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The Effect of Nursing Care Standards Training Sessions on Critical Care Nurses' Practice Post-Cardiac Catheterization

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ABSTRACT

Background: Post-cardiac catheterization care requires a highly experienced and qualified healthcare provider to achieve the best management outcomes. **Aim:** the aim of this study is to evaluate the effect of nursing care standards training sessions on critical care nurses' practice post-cardiac catheterization. **Method:** A quasi-experimental one-group (pre-post-test) design was used on 24 nurses at an Intensive Coronary Care Unit (ICCU) allocated to an Egyptian university hospital.**:** Data were collected using one tool: Nurses' Practice of Post-Cardiac Catheterization Care Tool. **Results:** Nurses' practice scores significantly improved after the training sessions compared with pre-training (P <0.001). **Conclusion:** Implementing nursing standards training sessions for critical care nurses can enhance their practice of cardiac catheterization care. **Recommendations**: ongoing in-service training programs for critical care nurses can enhance the care of patients' post-cardiac catheterization.

Keywords: Cardiac Catheterization, Standard of Care, Critical Care Nurses' Practice.

Introduction

Cardiovascular diseases are the primary cause of morbidity and mortality globally **(World Health Organization [WHO], 2021).** Coronary artery diseases (CADs) known as coronary heart diseases, are the most common type of cardiovascular disorder that represents the largest contribution to all acute hospitalized cases worldwide **(World Heart Federation, 2021).** Egypt has one of the highest proportions of coronary heart disease deaths in the area, as the mortality rate reached 4.9% (**Central for Disease Control and Prevention [CDC], 2022).**

Cardiac catheterization including coronary angiography and coronary angioplasty has drawn interest as a diagnostic and treatment option for suspected or confirmed CADs **(Ralapanawa & Sivakanesan, 2021: Sorajja, Lim, & Kern, 2022).** Cardiac catheterization is a medical technique whereby hollow plastic tubes, with a diameter of 2 to 3 mm are placed into a patient's vein or artery for an accurate evaluation of the heart and blood vessel function **(Kern & Kirtane, 2020; Urden, Stacy & Lough, 2021).**

According to the Egyptian National Institutes of Health, cardiac arrhythmias, pericardial tamponade, vascular complications, and renal failure in addition to patients' unpleasant experiences are common complications of cardiac catheterization procedures **(Manda & Baradhi, 2023)**. From this perspective, nurses should know all the variables that increase a patient's risk of cardiac catheterization problems and have the diagnostic abilities to identify them **(Lee et al., 2023**).

According to **the American College of Cardiology (2021),** many nursing strategies guide nurses toward preventing post-cardiac catheterization complications. These strategies involved secondary assessment measures observation, patients' immobilization, adequate

hydration, and optimal puncture site care post-sheath removal. Patient education was also emphasized as a key to facilitating the successful patient transition from hospital to home **(Ahmed, Abd El-Hay, Al-Metyazidy, & Allam, 2023**; **Al-Bayati, & Al-Kassar, 2023; Saad, Taha, & Mohammed, 2024)**.

A cross-sectional survey by **Mahmood, Ibrahim, Hassan, and Abdulghani. (2021** highlighted that multidisciplinary strategies and education programs should be available in ICCUs to advance the nursing care provided to patients and their families during cardiac catheterization. One of the interdisciplinary approaches is nursing care standards which is outlined in the Society for Cardiovascular Angiography and Intervention Consensus Document on Cardiac Catheterization Standards Update as numerous strategies that illustrate the required degree of care the nurse provides through the nursing process **(Naidu et al., 2021; Sakuramoto, Kuribara & Ouchi, 2023).**

Some Egyptian quasi-experimental studies assessed the nursing practice for patients undergoing cardiac catheterization and boosted unsatisfactory nurses' practices before applying the educational session rather than following it **(Ahmed, Hamad & Sayed, 2023; Mohamed, Fathy &Mahmoud, 2023; Saad et al., 2024).** Similarly, a large cross-sectional study by **Parveen, Bashir, Akhtar, Perveen, and Ullah (2024)** in Pakistan involving 80 nurses showed the same findings and the beneficial effects of training sessions on nurses' practice.

