

Creating Learning Guideline for Nurses Caring for Patients Safety Undergoing Cardiac Catheterization

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Abstract

Background: Cardiac catheterization is considered as the gold standard practice for the recognition and diagnosis coronary heart disease. The hazard physically and emotionally occurs from this procedure can disturb the patient's perception of their health. Nursing care is vital in survival and avoids the patients from post cardiac catheterization problems. So the competence of nurses about knowledge and practice regarding patient care after cardiac catheterization is very crucial. **Aims:** the aim of this study to investigate the effect of creating learning guideline for nurses caring for patients safety undergoing cardiac catheterization. **Methods:** A quasi experimental research design was conducted. The study was conducted at the Cardiac Catheterization intensive care, cardiac care and emergency units at general Port Said hospital in Port Said city – Egypt. Subjects: A purposive sample of 51 nurses was working in those departments. Tools: two tools were utilized. Tool I: consisted of the following: Part I: Socio-demographic data of the nurses. Part II: nurses' knowledge about cardiac catheterization. Tool II: Nursing care after cardiac catheterization to providing patient safety. **Results:** The study revealed that the majority of nurses have a highly satisfactory level of knowledge and performance regarding patient safety on cardiac catheterization post implementation the learning guideline than pre learning guideline. It was reflected positive correlation between nurses qualification, experience and knowledge regarding patient's safety at post learning guideline with significant difference regarding experience. While, there was a strong positive correlation between the performance of studied nurses and their qualification regarding the post learning guideline implementation with significant. Finally, positive correlation between performance and knowledge regarding patient safety at post learning guideline implementation. **Conclusion:** it can be concluded that learning guideline considerably improved the nurses' level of knowledge and performance regarding Caring For Patients Safety Undergoing Cardiac Catheterization. Overall knowledge score between pre learning guideline and post learning guideline was found to be significant. While, total performance score between pre learning guideline and post learning guideline was found to be not significant. Therefore, the learning guidelines are recommended for educating these nurses to promote knowledge and performance regarding patient safety to decrease hazards following cardiac catheterization.

Keywords: Creating; learning guideline; Patients safety; Cardiac catheterization.



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1. Introduction

Coronary Artery Disease (CAD) is the leading cause of death in both men and women (CDC, 2010). CAD occurs primarily due to a build-up of plaque inside the arteries of the heart which supply blood to the heart muscle. When the arteries become narrowed from plaque, there is a lack of blood circulating to the heart muscle which can cause irreversible damage. This in turn can lead to chest pain, myocardial infarction (MI) and possibly death Schiks *et al.* (2008). According to the Centers for Disease Control (CDC), it was estimated that over 631,000 people died from heart disease, and more than half of those individuals were women (2006). In the United States (US), someone has a heart attack every 34 seconds, and every minute there is a death related to a heart disease related event CDC and NCHS (2015). Cardiovascular diseases are known as the leading cause of death in the world Jamshidi *et al.* (2010). According to World Health Organization, about 18 million deaths occurred due to cardiovascular diseases in 2008 and this value has been estimated to reach 23 million by 2030 World Health Organization (2013).

Cardiac catheterization (cardiac cath or heart cath) is a procedure to examine how well your heart is working. A thin, hollow tube called a catheter is inserted into a large blood vessel that leads to your heart. View an illustration of cardiac catheterization American (2018). Cardiac catheterization is an percutaneous treatment which is used in the diagnosis and management of various cardiac health problem. It may prime to some major and minor complications which may lead to disease and death. Early identifying of complications and appropriate intervention is logically tight to compelling action to have prompt management and thus diminishing additional complications. Nearly complications happens during the transfer of patients later cardiac catheterization or late or inadequately provided care. Patient safety is defined as being free from accidental harm as a result of a health care encounter. It is the responsibility of the cardiac catheterization team to make that commitment to every patient and to each other. A well-functioning unit with a culture of safety, demonstrated clinical quality outcomes, and high internal/external customer satisfaction scores can avoid the risks associated with a less reliable unit Arathy (2011) and Michael *et al.* (2018)

Complications are usually temporary and may include minor infections, bleeding, abnormal heartbeats, and reaction to medications or dye. There is also a possibility that more serious but rare problems may develop during the procedure. These major cardiac catheterization complications include heart or lung problems, stroke, heart attack, or kidney failure. The frequency of haematoma was 1.3% (>10 cm) and 8.9% (>5 cm), which corresponds with reports from similar studies and departments. The factors found to increase the risk of haematoma development can provide background for procedural changes and increase the focus on patients at increased risk in order to minimize the development of haematomas [Anderson et al. \(2005\)](#).

