

"Coronary artery bypass grafting" Effect of developing and implementing Nursing Care Standards on patient's outcome.

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Abstract: Coronary artery bypass grafting (CABG) is a common surgery to treat coronary artery disease. It involves a section of a vein or an artery to create a connection (or bypass) between the aorta and the coronary artery beyond the obstruction. **Aim:** This study aimed to assess nurses' knowledge and practice regarding patients undergoing coronary artery bypass grafting, to develop nursing care standards for coronary artery bypass grafting on patient's outcome, and to evaluate the effect of implementing nursing care standards on nurse's knowledge, practice as well as on patient's outcome. **Methods:** Quasi-experimental research design was utilized to conduct this study, the study was carried out cardiothoracic surgery department, post operative intensive care unit, and operating room at Assiut University Hospital. **Sample:** A convenient sample included (38) nurses and (40) patients who had CABG (20) patients pre and (20) patients post implementing nursing care standards aged from 18-65 years from both sexes. **Tools:** a) pre/post structured interview sheet. b) pre/post observation checklist sheet. c) Cardiac surgery patient's assessment sheet. d) Construction of nursing care standards booklet. **Results:** The first and second hypotheses were supported as a good improvement in the mean knowledge and practice scores were found post implementation of nursing care standards. The third hypotheses were supported as postoperative complications were reduced post nursing care standards implementation. The fourth hypotheses were supported as a positive relationship was found between nurses' knowledge and practice scores immediately post nursing care standards implementation. **Conclusion:** Improving nurses' knowledge and practice can favorable affect the incidence of coronary artery bypass graft surgery patient's complications. Recommendations: in-service training programs and refreshing courses must be applied to improve nurse's knowledge which will reflect into their practice while working with patients. [Ghada H. Ahmed, Zienab AE. Muhammad, Mahmoud K. Abd-Elateef, Hala M. Ghanem. **Coronary artery bypass grafting" Effect of developing and implementing Nursing Care Standards on patient's outcome.** *J Am Sci* 2015;11(7):181-188]. (ISSN: 1545-1003). <http://www.jofamericanscience.org>. 23

Key words: Coronary artery disease, Coronary artery bypass grafting, nursing care standards.

1. Introduction

Cardiovascular disease is a significant global health problem. Worldwide, an estimated 17.3 million people died from cardiovascular disease in 2008 (Mendis *et al.*, 2011). In the United States, cardiovascular disease continues to be the leading cause of death for men and women (Kochanek *et al.*, 2009). About 2,200 Americans die each day from cardiovascular disease; this represents an average of one death every 39 seconds (Roger *et al.*, 2011). Coronary Artery Disease (CAD) caused about one in every six deaths in the United States in 2007. Every year, about 758,000 Americans will have a new coronary attack and about 470,000 will have a recurrent attack. An additional 195,000 silent first myocardial infarctions (MIs) occur each year (Roger *et al.*, 2011). Coronary artery bypass grafting (CABG) has become an acceptable treatment for CAD. Compared with medical treatment, CABG surgery has proved effective in relieving angina and improving exercise tolerance, and it prolongs life in patients with left main CAD and three-vessel disease with poor left ventricular function (Perrin, 2009). It is estimated that 571,000 cardiac bypass surgeries are performed on

355,000 people annually in the USA. Of the people who undergo bypass surgery, 238,000 are men, 117,000 are women, and 27,000 are over 65 years of age (World Health Organisation, 2011). In Assiut, the numbers of patients undergoing coronary artery bypass graft surgery during the period between 2013-2014 presented to the cardiothoracic department of Assiut University Hospital was approximately (35) cases (Hospital record, 2014). In 1962, a cardiac surgeon by the name of Sabiston conducted the first unsuccessful saphenous vein graft from the ascending aorta to the distal right coronary artery and the patient died 3 days later. The technique was then pioneered by Argentinian René Favaloro and others at the Cleveland Clinic in the late 1960s. The next major development was in 1970, when the internal mammary artery was used as a bypass conduit to the coronary arteries. By the mid 1970s, many centers in the United States, Australasia, and Europe were performing CABG with low peri-procedural mortality, and a high rate of pain relief (Hawkes *et al.*, 2006). Common complications associated with CABG surgery include renal failure, respiratory failure, perioperative myocardial infarction (MI), vein graft closure, hemorrhage, microemboli,

