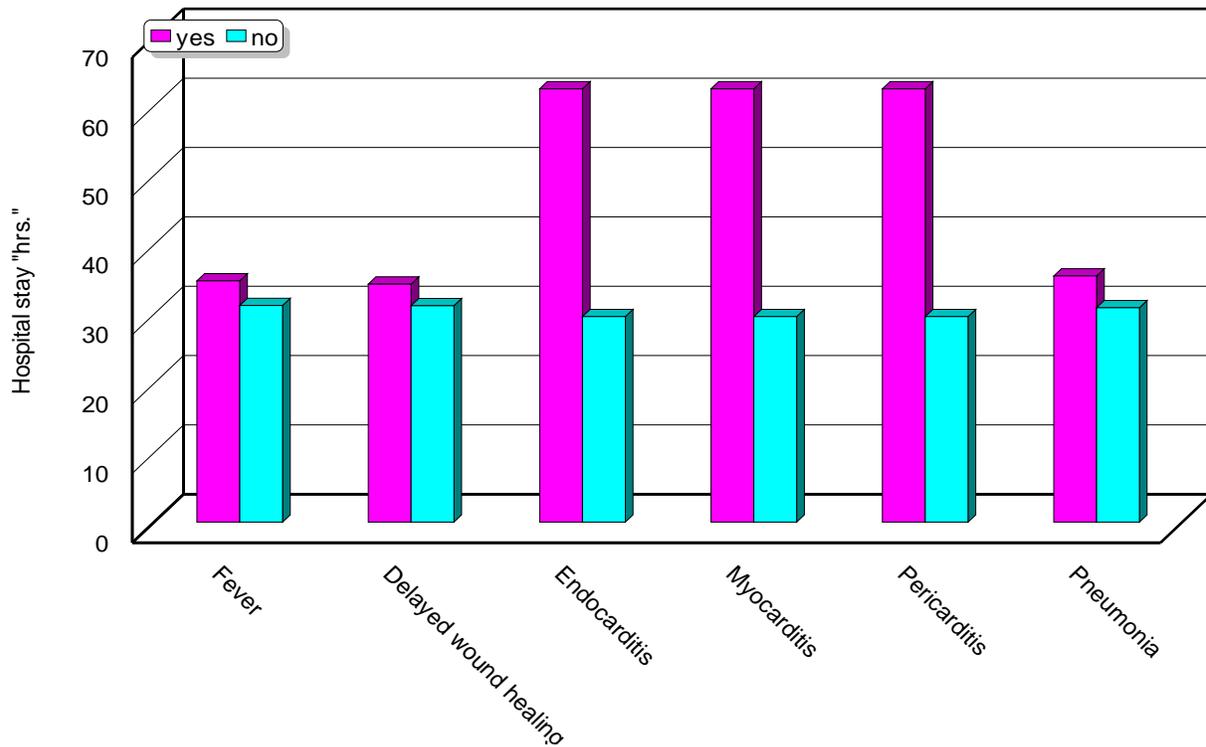
4. Discussion:

Patient education is an essential component of nursing practice, there has been a continuous a development and emphasize on the leadership role of nurses in the arena over the last century. Kane (2003) stated that the nurse is responsible for providing preoperative nursing care for patients which includes assessing physical and psychological needs preparing patients for operation includes the following instruction such as listing medication routinely, limitation of eating or drinking before surgery with specific time, bathing, checking vital signs, laboratory investigation and administrating preoperative medication.

Based on the results of the present study biosocio-demographic characteristics, two groups study & control were included in this study with no statistically significant differences shown between them regarding; sex, age, marital status, educational level, occupation, family size, and housing condition at the beginning of the study.

Concerning sex, the present study showed that approximately half of study and control groups were female, this result agree with Hopkins, (2005) study finding who mentioned that the majority of participated patients with open heart surgery were females. Whiles this disagrees with that of Stahle(1997) and Borger (1998) who reported that fewer female patients than males (female: male ratio = 1: 4.4).

The result revealed that, more than one third of the total studied patients were in the age group from 18 - 29 years old in study group and control group. On same line, this finding disagrees with Chih-Hung (2005) who reported that the number of open heart surgery is increasing in patient who are 50 years old or more.

The present study findings have shown that; one third of the study groups were illiterate and less than one third of the control group were able to read and write. As patient's education can increase the patients' awareness toward the surgery and the importance of follow up program.

The present study showed that, the mean scores vital signs in study group in preoperative phase were less than those of the control ones especially for temperature and pulse (85.53 ± 15.38, 83.43 ± 11.55 and 37.04 ± 0.37, 36.92 ± 0.457 respectively) with highly statistical difference between control and study group related to respiratory rate (0.005). Punder (2005) and Koplow and Hardin (2007) mentioned that pulse and blood pressure serve as useful tools to assess cardiac output in heart disease..

Based in the results in the present study preoperative cardiovascular clinical assessment, more than two third of study group and all patients who participate in control group have palpitation and

nocturnal dyspnea, these findings is at one with those of Gamer *et al.*(1996), Mangram *et al.*(1999), and Spelman *et al.* (2000) who reported that, all patients with cardiac disease have complained with palpitation and nocturnal dyspnea.