Cardiac nurse must assess and care for patients with cardiac problems as well as patients undergone cardiac catheterizations procedures, patient for any negative signs of a change in condition, safe transport, administering medication, help with basic personal care needs control of bleeding, maintenance of haemostatis. This will help in minimizing the vascular complications in patient. Increased risk for vascular complications was found in patients who were older than 70 years, were female, had renal failure, underwent percutaneous intervention. [Dumont et al. \(2006\)](#) Cardiac nurses are responsible for providing patient's safety and minimizing vascular complications after cardiac catheterization procedures. They should be aware about the guidelines for providing safety for the patient. Each nurse should know the high risk patient, safe practices for handling and maintenance of homeostasis. Patient safety in minimizing complications is increasingly recognized as essential in practice of coronary care unit. Individual have right to safe and effective quality health care. Cardiac nurses are responsible for providing patient's safety and minimizing vascular complications after cardiac catheterization procedures. They should be aware about the guidelines for providing safety for the patient. Each nurse should know the high risk patient, safe practices for handling and maintenance of homeostasis ([Arathy, 2011](#)).

1.1. Theoretical Framework

Knowles' Adult Learning Theory was utilized in the development of this study. There are five principles of the Adult Learning Theory: self-concept, experience, readiness to learn, orientation to learning and motivation to learn. Knowles stated "adults should acquire a mature understanding of themselves. They should be able to understand their needs, motivations, interests, capacities, and goals". This theory supports the idea that the quality of experiences people have in society will influence the skills and attitudes they will carry into the future [Smith \(2002\)](#).



Knowles' Adult Learning Theory

1.2. Significance of the Study

Several studies have been conducted to determine the effectiveness of self learning modules. With the increasingly rapid pace of society, many people do not have the time to participate in traditional education classes and are more likely to participate when it is convenient for them. Self-learning modules include a complete education package allowing learners to gain knowledge at their own pace. These provided a self directed learning opportunity for the nurses participating in this study. It also allows individuals to gain the knowledge needed to perform tasks and be successful at their jobs [Stacy \(2011\)](#).

1.3. Aim of the Study

Aim of the study was to investigate the effect of creating learning guideline for nurses caring for patients' safety undergoing cardiac catheterization.

1.4. Research Hypotheses Were As Follows

1. There are improvements of nurses' knowledge regarding patients safety undergoing cardiac catheterization post Learning guideline implementation
2. There are improvements of nurses' performance regarding patients safety undergoing cardiac catheterization post Learning guideline implementation

2. Subjects and Methods

2.1. Research Design

A quasi experimental research design was used to conduct this study.

2.2. Setting

This study was conducted at cardiac catheterization, intensive care, cardiac care and emergency units at general Port Said hospital in Port Said city – Egypt.

2.3. Subject

The researchers used a purposive sample to select nurse's participants; 51 nurses were worked in those departments included in the study.

2.4. Tool of Data Collection

2.4.1. The Study Instruments

For the purpose of the present study, the questionnaire was used before and after conducting a special learning guideline designed. Two tools were utilized by the researchers to collect the necessary data. These tools were as following:

Tool I: It consists of two parts as the following:

Part I: Socio-demographic data of the nurses was comprised of items related to nurse age, sex, educational qualification, place of work and total years' experience.

Part II: Nurses' knowledge regarding patients safety undergoing cardiac catheterization.