There was a paucity of research that examined the effect of implementing nursing standards on nurses' practice and cardiac catheterization patient outcomes in Egypt. Only one Egyptian study by **Thabet, Ghanem, Ahmed,** and **Abd-ElMouhsen (2019)** assessed the effect of implementing nursing care standards among cardiac catheterization patients at Assiut University Hospital. The authors revealed good improvements in nurses' practice and patient outcomes after implementing nursing care standards. They also recommended additional training in different settings for other nurses who care for such patients.

From our clinical experience and observations, no special nursing protocols or standards of care are available for cardiac catheterization patients in the study setting. Furthermore, ICCU nurses are unaware of the significance of implementing the nursing care standard practices for cardiac catheterization patients' outcomes. This urged the need for training programs for ICCU nurses on the nursing care standard elements. So, the present study was carried out to address this issue. Hopefully, this investigation might contribute to evidence-based data concerning the nursing care of patients with cardiac catheterization.

Aim of the Study

The aim of this study was to evaluate the effect of nursing care standards training sessions on critical care nurses' practice post-cardiac catheterization.

Research Hypothesis

To achieve the aim of the study, we hypothesized that the mean practice score of critical care nurses post-implementing nursing care standards training sessions would be higher than their score pre-training.

Research Design

A quasi-experimental one-group (pre-post-test) research design was utilized in this investigation. It is an effective instrument for measuring evaluation accuracy in educational and healthcare settings. It enables researchers to assess the efficacy of an intervention within the same group without using randomization **(American Psychological Association, 2023; Polit & Beck, 2021)**.

Setting

This study was carried out at ICCUs of one Egyptian university hospital's ICCUs. This unit provides invasive hemodynamic monitoring and care for adult patients during the critical phase or post-recovery phase from heart diseases. The nurse-patient ratio in this unit is almost 1:2 in work shifts.

Subjects

The study involved a convenience sample of 24 nurses working in the study setting, with more than one year of working experience, who provided direct patient care, and willingly accepted to participate in the research.

Data Collections Tool

Data were collected using one tool: Nurses' Practice of Post-Cardiac Catheterization Care Assessment Tool. This tool was used to assess critical care nurses' practice pre-post application of nursing care standards training sessions. It comprised two main parts:

Part I: Nurses' Demographic Characteristics

This part included participant nurses' age, gender, education level, years of work experience in the ICCU, and attended training programs related to post-cardiac catheterization care.

Part II: Nurses' Practice of Post-Cardiac Catheterization Care Observation Checklist

This part was adapted from **Intersocietal Accreditation Commission (IAC) Standards (2018)** and the researchers made some modifications based on recent evidence literature **(Abd El-Maguid, Keshk & Yassein, 2022; Hamed, Shehata, Soliman, & Elwan, 2023; Naidu et al., 2021; Sakuramoto et al., 2023).** It was used to evaluate critical care nurses' practice of cardiac catheterization care after patients' admission to ICCU. It involved five main domains including:

1. Patient's secondary assessment measures (6 practices).
2. Puncture site care (3 practices).
3. Mobility and positioning (4 practices).
4. Patient's instructions during CICU stay (4 practices).
5. Patient's instructions following discharge (4 practices).

Scoring System:

The scoring system was calculated as follows: done correctly =1 point and done incorrectly or not done = 0 point. The total scoring system was classified into two categories as follows: satisfactory level of practice was ≥80% and unsatisfactory level of practice was < 80% (**El Sayed, Said, & Elsayed, 2022; Sania, Ali, & Ali, 2022; Thabet et al., 2019; Zhang & Qi, 2021).**

Validity and Reliability of the Tool

A panel of seven academic staff members with expertise in critical care evaluated the content validity of the tool. They were experts in the disciplines of medicine and critical care nursing. The reliability of Part II of the tool was assessed using Cronbach's alpha test, and the result was 0.83, indicating a reliable tool.

Data Collection Process

Before commencing data collection, approval to undertake the study was obtained from the hospital's leadership authorities. A pilot study was executed on 10% of the entire sample, which included three ICCU nurses, to evaluate the objectivity, applicability, and accessibility of the observation checklist before starting data collection. Pilot study participants were excluded from the main study.

The research study was conducted between January and June 2023. Nurses' demographic data were gathered by using part I of the tool, through 15-minute one-on-one interviews with each participant nurse. Participant nurses' practice for cardiac catheterization care was observed twice using part II of the tool. Using a variety of instructional techniques, including PowerPoint Presentations, lectures, and illustrated videos, the principal investigators (PI) carried out the cardiac catheterization educational training sessions in the designated ICCU.