The present study showed that, consumption of tea and coffee it was more prevalent among control group subjects than those in the study ones. More than two third of study and control group were non smoker. This agrees with those of Kleinbaum *et al.*(1998), Delgado *et al.*(2001), and Kern (2005) who reported that, the majority of sample in study and control group were smokers and smoking is considered one of the risk factors for sternal surgical site infection.

According to Debacker *et al.*(2003) who recommended that physical activity for cardiac patient should be positively encouraged because this may reduce blood pressure, cholesterol level, and body weight. Patients should be encouraged to exercise at least four times a week, but preferably daily for a period of 30 minutes. Exercise does not need to be complex or competitive; a daily walk is sufficient to gain health benefits. These contradicts with study more than two third of the patients were not performing exercises (walking) in both groups. The American College Sports Medicine (ACSM, 1993) guidelines and Ellis (1995) who stressed that the individual will benefit from daily bouts of aerobic exercise totaling 30 minutes.

According to Syed and Davis (2000) who mentioned that within the standard level of weight 20 to < 26, over weight 26 to < 30, obese > 40 Kg. It was found in the present study, two third of the study and more than one third in the control group were having standard level of weight. According to Grady and Jalowiec (1995), Debacker *et al.*(2003) and Jarrick(2006) who recommended that nutritional information should be given to optimize wound healing, maintain ideal body weight and reduce cholesterol levels if elevated.

With regard associated disease, the study revealed that less than one third of subjects in study and control group were complaining from diabetes this may be due to that most of the sample were young (18 -29 years). Slaughter *et al.* (1993), Minohara *et al.*(1993), Spelman *et al.* (2000), Swanton (2003), American Heart Association(2004) consistent diabetes and obesity were independent predictors of sternal surgical site infection following coronary artery bypass grafting.

Also in the present study, it was found that half of subjects in study and control group were complaining from chronic obstructive pulmonary disease. However, Paletta *et al.* (2000), Keogh(2003), American Heart Association(2004),

Adam (2005), Drain and Forren (2009) and Morton and Fontaine (2009), emphasized that patients complaining from chronic obstructive pulmonary disease lead to impaired sternal wound healing.

In this context finding that all patients who participate in study and control group were using antibiotics, this is in agreement with those of Paletta *et al.*(2000);Trick *et al.* (2000) and Abd El Aziz *et al.* (2007) who mentioned that, the use of antimicrobial prophylaxis surgical procedures is one of the measures used to prevent the development of a surgical site infections.

The present study mentioned that more than two thirds of the patients in study and more than one third in control group were using anticoagulant. This agrees with those of, Kern (2003), and Punder (2005) who recommended that patients with mechanical prosthetic valves will require warfarin anticoagulation for life to prevent thrombosis and embolism.

Based on present finding mentioned that more than half of the patients in study and two thirds in control group have normal laboratory values of prothrombin time in preoperative period, while more than two thirds in study and more than half in control group have abnormal values as regard prothrombin time in postoperative period, this may be related to anticoagulation therapy.

The present study revealed that, more than two thirds in study and control group have normal laboratory values as regard serum sodium, serum potassium, calcium, and magnesium. This is in with accordance Noronha and Matuschak(2002), Dlercks (2004), Palmer(2006) and Urden *et al.* (2006), who mentioned that normal serum potassium levels are 3.5 to 4.5 mEq/L. Hyperkalemia and Hypokalemia elicits significant changes in the electrocardiogram (ECG) and impairs myocardial conduction.

Regarding glucose level two thirds of the patients in study and more than two thirds in control group have normal values as regard glucose level in preoperative period. In addition Garber *et al.* (2004) and Wynne *et al.* (2007) consistent the detection of increased blood glucose (more than 110 mg/dI) during a fasting state may indicate diabetes mellitus.

The present study showed that, the highest percentage (33.33 % and 26.67 %) in study and control groups respectively were having knowledge about rest and sleep. It also showed that most of patients had a general lack of knowledge in both groups about other items. Level of knowledge was insufficient this may be due to inavailability of training programs and lacking of continuous educations. This result was in agreement with Bedier (2005) who found that their was lack of patient's knowledge about pre and post operative care which predict poor recovery outcome

After implementing of the educational program study group patients had a highly significant improvement than those of control ones in relation to all items of knowledge. In this respect, Jennifer (2003) and Charlson et al. (2006) found that, applying nursing intervention postoperatively plays a major role in patients' improvement of knowledge and recovery.

As regard level of preoperative nursing care practice for open heart surgery patient, more than half of the patients in both groups had knowledge about performing foot and leg exercise. It also revealed that more than one third in study and control groups has no knowledge about how to perform coughing and breathing exercises, arm and shoulder exercise. According to American College Sports Medicine (ACSM, 1993) guidelines and Urden et al.(2006) recommended that exercise is important in the maintenance of the healthy heart.