It was used to determine the nurse knowledge regarding cardiac catheterization patients complications that composed of 10 questions multiple choice. It was adopted by [Arathy \(2011\)](#) and modified by the researchers. It was concerned with items related knowledge about local complications occurring in patients, detect pseudoaneurysm, check the serum creatine level of patients, identify the complication of delayed sheath removal, development of contrast-induced nephropathy occurs, determine the risk for developing renal failure, determine sign of thrombus formation, patient's affected extremity to be kept immobilized, risk for developing pulmonary edema and detect a hematoma at the puncture site after cardiac catheterization pre/post learning guideline. Scoring system: - multiple choice (10 questions) were each right answer was given one score and the false answer code was (0) this to assess nurses knowledge. While those who obtained score <60% were considered having unsatisfactory nurse knowledge and satisfactory score of $\geq 60\%$.

Tool II: Nursing care after cardiac catheterization to providing patient safety

Observational checklist was designed to assess the nurse performance regarding patients' safety after cardiac catheterization. It was adopted by [Arathy \(2011\)](#) and modified by the researchers. It covered the following skills:

Mode of transport from Cath lab to CMICU/CMWR, Puncture site, transfer to bed, checking distal pulse, frequency of checking pulse, assessing the puncture site, frequency of assessing the puncture site, communicated to the patient, connected to cardiac monitor, checked for (ECG , heart rate , respiratory rate and temperature), immobilizing the affected limb, administering intravenous(IV) fluids. compression given to puncture site after sheath removal till bleeding stops, Immobilizing the affected limb after sheath removal, checked for untoward symptoms, development of symptoms, Any episodes of vasovagal attacks, Intake output chart maintained, urine output In 8 hours, If urine not passed, bladder Palpable, If urine not passed, intervention done, administered fluid and soft diet, due medicines given, ambulation done in 8 hours and Seen by relatives. Scoring system: each item right safe performance was given one score and the unsafe performance code was (0) this to assess nurses performance regarding patient safety after cardiac catheterization. While, higher scores indicate greater satisfaction with the procedure is $\geq 60\%$ and the lower scores <60% indicate un-satisfaction with the procedure.

2.5. Pilot study

Pilot study was conducted on the month of August 2017 after obtaining permission from the authorities of hospital management. The study was conducted in 5 cardiac nurses with a self-prepared questionnaire and observation tool. After pilot study assessment has been done after making necessary corrections in the questionnaire.

2.6. Learning Guideline Construction

The current study was carried out on three phases (preparatory, implementation and evaluation phase.

Phase I: Preparatory phase: Human rights and ethical permission were obtained to conduct the study. An official permission was obtained from the Dean of nursing faculty in which the study was conducted and then the official permission was obtained from director of hospital. Nurses were fully informed of the study aim. The voluntary nature of participation was stressed as well as confidentiality. Consent was obtained from each nurse. The Learning guideline (Nursing intervention) was designed by the researchers and based on the results obtained from the study tools; also, it was revised and modified according the related literature, cultural and socio-demographic aspects of the study sample.

Phase 2: Implementation phase: Data collection was carried out during the period from August 2017 to October 2017. The pre learning guidelines was done for nurses in order to have base line information. The implementation phase of the learning guideline lasted for 3 months. The time taken to develop educational skills of learning

guideline for nurses one month, and then the assess their performance. The learning guideline was designed by the researchers and based on the result obtained from the study tools and findings of similar researches, also it was revised and modified according the related literature. It consists of one session every week for 4 weeks to nurses. Each session took 30-45 minute in addition to 15-20 minutes to discuss any questions for nurses. Nurses were allocated into small groups (each group contained 3- 5 nurses) to ensure assembly of patients` care. After there, the contents of the learning guideline was given to the nurses after assessment knowledge and observe their performance and explain any queries with them through booklet. Then nurses` knowledge and performance were assessed immediately after learning guideline implementation.

Phase 3: Evaluation phase: Evaluation was applied before and after the Learning guideline, in order to identify differences, similarities and areas of improvement, as well as defects. This was done through pre and post administration of the self-administered questionnaires and observation checklist performance for nurses. Also the Learning guideline evaluated through measure the patients safety regarding Nursing care after cardiac catheterization

2.7. Ethical Consideration

An officially letter from the faculty of nursing was send to accountable authorities of the hospital and approval was attained to conduct this study after explanation of the aim of the study. Formal consent was taken from the nurses to participate in the study. The researchers firstly introduced themselves to all potential subjects, then explaining the purpose of the study and they were assured that all data collected would be very confidential and only will be used for the study' aim. The researchers stressed that contribution in the study is entirely volunteer and anonymity of the nurse was sure through coding data. Subjects were also knowledgeable that rejection to participate in the study would not disturb their care

2.8. Data Analysis

Data were revised, coded, analyzed and tabulated using the number and percentage distribution and carried out using SPSS version 20. The statistical tests used are chi-square test and correlation. A value of $p < 0.05$ was considered to be statistically significant.