dysrhythmias, pericarditis, postpericardiotomy syndrome, embolism, pneumonia, atelectasis, hemothorax, stroke, and postcardiotomy delirium. Other complications that are seen less often include stress ulcer, endocarditis, gastrointestinal bleeding, mediastinitis, and paralytic ileus (Osborn *et al.*, 2010). Nursing care standards are professional nursing activities demonstrated by the nurse through the nursing process. Standards may be defined as "a benchmark of achievement which is based on a desired level of excellence". Standards of care measure the degree of excellence in nursing care and describe a competent level of nursing care. All standards of practice provide a guide to the knowledge, skills, judgment and attitudes that needed to practice safety (McMahon *et al.*, 2011).

Aim of the study:

This study aimed to evaluate the effect of developing nursing care standards booklet. This aim was achieved through the following:

- Assessing nurses' knowledge and practice regarding patients undergoing coronary artery bypass grafting.
- Developing and implementing nursing care standards booklet for patients undergoing coronary artery bypass grafting and evaluating its effect on knowledge and practice as well as patient's outcome.

Hypothesis:

To fulfill the aim of the study, the following research hypotheses were formulated:

- The post mean knowledge score of nurses will be higher than pre mean knowledge score.
- The post mean practice scores of nurses will be higher than pre mean practice scores.
- The incidence of postoperative patient's complications cared by nurses post standard care implementation will be lesser than that pre-standard care implementation.
- A positive relationship will exist between knowledge and practice score obtained by nurses receiving the developed nursing care standards.

2. Subjects and Method:

Research design:

Quasi-experimental research design has been utilized in this study.

Study variables:

The independent variable in this study is the developing nursing care standards while the dependent variables are: nurse's knowledge, practices, and patient outcome.

Setting of the study:

The study was conducted in cardiothoracic surgery department, intensive care unit, and operating room at Assiut University Hospital.

Study subjects:

A convenience sample of all available nurses are working in selected setting (about 38 nurses); (10) nurses working in cardiothoracic surgery department, (23) nurses working in intensive care unit, and (5) nurses working in operating room and who are willing to participate in the study which include patients undergoing coronary artery bypass grafting (20 patients) pre and post application of the developing nursing care standards.

Inclusive criteria:

- Adult conscious patients undergoing coronary artery bypass grafting age ranged between (18-65years),
- Both sexes (male and female).

Tools of data collection:

1. Structured interview sheet (pre / post tests), which was developed in a simple clear Arabic language by the researchers based on literature review and experts' opinions in the light of relevant references to assess nurses' knowledge regarding patients undergoing coronary artery bypass grafting. It included the following parts:

- **The first part:** related to socio-demographic characteristics of the study subjects age, marital status, qualification, years of experiences, and attendances of training programme.
- **The second part:** related to nurses' knowledge about heart and coronary arteries: definition of heart, coronary arteries, coronary artery bypass grafting, indications of coronary artery bypass grafting, types of coronary arteries, layers of coronary arteries, and types of coronary artery bypass grafting.
- **The third part:** related to nurses' knowledge about nursing care for patient undergoing coronary artery bypass grafting.

Scoring system: The total score for all items was 150. Each right answer was given two score. Those who obtained less than 50% were considered having unsatisfactory level of knowledge. While those who obtained from (50%- 70%) or above 70% were considered having satisfactory level of knowledge.

2. Observation checklist sheet (pre / post tests): It was developed and filled by the researchers to assess expected complications that might develop among patients of coronary artery bypass grafting. It included the following parts:

- **The first part:** related to socio-demographic characteristics of study sample 40 patients (e.g., age, sex, marital status, level of education, and occupation).
- **The second part:** related to physical and psychological patient assessment.
- **The third part:** related to patient's complication.

Scoring system: Each item was observed, categorized, and scored as follow: 2 for each step that done correct

(correctly, in time and with the required frequency) and 1 for each step done incorrect (incorrectly, not in time and without the required frequency) and zero for step that not done. Inapplicable means that the nurses were not able to apply the principles of the standard due to shortage in supplies and equipment, not due to shortage or negligence from the nurses. Those who less than (50%) were considered having inadequate level. Above (50%) were considered having adequate level.