Based on present finding assessment of practice level about post operative nursing care among patients in study and control groups, approximately an equally more than two thirds of patients in both groups have knowledge about nursing care of urinary catheter, activities and exercises in intensive care unit. It also showed that lacking of patient's knowledge about patient observation in intensive care unit, nursing care of nosogastric tube, and nursing care of chest tube in both study and control groups.

Regarding post operative activities, Charlson and Islam (2003) stressed that, following the cardiac surgery; the patient must be encouraged slowly to resume an active life, while minimizing the risk associated with overexertion. On the other hand Gerald and Fletcher (2007) . Abdel Monem (2008) illustrated that, active but not restrictive range of motion of extremities is also well tolerated early after cardiac surgery as long as activities do not stress or impair healing of sternal incision while patient become stable and early ambulated from bed.

As regards discharge instructions for open heart surgery patients, more than one third for study and control groups has had knowledge about how to perform walking exercise. Backer et al. (2003) and Punder (2005) recommended that a daily walk is sufficient to gain health benefits for patients after open heart surgery.

Before program implementation (pre-test) there was unsatisfactory level of knowledge. The implementation of educational program showed an improvement in patient' level of knowledge regarding all information related to open heart surgery. This has improved immediately after the program implementation and remained in the follow up.

The present study revealed that, before program implementation the patient did not have any background or information about level of practice in preoperative, postoperative nursing care and discharge instructions for open heart surgery. Post program implementation their were significant improvement in patient' level of nursing care practice about open heart surgery preoperative, postoperative and discharge instructions on immediate post-test and follow up test.

According to Morton et al.(2005); Morton and Fontaine(2009) effective preoperative teaching program for patient before open heart surgery is important to help the patient in rapid recovery and prevent postoperative complications. The surgical procedure, the intraoperative and postoperative experiences are explained.

In the present study there were statistical significant differences in improvements throughout the educational program phases among study group regarding total score of knowledge and practice about open heart surgery.

The study in the line with those of Morton et al.(2005); Morton and Fontaine(2009) ; Okkonen and Vanhanen (2006) who emphasized that after cardiac surgery the patient may experience pain resulting from the chest or leg incision. In addition Wynne et al. (2007) and Osborn(2010) illustrated that the goals of nursing management is a thorough assessment of the patient's pain using a pain scale, provide a calm environment, adequate period of rest and sleep, administration of analgesics based on the report of pain intensity.

In present study the scoring system used is of Southampton Wound Assessment Scale to assess surgical wound infection in patients, the wounds graded before discharge and after 2 weeks postoperatively. In the present study, more than half of the patients in study and control group were having normal healing with mild erythema predischarge, while in follow up phases all patients in study group and more than two third in control group were having normal healing with mild erythema. In addition Bailey et al.(1992), Morris (2003) and Punder (2005) devised the Southampton Wound Assessment Scale to assess surgical wound infection in patients following surgery; the wounds were graded before discharge and 10-14 days postoperatively into one of four categories; normal healing, minor complication, wound infection, and major haematoma.

Based on the study results; it was clear that there were a significance difference as regard the relation between hospital stay and ICU stay and incidence of infection. Eagle et al.(2004), Morton and fontaine (2009) supported that length of stay in ICU and hospital environment after cardiac surgery increased risk for sternal surgical site infection.

It was found that in the present study there was significance difference as regard to relation

between housing condition and incidence of fever, delayed wound healing and pneumonia. This in line with Minohara *et al.*(1993) and Campbell (2000) and DVLA (2003) who found that poor housing condition increases incidence of surgical site infection.

It is the fact that study documented the statement of role of the nurse play a vital role in the prevention of SSIs in patients with open heart surgery, identification of early signs of infection are vital to the prevention and optimum treatment of SSIs. The critical care nurse must be integrating theoretical knowledge, assessment skills, and problem solving ability to provide optimal nursing care and maintain high quality outcomes for open heart patients.

Conclusion:

Based on the result of the present study, it can be concluded that; Significant differences in improvements throughout educational program phases among study group regarding total score of knowledge and practice about open heart surgery. A significant relation was exited between age, nutritional status, diabetes, hospital stay, ICU stay and incidence of delayed wound healing among study group.

Based on results of the present study, the following can be recommended:

I. For patients:
1. Patients who have had valve replacement require additional verbal and written information about protecting their prosthetic valve from infective.
2. The patients must understand the importance of oral hygiene and visiting a dentist regularly because dental infections can affect the valve prosthetic.
3. Tell the patients about importance of regular follow up in regular time.
4. Advice the patient regarding effective education and information are required to enhance understanding of drug therapy (anticoagulant drug).

II. For nurses:
1. An in-service education center should be established within Assiut University Hospital to improve nursing staff level of knowledge and performance.
2. To reduce the rate of infection, implementation of universal precaution and comprehensive education are required.

III. In services:
1. Follow-up care for patients with open heart surgery phone calls, home health visits and clinic visits would help to pinpoint problems and solve it.

2. Establishment of specialized cardiac clinics in all health centers to help guiding and caring for patient with open heart surgery.

IV. For research (future study):
1. Importance of doing separate studies of open heart surgery helpfully lead to more effective and preventive – based strategies for future.
2. Studies should be done for those patients who high risk for infection

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