3. Results

Figure (1) illustrated that the majority of the studied nurses were ranged between (30≤40) years.

Figure (2) showed that the majority of studied nurses had a diploma degree (88.5%).

Figure (3) indicated that the majority of studied nurses had experienced ≥ 10 years.

Table (1) Showed that the majority of studied nurses have a highly satisfactory level of knowledge and total score regarding patient safety on cardiac catheterization post implementation the learning guideline than pre learning guideline with a highly significant difference.

Table (2) indicated that all studied nurses have a satisfactory level of total performance score regarding patient safety after implementation of the learning guidelines on cardiac catheterization.

Table (3) reflected that the positive correlation between the studied nurses qualification, experience and knowledge regarding patient's safety at post learning guideline with statistically significant difference regarding experience. Also, the table shows that the negative correlation between the studied nurses qualification, experience and knowledge regarding patient's safety at pre learning guideline with no statistically significant difference.

Table (4) illustrated that the strong positive correlation between the performance of studied nurses and their qualification regarding the post learning guideline implementation with a statistically significant difference. Also, the table shows that the negative correlation between the performance of studied nurses regarding their qualification and experience at the pre learning guideline implementation with no statistically significant difference.

Table (5) reflected that the positive correlation between the performance of studied nurses and their knowledge regarding post learning guideline implementation with no statistical significant difference. Also, the table indicates that negative correlation between the performance of studied nurses and their knowledge regarding pre learning guideline implementation with no statistically significant difference.

Figure-1. Number and percent distribution of the studied nurses regarding age group (N=51)

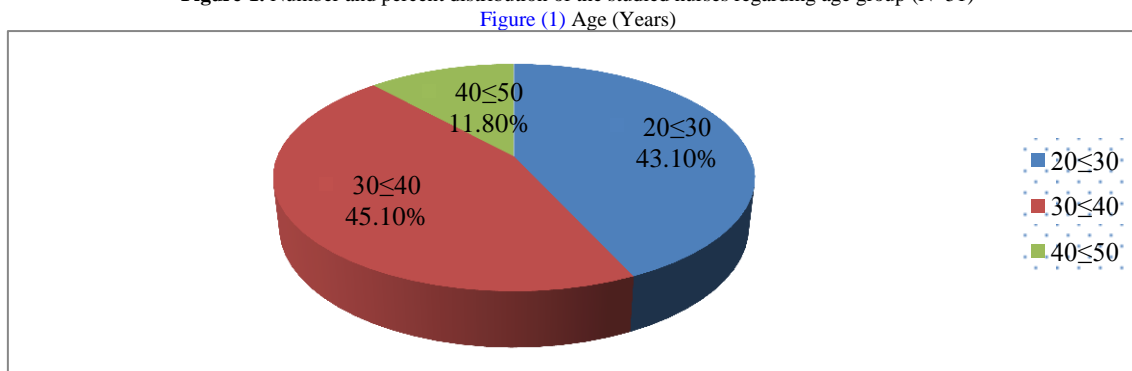


Figure-2. Percentage distribution of the studied nurses regarding professional qualifications (N=51)

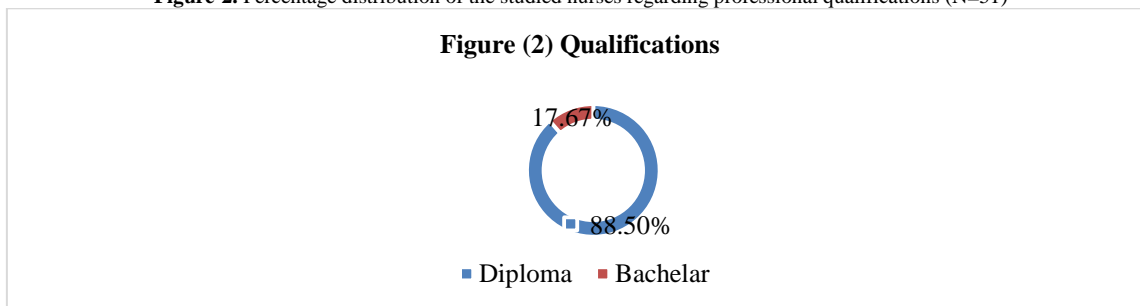


Figure-3. Percentage distribution of the studied nurses regarding their experience