Participant nurses were split up into small groups. Each group involved 3 to 5 nurses who participated in two educational sessions of 20–30 minutes. Six training sessions were given over a full month covering the practical and theoretical components of the cardiac catheterization nursing standards. Each session concluded with a summary and an emphasis on the key ideas from the PI. All participant nurses were evaluated for their practice before and after implementing the cardiac catheterization nursing care standards. Finally, a comparison was computed between nurses' scores in pre- and post-training sessions.

Ethical Considerations

Ethical approval was obtained from the local Research Ethics Committee (Ref. 0243). Participant nurses were guaranteed that the observed performance was not a part of their annual appraisal. Additionally, they also received guarantees that their data was encrypted and that their private information would be kept confidential.

Data Analysis

The obtained data were statistically analyzed using the Statistical Package for the Social Sciences (Chicago, IL, USA), version 20. All continuous data were normally distributed and presented in means ± standard deviations (SD). Numbers and percentages were used to express categorical data. The student's t-test and the chi-square (c2) test were used to compare the continuous quantitative (two groups) and categorical variables respectively. Additionally, when more than 20% of the cells had an expected count of less than 5, Fisher's Exact or Monte Carlo tests were applied. A significant level value was reflected when *P*-value ≤ 0.05 and a highly significant level value was considered when *P*-value ≤ 0.001.

Results

Table 1 depicts recruited nurses' demographic characteristics. It showed that female nurses represented 70.8% of the sample. More than half (54.2%) of nurses were under 30 years old, with a mean age of ± SD 30.67±7.27. Additionally, only 4.2% of the nurses held a Bachelor's degree in nursing, while 58.3% of them were graduates of the Technical Nursing Institute. More than half of the participant nurses (54.2%,) had less than 5 years of work experience in the ICCU with a mean of 7.45 ± 5.71. Further, 58.3% of the participant nurses did not attend workshops or training sessions on caring for cardiac catheterization patients.

Table 2 illuminates the relationship between the participant nurses' practice scores pre-post implementation of nursing standards, and their demographic characteristics. The results displayed a highly statistically significant relation between nurses' practice level and their demographic data including age, gender, years of experience in ICCU, attendance of training programs ($p < 0.0001$), and level of education ($p = 0.025$) before implementation of nursing care standards educational sessions. Nevertheless, following the implementation of educational sessions, there was no statistically significant association between participating nurses' demographic data and their practice ($p => 0.05$ for all).

Figure 1 presents a comparison between nurses' practice levels pre- and post-implementation of educational sessions of the nursing care standards. These results revealed that 62.5% of nurses had unsatisfactory practice pre-implementation of the nursing care standards. There was a marked improvement in the total practice scores post-implementation of the education sessions (pre-training: 37.5% and post-training: 91.7%).

Table 1: Participant Nurses' Demographic Characteristics

Variables	Participant Nurses (n=24)	
	n	%
Gender		
Male	7	29.2
Female	17	**70.8**
Age (years)		
< 30	13	**54.2**
≥ 30	11	45.8
Mean ± SD	**30.67±7.27**	
Qualifications		
Secondary Nursing School Degree	7	29.2
Technical Institute of Nursing	14	**58.3**
Bachelor of Nursing	1	4.2
Postgraduate study	2	8.3
Years of work experience in the CICU		
>1-< 5 years	13	54.2
5 – 10 years	1	4.2
>10 years	10	41.6
Mean ± SD	**7.45 ± 5.71**	
Attended training programs or workshops on the care of patients' post-cardiac catheterization		
Yes	10	41.7
No	14	**58.3**
Type of training program		
Course	1	4.2
Conference	1	4.2
Workshop	8	33.3
Number of training sessions		
One session	1	4.2
Two sessions	3	12.5
Three sessions	5	20.8
More than three sessions	1	4.2

ICCU: Intensive Coronary Care Unit

Data are expressed as numbers (n) and frequency (%), SD= Standard Deviation.