3. Coronary artery bypass grafting patient's assessment sheet: It was developed and filled by the researcher to assess expected complications that might develop among patients of coronary artery bypass grafting. It included the following parts:

- **The first part:** related to preoperative preparations vital signs, deep breathing and coughing exercises and leg exercises.

- **The second part:** related to intra operative procedures perform surgical hand antisepsis.

- **The third part:** related to post operative procedures

4. Nursing care standards booklet: It was developed by the researcher based on nurses and patients needs assessment, literature review, researcher experience and opinions of the medical and nursing expertise. The teaching booklet was revised and modified based on the expertise comments, it was written in Arabic using simple language with illustrations.

Content validity:

It was established by panel of 5 expertises who reviewed the instruments for clarity, relevance, comprehensiveness, understanding, applicability and easiness for administrative minor modifications were required. The content validity of this tool was checked by expert professors in fields of medicine and nursing and correction was carried out accordingly.

Ethical considerations and human rights: An official permission to conduct the study was obtained by the researcher from the head of the cardiothoracic surgery, post operative intensive care unit at Assiut university hospital as well as from head nurses of each unit. Nurses and patient were informed of the purpose and nature of the study. The investigator emphasized that the participation is voluntary and confidentiality and anonymity of the subjects will be assured through coding all of data.

Tools testing and pilot study: A pilot study was implemented on 10% of the total study subjects to test the tools. Analyses of the pilot study revealed that minimal modifications are required. These modifications were done and the subjects were not excluded from the actual study.

Procedures:

- Data were collected at Cardiothoracic department, Operating room unit, and Post operative

intensive care unit at Assiut University Hospital during the period from 31/1 /2012 to 20/8/2014.

- The tools filled through interviewing. The purpose of the study was explained to the nurses prior to answering the questions. The study was carried out at morning, and after noon shifts.

- At initial interview the researcher introduce herself to initiate line of communication, explain the nature & purpose of the developed nursing care standards and fill out the structured interview sheet (tool I) to assess nurse's knowledge pre implementation of nursing care standards and the researcher fill out the observation checklist sheet (tool II) to assess nurse's practice pre implementation of nursing care standards.

- The researcher scheduled with them the teaching sessions for both theory and practice and the nurses were divided into small groups, each group contains 3-4 nurses. Teaching has been implemented for nurses in terms of sessions and teaching on the spot during their official working hours. There were a total of 10 sessions. The duration of each session was 30-45 minutes, including 10 minutes for discussion and feedback.

- The researcher explained the nature & purpose of the developed nursing care standards to the selected patients who are willing to participate in the study and filled out the patient assessment sheet (tool III).

- The effect of the developing nursing care standards on patient's outcome was reached through comparing level of nurse's knowledge and practice pre and post implementing of nursing care standards has been evaluated by the researcher through filling the study tools(I,II).

3.Results:

Table (1) clarified that; the majority of the nurses (78.94%) their age ranged from 20 to 40years and have diploma degree. (68.42%) of them were married, their experiences were ranged from 5 to 10years (68.42%) with mean duration of 7.83±2.51 years. The majority of the nurses (65.78%) did not attend training courses related to coronary artery bypass graft surgery.

Table (2) revealed that; the mean scores for total knowledge was low pre implementing of nursing care standards (11.62±2.79, 24.10±6.72, 35.72±9.51 respectively) and there was a noticeable improvement in the mean knowledge scores post the implementation of nursing care standards (21.70±4.57, 57.43±12.11, 79.13±16.68 respectively).

Figure (1) reveals that; more than half of nurses had adequate practice in post implementing of nursing care standards (60.52%) with $P<0.0001$.

Table (3) shows that; more than half of the sample, their age ranged between 40<60ys with mean of (41.83±12.59), more than half of them were male; all of them (100%) were married. As regard level of education, more than half of the study sample was

illiterate. As regard occupation, one-third of patients were farmer and housewife.

• Table (4) revealed that; there was a highly statistical significant difference pre and post

implementation of nursing care standards regarding local, respiratory, and urinary complications.