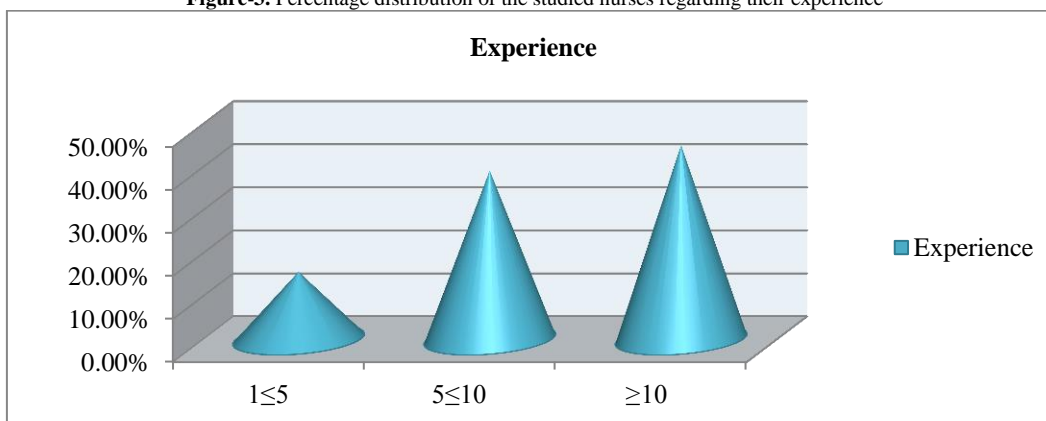


Table-1. Number and percent of satisfactory level of nurse's knowledge regarding patient's safety on cardiac catheterization at pre and post learning guideline

		Satisfactory		Unsatisfactory		2X	P value
		No	%	No	%		
1. Identify the local complications occurring in patients after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	2.040 ^a	.153
	post learning guideline	49	96.1%	2	3.9%		
2. Detect pseudoaneurysm after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	12.330 ^a	.000
	post learning guideline	40	78.4%	11	21.6%		
3. check the serum creatine level of patients after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	33.117 ^a	.000
	post learning guideline	26	51.0%	25	49.0%		
4. Identify the complication of delayed sheath removal	pre learning guideline	0	0.0%	51	100.0%	11.087 ^a	.001
	post learning guideline	41	80.4%	10	19.6%		
5. Development of contrast-induced nephropathy occurs	pre learning guideline	0	0.0%	51	100.0%	21.857 ^a	.000
	post learning guideline	33	64.7%	18	35.3%		
6. Identify the risk patient for developing renal failure after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	21.857 ^a	.000
	post learning guideline	33	64.7%	18	35.3%		
7. Identify the sign of thrombus formation after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	9.871 ^a	.002
	post learning guideline	42	82.4%	9	17.6%		
8. Identify the patient's affected extremity to be kept immobilized after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	7.516 ^a	.006
	post learning guideline	44	86.3%	7	13.7%		
9. Identify the risk for developing pulmonary edema after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	7.516 ^a	.006
	post learning guideline	44	86.3%	7	13.7%		
10. detect a hematoma at the puncture site after cardiac catheterization	pre learning guideline	0	0.0%	51	100.0%	24.878 ^a	.000
	post learning guideline	31	60.8%	20	39.2%		
Total scores of Knowledge	pre learning guideline	22	43.1	29	56.9%	20.778 ^a	.000
	post learning guideline	44	86.3	7	13.7%		

Table-2. Number and percent of satisfactory level of nurse's performance regarding patient's safety on cardiac catheterization at pre and post learning guideline

		Satisfactory		Unsatisfactory		2X	P value
		No	%	No	%		
Total scores of performance	pre learning guideline	3	5.9%	48	94.1%	3.091 ^a	.079
	post learning guideline	51	100.0%	0	0.0%		