Table 2: Association Between Nurses' Demographic Data and Their Practice Pre- and Post-Nursing Care Standards Implementation

Nurses Characteristics	Pre-standard implementation		Post-standard implementation	
	Unsatisfactory practice	Satisfactory practice	Unsatisfactory practice	Satisfactory practice
	n (%)	**n (%)**	**n (%)**	**n (%)**
Age				
< 30 years	13(100%)	0 (0%)	2(15.4%)	11(84.6%)
≥ 30 years	2(18.2%)	9(81.8%)	0 (0%)	11(100%)
Test of significance	*FE*=17.018		*FE*=1.846	
P	p=<0.0001**		*p=0.482*	
Gender				
Male	1(14.3%)	6 (85.7%)	0 (0%)	7(100%)
Female	14(82.4%)	3(17.6%)	2(11.8%)	15 (88.2%)
Test of significance	*FE*=9.802		*FE*=.898	
P	*p=0.004***		*p=0.343*	
Level of Education				
Secondary school diploma	7(100%)	0 (0%)	2(28.6%)	5(71.4%)
Technical diploma	8 (57.1%)	6(42.9%)	0 (0%)	14(100%)
Bachelor's degree	0 (0%)	1(100%)	0 (0%)	1(100%)
Post-graduate affiliation	0 (0%)	2(100%)	0 (0%)	2(100%)
Test of significance	*MC* = 9.371		*MC* = 5.299	
P	*p=0.025**		*p=0.151*	
Years of experience in ICCU				
>1-< 5 years	13(100%)	0 (0%)	2(15.4%)	11(84.6%)
6 - 10 years	1(100%)	0 (0%)	0 (0%)	1(100%)
>10 years	1(10%)	9 (90%)	0 (0%)	10 (100%)
Test of significance	*MC* =20.160		*MC* =1.846	
P	*p=<0.0001***		*p=0.397*	
Nurse shift time				
Morning shift	7(87.5%)	1(12.5%)	2(25%)	6(75%)
Evening shift	7(100%)	0 (0%)	0 (0%)	7(100%)
Night shift	1 (11.1%)	8(88.9%)	0 (0%)	9(100%)
Test of significance	*MC* =16.474		*MC* =4.364	
P	*p=<0.0001***		*p=0.113*	
Attendance of training programs				
Yes	1(10%)	9 (90%)	0 (0%)	10 (100%)
No	14(100%)	0 (0%)	2 (14.3%)	12 (85.7%)
Test of significance	*FE*=20.160		*FE*=1.558	
P	*p=<0.0001***		*p=0.212*	

(*) Statistically significant at $p \leq 0.05$, χ^2 = chi-square, MC: Monte Carlo test, FE: Fisher Exact test

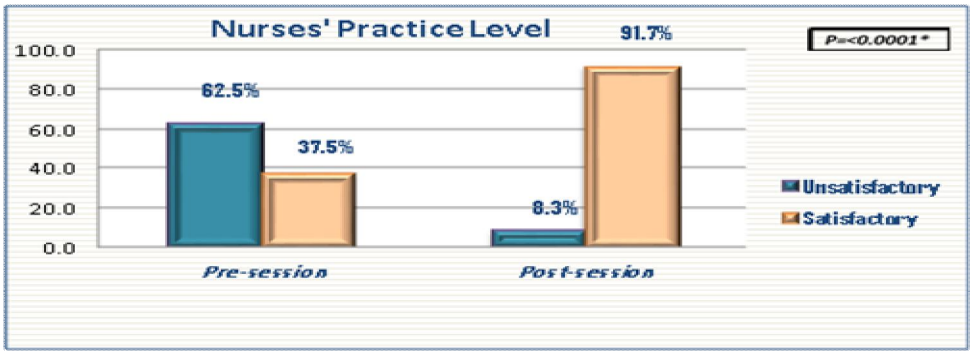

Figure 1: Comparison Between the Studied Nurses' Practice Level Pre- and Post-Implementation of Cardiac Catheterization Nursing Care Standards Training Sessions.

Discussion

The primary objective of this study was to evaluate the effect of nursing care standards training sessions on critical care nurses' practice post-cardiac catheterization. According to the study, over half of participating nurses were under 30 years old. This demographic characteristic is consistent with the prevalent practice in Egypt of assigning newly graduated nurses to intensive care units to enhance patient care. These findings align with previous research (**El Sayed et al., 2022; Mohamed, Kandeel, Abosaeda & Ali, 2020).**

The results of the present study depicted that the majority of the participating nurses were females. This was anticipated as it was believed that the nursing profession in Egypt was solely women. Furthermore, males joined the nursing profession in growing numbers lately. This finding corresponds with other quasi-experimental investigations (**Abdel Monem, Ragheb, & Ghonaem, 2022; Afşar, Özkan, & Köksal, 2023; Kousar, Yaqoob, Afzal, & Khan, 2022).** On the other hand, a recent quasi-experimental study by **Sabrah, Kandeel, Moustafa, Elsayed, and Pellegrino (2024)** investigated critical care nurses' practices after the adoption of an oral care bundle in emergency intensive care units. It revealed the majority of the participant nurses were males. The disparities in the nurses' gender may be due to different study setting nature.