Table (1): Distribution of socio-demographic characteristics of the studied nurses (n=38).

Characteristics	Frequency (N=38)	
	No.	%
Age:		
• <20 year	3	7.89
• 20:40 year	30	78.94
• >40 year	5	13.15
Mean ± SD	24.67 ± 3.69	
Sex:		
• Male	4	10.52
• Female	34	89.47
Marital status:		
• Single	12	31.57
• Married	26	68.42
Education:		
• Diploma Nurse	30	78.94
• Technical Nurse	7	18.42
• Baccalaureate Nurse	1	2.63
Experience:		
• <5 years	9	23.68
• 5:10 years	26	68.42
• >10years	3	7.89
Mean ± SD	7.83±2.51	
Previously Attended of training courses related to coronary artery bypass graft surgery:		
• Yes	13	34.21
• No	25	65.78

Table (2): Total mean knowledge scores obtained by nurses pre and post implementing nursing care standards for patient undergoing coronary artery bypass grafting (n=38).

Knowledge Items	Mean ± SD	p-Value
Knowledge about anatomy of heart and coronary artery, coronary artery bypass grafting: (Maximum score = 30)		
• Pre-test	11.62±2.79	***
• post-test	21.70±4.57	0.0001
Knowledge about nursing care for patients undergoing coronary artery bypass grafting: (Maximum score = 120)		
• Pre-test	24.10±6.72	***
• post-test	57.43±12.11	0.0001
Total score (Maximum score = 150):		
• Pre-test	35.72±9.51	***
• post-test	79.13±16.68	0.0001

:*** Highly significant

Table (3): Distribution of study sample according to socio-demographic characteristics of patients as regard pre and post implementing nursing care standards (n= 40).

Characteristics	Frequency (N=40)	
	No.	%
Age:		
• 18<40 ys.	--	--
• 40<60ys.	15	75.0
• >60ys.	5	25.0
Mean ± SD	41.83±12.59	
Sex:		
• Male	13	65.0
• Female	7	35.0
Marital status:		
• Single	-	-
• Married	40	100.0
Education:		
• High education	1	5.0
• Secondary	1	5.0
• Basic education	4	20.0
• Illiterate	14	70.0
Experience:		
• Employee	2	10.0
• Farmer	8	40.0
• House wife	7	35.0
• Retired	3	15.0

Table (4): Distribution of study sample according to postoperative complications regarding pre and post implementing nursing care standards.

Variables	Pre standard group (n=20)		Post standard group (n= 20)		P= value
	No	%	N	%	
1. Local complications:					
▪ Deep sternal wound infection	18	90.0%	2	10.0%	0.0001***
2. Respiratory complications:					
▪ Pneumonia	13	65.0%	2	10.0%	0.03*
▪ Atelectasis	--	0.0	--	0.0	
3. Circulatory Complications:					0.387n.s
▪ Hemorrhage	1	(5.0%)	-	-	
▪ Stroke	-	-	-	-	
▪ Myocardial infarction	-	-	-	-	
▪ Pericardial tamponade	-	-	-	-	
▪ Pericardial effusion	-	-	-	-	
▪ Pleural effusion	-	-	-	-	
▪ Atrial fibrillation	2	10.0	1	5.0%	
4. Urinary complications:					
▪ Acute renal impairment	5	25.0%	2	10.0%	<0.02*
5. Gastrointestinal Complications:					0.583n.s
▪ Nausea & Vomiting	7	35.0%	5	25.0%	
▪ Constipation	-	0.0	--	0.0	
▪ Paralytic ileus	--	0.0	--	0.0	

- more than one N.S. $P > 0.05$ non significant * $P < 0.05$ significant *** $P < 0.001$ highly significant

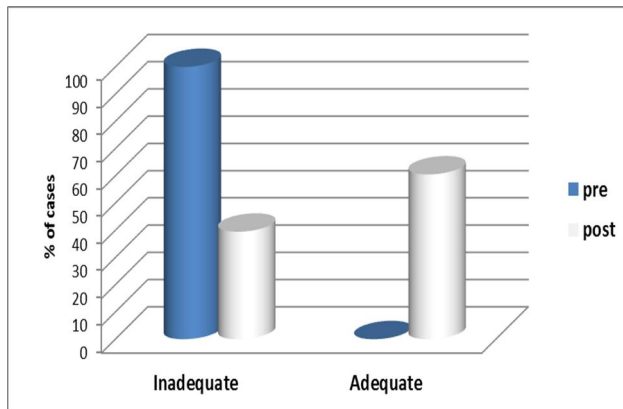


Figure (1): Frequency distribution of the level of nurses' practice as regard pre and post implementing of nursing care standards for patient undergoing coronary artery bypass grafting (n=38).