Table-3. Correlation between the nurses knowledge regarding patient's safety and their qualification and experience at pre and post learning guideline

Items	Knowledge of studied nurses			
	pre learning guideline		post learning guideline	
	R	P	R	P
Qualification	-.145	.308	.776	.041
Experience	-.088	.541	.987	.002

Table-4. Correlation between the nurses performance regarding patient's safety and their qualification and experience at pre and post learning guideline

Items	Performance of studied nurses			
	pre learning guideline		post learning guideline	
	R	P	R	P
Qualification	-.140	.328	.441****	.001
Experience	-.198	.163	.056	.697

Table-5. Correlation between the performance of studied nurses and their knowledge regarding patient safety pre and post learning guideline implementation

Items	Performance of studied nurses			
	pre learning guideline		post learning guideline	
	R	P	R	P
Knowledge	-.017	.906	.216	.128

4. Discussion

Cardiac catheterization is a common interventional process useful for diagnosis the patients suffering from acute coronary syndrome (ACS). It can source of various health problems that have to be recognized and treated following the test. Taking into consideration probable dangerous complications so that the nurse plays a critical role in cardiac catheterization unit in the provision great quality nursing care and increase patient safety to their patients. Creature knowledgeable and existing on evidence based practice is the crucial to being an efficient and effective nurse. So nurses should understand clearly information and optimal performance about patient safety to improve quality care.

The findings of the study regarding to age group the majority of the studied nurses were ranged between (30≤40) years. This could be meaning the age group is considered a period of steadying in which the person creates job decision and develops additional adjustable and reactive to tasks. Concerning this age behavior throughout delivery of health care, they developed additional alert of the effect of medical intervention on the patients; sensitive to their fears; honestly explain medical procedures and predictable outcomes. This result disagreement with [Elfeky and Ali \(2013\)](#), [Rushdy et al. \(2016\)](#) [Feroze et al. \(2017\)](#) who revealed that almost of the studied nurses was young adults from 26-30 year and more than two third them of had 1-4 years' experience an intensive care unit.

Concerning qualifications, the current study revealed that the majority of studied nurses had a diploma degree (88.5%). This result disagreed with the findings of the study done by [Abdel \(2006\)](#), [Zaki \(2010\)](#); [Hassan and Aburaghif \(2016\)](#) who indicated that most of the studied nurse were graduate of health technical institute. While this result supported by [Feroze et al. \(2017\)](#).

As years of experience in cardiac catheterization highest percentage of the nurses had experience years for ten or more years. These results disagree with the findings of many studies which were done by [Abdel \(2006\)](#), [Zaki \(2010\)](#) ; [Hassan and Aburaghif \(2016\)](#) who reported that most of the studied nurse had years of experience between (1-10) years.

In current the study revealed that the majority of nurses have a highly satisfactory level of knowledge and total score regarding patient safety on cardiac catheterization post implementation the learning guideline than pre learning guideline for the highly statistically significant difference. This could be connected to the fact that majority of nurses hold diploma nursing. This study result in the same line [Thapa and Neupane \(2018\)](#) Who was conducted a study to assess the impact of teaching programme (STP) on nurses knowledge concerning intra-aortic balloon pump (IABP) implantation therapy for coronary artery bypass grafting (CABG) patient at selected hospitals in Dehradun and

found that most of the studied nurses had reported adequate knowledge regarding IABP and the level of knowledge increased after intervention. Also, [Straight \(2008\)](#) developed a self learning module to evaluate nurses knowledge of safe medication delivery. Results showed an increase in use and awareness of resources available after the completion of the self learning module. Participants strongly supported the study methods. All participants expressed a desire for more training similar to that used in this study. In the same line [Kang \(2002\)](#) stated that the self learning module was developed in a simple writing format and addressed the important learning needs of the nurses. A pre test and post test consisting of 15 questions each were available on each pediatric unit for nurses to complete. Results of the study revealed an increase in the score of the post test when compared to the pre test. A majority of the nurses gave a positive evaluation of the self learning module. They thought the module was attractive, and agreed that topics were comprehensive, and would help them to better care for their patients. Addition, [Taha A. \(2006\)](#), [Sharma \(2008\)](#), [Shini et al. \(2018\)](#), [Mahgoubn et al. \(2017\)](#); [Elsay et al. \(2016\)](#) Who documented that knowledge of nurses were significantly increased post program implementation in these study results.