Over half of the participant nurses were graduates of the Technical Nursing Institute. This is supported by the results of an observational Egyptian study by **Hamed et al. (2023)**. Conversely, other Egyptian observational studies found that more than half of the studied nurses predominantly hold Bachelor's degrees in nursing (**Afşar et al., 2023; El-Assy, Kandeel & Abd El Rahman, 2022)**. Furthermore, **Sabrah et al. (2024)** demonstrated that over half of the nurses graduated from secondary nursing schools. This disparity can result from the fact that Egypt offers a variety of nursing education options.

Our results indicated that slightly more than half of the nurses had more than one year and less than 5 years of work experience in ICCU. This might be because the largest proportion of the studied nurses are juniors. These findings go hand in hand with another study that examined nurses' adherence to safety protocols in the cardiac catheterization unit at Benha University Hospital (**El Sayed et al., 2022**). Moreover, our findings showed that more than half of the participant nurses did not attend any training courses or workshops on caring for cardiac catheterization patients. This can be explained by the shortage of nurses and their excessive workload, which keeps them from participating in training courses. This is additionally supported by the findings of other Egyptian studies **(Mahmood et al., 2021; Sabrah et al., 2024).**

The findings of the present study revealed a significant increase in nurses' overall mean practice scores post-training compared to pre-training. This suggests that the studied nurses were receptive to professional development and that the educational intervention was effective in enhancing their practice. These results align with a quasi-experimental study by **Thabet et al. (2019)** which demonstrated a similar improvement in nurses' practice following the implementation of nursing care standards post-cardiac catheterization.

Similarly, a previous Egyptian quasi-experimental investigation by **Abdelwanees et al. (2023)** studied the impact of cardiac catheterization educational guidelines training on nurses' total practice scores and found a significant improvement in the nurses' practice following the training. On the other hand, **Abo El-ata, Shehab, and ElZayat (2020)** assessed nurses' performance regarding cardiac catheterization patients' care and illustrated that the majority of nurses had

competent practice before the program implementation. The explanation for this disparity is the availability of continuous training programs for nurses in their study setting.

In the same line with earlier Egyptian research, a positive, statistically significant relationship was found between nurses' practice scores, and their personal data including age, qualifications, and years of work experience before training sessions. This indicates that nurses with higher levels of education, experience, and advanced age had better practice of cardiac catheterization care than other nurses. The current findings are compatible with the results of other Egyptian studies (**Elsayed, Hussein & Ramadan, 2023; Thabet et al., 2019).** Moreover, a quasi-experimental investigation by **Abdel Monem et al. (2022)** displayed a statistically significant relationship between the nurses' total performance scores, and their education, while no significant differences were noted between years of experience and nurses' total practice scores.

There was no significant statistical relationship between nurses' level of education, gender, age, years of work experience, and their practice scores post-educational sessions. These findings are confirmed by a quasi-experimental Egyptian study by **Thabet et al. (2019).** This contradicts the research findings of a study conducted by **Ali** and **Ali (2019)** who assessed the impact of an established education protocol following cardiac catheterization on nurses' performance and found a significant association between the studied participants' age, gender, and their practice level following teaching sessions. Overall, the findings of the current study demonstrated the positive impact of nursing standard-of-care education sessions on nurses' practices of cardiac catheterization care. These findings support the research hypothesis of the corner of the study.

Conclusion and Recommendations

Based on the results of the study, it can be concluded that the implementation of post-cardiac catheterization nursing standards training sessions improved critical care nurses' practice. Periodic in-service training programs are necessary for critical care nurses to upgrade their practices in caring for cardiac catheterization patients. Further investigation is required to investigate the effect of applying standard domains in different settings with a focus on extended-term outcomes.

The limitation of the current study

This study was conducted in only one Egyptian university hospital with a small sample size of 24 critical care nurses involved in direct care for cardiac catheterization patients, therefore the potential for generalization may be limited.

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