4. Discussion:

Coronary artery bypass grafting (CABG) has become an acceptable treatment for coronary artery disease (CAD). Compared with medical treatment, CABG surgery has proved effective in relieving angina and improving exercise tolerance, and it prolongs life in patients with left main CAD and three-vessel disease with poor left ventricular function (**Perrin, 2009**).

Cardiothoracic surgery nurse should be qualified enough to care for patients because those patients need special nursing care; standard nursing care to improve their conditions and to help in preventing or reducing potential postoperative complications. Nurses should develop their own standards of care and the profession should agree on acceptable levels of excellence. Nurses are planned, systematic and focused on mutually agreed goals in which standards of care influence nursing practice, education and management (**Huston, 2003**).

The results of the present study showed; that the majority of nurses were aged from 20 - 40 years. The majority of nurses were female and nursing diploma was the highest proportion, more than half of them, their experiences were ranged from 5 to 10 years and the majority of them have no in service training courses related to coronary artery bypass graft surgery.

Ahmed, (2013); in the same line with the current study findings conducted a study in neurosurgery department at Assiut University Hospital entitled "Developing nursing care standards for patients post discectomy at Assiut University Hospital". Reported that, the majority of nurses were female, nursing diploma was the highest proportion, less than half of them have an experience more than ten years and all of them have no in service training courses related to standards of nursing care for patients with discectomy.

As regard nurse's knowledge, the current study showed that, pre implementing nursing care standards showed unsatisfactory level of nurse's knowledge about anatomy of heart, coronary arteries and standards care of patients undergoing coronary artery bypass graft surgery, which reflects the lack in their scientific preparation. Post implementation of nursing care standards showed an improvement in the nurses' level of knowledge regarding the care offered to coronary artery bypass graft surgery patients. The findings indicate that a good improvement in the mean knowledge scores after implementation of nursing care standards.

So, we can conclude from the data collected and analysis in the present study that all studied nurses weren't properly prepared prior to their working and/or dealing with such coronary artery bypass graft surgery patients and really they got their experience while being there, working and managing the patients in the real life emergency situations.

In this respect, **Change (2006)**; mentioned that nurses must be able to expand their knowledge of this area through ongoing education, Journal, and seminars. Consequently, teaching programs for nursing staff constitute an important part. These programs are urgently designed to assess nursing staff in developing and enhancing the skills needed to provide high standards of care to their patients.

The current study revealed a great improvement in the level of nurse's practice post implementing nursing care standards in all items. This has been concluded by the presence of significant differences between results of pre and post implementing nursing care standards. This finding indicated that skills can be easily improved, especially if linked with their relevant scientific base of knowledge.

In this respect, **Sherwood (1996)**; reported an improvement in nurses' practice after the attendance at continuing nursing education sessions. Research findings indicated that continued nursing education programs increase both knowledge and performance and can also improve attitudes. As well, **Abd-Ala, (2000)**; documented that the inservice training program has a beneficial effect in improving the nurses' knowledge and skills. They also recommended that educational programs should be organized according to the needs of nurses with continuous evaluation.

As regards gender, in the current study, more than half of the patients were male. This result comes in agreement with **Bickley and Szilagyi (2005)**; who stated that fewer of participated patients with open heart surgery were females (female: male ratio = 1: 4.4). As well, **Giakoumidakis et al., (2010)**; mentioned that, sixty seven percent of the studied patients were male. However, this result disagree with

Hopkins (2005); who mentioned that the majority of participated patients with open heart surgery were females.