Moreover, Self learning modules (SLMs) are used frequently for nurses in hospital settings and expand knowledge needed to successfully perform tasks. Results of these studies showed that self learning modules have the potential to increase knowledge of a particular topic, and were accepted by the participants. Use of SLMs is a low cost way to provide information so nurses are better able to care for their patients [Stacy \(2011\)](#).

The present study showed that all studied nurses have a satisfactory level of total performance score regarding patient safety after implementation of the learning guidelines on cardiac catheterization. This result agreement by [Thomas \(2013\)](#) who implemented study to evaluate the effect of video assisted programme teaching on staff nurses practice and knowledge regarding defibrillation and cardioversion as a cardiac unit in Bagalkot hospitals. He illustrated that there were statistically significant difference between post and pretest practices score.

However other researcher is contradicted for the result of [Hassan and Aburaghif \(2016\)](#). Also, [Schiks et al. \(2007\)](#) reflected that the performance estimation of sheath removal arterial femoral by nurses post Percutaneous Intervention PCI through training nurses to remove the sheath and throughout the sheath removal observed them for elective non complicated PCI-patients. The result reported that there was greater than 90% for the total score of the performance was not achieved for those nurses.

Also the current study revealed that the positive correlation between the studied nurse's qualification, experience and knowledge regarding patient's safety at post learning guideline with statistically significant difference regarding experience. This finding inconsistent with [Shini et al. \(2018\)](#) who conducted study to determine the effect of protocol nursing care on staff nurses knowledge and practice related to the nursing management of patients during coronary angioplasty He reported that no association was found between knowledge, professional qualification and total professional experience among nurses regarding role of patients undergoing coronary angioplasty.

While the study indicated that a negative correlation between the performance of studied nurses and years of experience at the pre learning guideline implementation with no statistically significant difference. This result consistent with ([Feroze et al., 2017](#)) and [Shini et al. \(2018\)](#).

The current study revealed that a strong positive correlation between the performance of nurses and their qualification regarding the post learning guideline implementation with a statistically significant difference. This result is inconsistent with [Taha N. M. A., Z. H. \(2013\)](#) who implemented research a study regarding the effect of an educational program on knowledge and practice for critical care nurses' regarding physical restraints and illustrated that nurses' experience years had no effect on performance scores and job qualification. While other researchers consistent with this study [Thomas \(2013\)](#) who implemented a study to assess the efficiency of video assisted teaching program on practice and knowledge about cardioversion and defibrillation and reported that a strongly significant result of planned nursing intervention on level of practice. On the other hand, [Best et al. \(2010\)](#) implemented a follow up study of quickly ambulation 90 minutes following left cardiac catheterization via a retrospective contrast group. Found that the nurse that performed early ambulation for patients within 90 minute of cardiac catheterization lead to safe and has the potential to improve both patient quality of care and comfort.

Finally there was positive correlation between the performance of studied nurses and their knowledge regarding post learning guideline implementation with no statistically significant difference. High level of nurses' knowledge reflected on their practice; knowledgeable nurses provide more accurate care. This result is in the same line with [Feroze et al. \(2017\)](#) who found a positive correlation between the skills and knowledge regarding patient's safety following cardiac catheterization in Pakistanis registered nurses and nurses that have adequate skills and knowledge lead to patient safety.

5. Conclusion

Study findings revealed that there was significant increase knowledge in the post- learning guideline. Also, all studied nurses have a satisfactory level of performance regarding patient safety after implementation of the learning guidelines on cardiac catheterization. Therefore, it can be established learning guideline shows a vital role in increasing nurse's level of knowledge and performance.

6. Recommendation

The nurses are accountable to offer a humanized support to deal with a fast convalescence, minimize complication of hospitalization and the procedure. So that the knowledge and performance of the safety and the strategies are fundamental to prevent patient hazards undergoing cardiac catheterization. The study recommended that continuous staff development regarding patients' safe with nursing care in every care settings.

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