Furthermore, the findings of the present study showed that, the prevalence of coronary artery bypass operation was greater in males than females. This result in the same line with **Kasliwal et al.(2006)**; who found that men have a greater rate of coronary artery bypass surgery than women.

In relation to educational level, more than half of the patients were illiterate, which explains why they were not complying with the medication regimen and routine follow up and not responding easily to the knowledge given to them to prevent postoperative complications. This result was supported by **Diab (2011)**; who mentioned that the patients with low education had decreased awareness toward the surgery and the importance of follow up routine.

As regard to their occupation, the current study revealed that about one-third of patients were farmer. This study finding was supported by **Emran (2004)**; who reported that physical activity and loading, such as lifting heavy objects can cause exertional angina.

As regard coronary artery bypass graft surgery complications in the present study, it was found that, the incidence of coronary artery bypass graft surgery complications post implementation of nursing care standards was lesser than pre implementation. The most common complications which occurred pre implementation of nursing care standards were deep sternal wound infection, post operative pulmonary complications, acute renal impairment, nausea and vomiting.

This result agree with **Olsen et al.(2002)**; who reported that one of the major complications after CABG surgery is deep sternal wound infection (DSWI) which is an infection of the anterior mediastinal space involving muscle, bone and/or mediastinum, the incidence of DSWI varies from 0.6–3%. This may be attribute to there are known host (e.g. advanced age, and diabetes) and procedural factors (e.g.wound class, duration of procedures and surgical technique) associated with increased risk of surgical site infections(SSIs).

The current study revealed that, the majority of studied patients. i.e. thirteen patients only out of twenty developed pneumonia after surgery. This result agree with **Brooks-Brunn (1995)**; who stated that, the overall incidence of PPCs following CABG surgery varies from 5% to 90%. However, This result disagree with a study was done on 117 adult patients who had undergone elective CABG surgery at the University Medical Centre Utrecht, Utrecht, the Netherlands by **Hulzebos et al. (2003)**; who reported that, the incidence of PPCs was 33%. This may be attribute to interventions such as breathing and coughing

exercises, early ambulating, and pulmonary clearing techniques often are used by physical therapists to prevent pulmonary complications after coronary artery bypass graft (CABG) surgery. However, there is controversy concerning both the efficacy of these postoperative procedures in diminishing the incidence of PPCs and the proper strategy for the identification of patients who might benefit from such interventions.

As regard the incidence of acute renal impairment, the current study was found that (10%) of patient developed acute renal impairment after implementation of developed nursing care standards as compared to (25%) of whom before implementation of developed nursing care standards. This result disagree with a study was done on 151 patients who underwent on-pump CABG, no patient was receiving dialysis. by **Ogawa et al.(2005)**; who reported that, Renal impairment (serum creatinine >1.5 mg/dL) developed 18.5% of the on-pump group ($P = 0.1$).

The current study revealed that, the minority of studied patients. i.e. seven patients only out of twenty developed nausea and vomiting after surgery. This result disagree with **Mace (2003)**; who stated that, nausea and vomiting, is experienced by a large number of patients after cardiac surgery (67%), with the majority suffering on the first day after surgery. The duration of nausea and vomiting for most is short, but for a significant number (7%) it can last up to one-quarter of their initial post-operative course. This may attribute to the incidence of postoperative nausea and vomiting (PONV) can be affected by surgical procedure, and use of anaesthesia.

Conclusion:

In the light of the current study it can be concluded that, Implementation of nursing care standards for patients with coronary artery bypass grafting shows a significant improvement in nurses' knowledge and practice.

Recommendations:

1. Standard nursing care for patients undergoing coronary artery bypass surgery should be included in the curriculum of nursing school and institutions as a minor specialty.
2. Nursing standards must be designed and communicated to all nursing staff in each hospital.
3. Teaching unit should be developed at Assiut University Hospital to provide continuous care for patients undergoing coronary artery bypass grafting.
4. Orientation program for all newly nurses and in services training programme for experienced nurses about nursing care standards for patients undergoing coronary artery bypass grafting.

5. Replication of the study on larger random sample acquired from different geographical areas in Egypt to figure out the main aspect of this problem, so further research studies are highly recommendation to gather in depth knowledge about nursing care standard for patients undergoing coronary artery bypass grafting.

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