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Prevention of indwelling catheter associated urinary tract infection: An interventional study for nursing staff

Ahmed Barid Kayem

Academic Nurse, Ministry of Health/ Al-Diwaniya Health Directorate, Iraq

Hakima Shakir Hassan

Assist. Prof, Adult Nursing/ College of Nursing University of Baghdad, Iraq.

Abstract---Background: The placement of a urinary catheter is the single most important predisposing factor for Catheter-associated Urinary Tract Infections, which causes significant morbidity in hospitalized patients, including pain, fever, and malaise. Urinary tract infections are responsible for around 13,000 fatalities each year. Catheter-associated Urinary Tract Infections complications lead to an increase in length of stay, patient pain, higher healthcare expenses, and death. Urinary tract infections are the second most frequent illness after respiratory infections. This has an impact on patients' health outcomes and periods of hospital stay. The aim of this study is to improve nurses' knowledge and practices by involving them in an educational program after assessing nurses' knowledge regarding preventing male catheter-associated urinary tract infections. Methods: A pre-experimental design had been applied with the use of one group pre-test/post-test design of samples of 45 nurses to assess of nursing staff's knowledge, and practices toward the prevention of indwelling catheter-associated urinary tract infection in Al-Diwaniyah Teaching Hospital. The reliability of the questionnaire was achieved through a pilot study and then presented to experts to prove its validity. The total number of items included in the knowledge questionnaire was 20 multiple-choice questions distributed on four domains and 15 items distributed on two domains in the observational checklist for nurses' practices. The data was collected by using the semi-structured interview and analyzed by the application of a descriptive and inferential statistical data analysis approach. Results: there were highly significant statistical differences between pre and post-test at $p < 0.001$ for the effectiveness of the nursing interventional program through assessing nursing staffs knowledge through the utilization of the knowledge test in Pre and Post Program, which also showed there were highly significant statistical differences between pre and post-

program at $p < 0.001$ for nurse's practices about nursing staff practice about urinary catheter insertion and practice about catheterization follow up to preventing Indwelling Catheter-Associated with Urinary Tract Infections in Pre and Post Program. While showed there were no significant statistical differences between knowledge and practices with nurses' education level at a p-value of > 0.05 . And the results showed there is no significant statistical correlation between knowledge and practices with nurse's age and years of experience at a p-value of > 0.05 . Conclusions: The study results accepted the alternative hypotheses and an interventional program has a significant effect on nursing staffs' knowledge and practices about preventing Indwelling Catheter-Associated with Urinary Tract Infections. The study confirmed that prior to the interventional program; the nurses had erroneous knowledge and practices about preventing indwelling catheter-associated urinary tract infections. The study showed that the interventional program positively affected the nurse's knowledge and practices concerning preventing indwelling catheter-associated with urinary tract infections training.

Keywords---catheter, urinary tract infection, interventional, nursing staff.

Introduction

Urinary catheters are frequently used to manage such things as perfecting urine output in intensive conditions, improving the rest of severely ill patients, and catheterization also helps to control skin breakdown caused by urinary incontinence, while other methods and uses for keeping the constant voiding of urine for surgical patients are ineffective (Shehab, 2017). The single most important predisposing factor for (CAUTI) is the installation of a urinary catheter, which produces severe morbidity in hospitalized patients, including discomfort, fever, and malaise (Coleman, 2017).

Every day that an indwelling urinary catheter is in place, it increases the risk of infection by 3% to 7%. CAUTIs are common, dangerous, and costly; around a quarter of all hospitalized patients are catheterized at least once a year, and 10% develop urinary tract infections (LO et al., 2014). On a yearly basis, CAUTI is associated with more than 75% of these UTIs all over the world. Over 1.7 million patients are affected by UTIs, which account for 32 to 40% of all hospital-acquired infections (Clarke et al., 2014). Each year, over 13,000 people die as a result of UTIs. HCAs kill more people than breast cancer, AIDS, and car accidents put together. On the other hand, most HCAs may be prevented. CAUTI is the most common kind of HCAI. CAUTI complications result in a longer hospital stay, more patient suffering, greater health-care costs, and mortality (Chant et al., 2015).

As a result, understanding CAUTI risk factors, such as catheterization length, advanced age, male sex, and weakened immunity, is crucial in order to propose CAUTI prevention strategies (Verma et al., 2017). Approximately half of all adult guys get at least one UTI. UTIs are the second most common ailment after

respiratory infections, accounting for around 5% of general practice appointments (Fashafsheh et al.,2017).

In Iraq, many male patients suffer from UTIs that result from IUC due to poor nursing performance which depends on their knowledge and practices. This has an impact on patients' health outcome, and period of hospital staying. Therefore, thus study concerns the effectiveness of nursing interventional program through assessing of nursing staffs' knowledge through the utilization of the knowledge test and evaluating of nursing staffs' practices through the utilization of practice checklist in Al-Diwaniya Province/ Iraq.

Method

The pre-experimental design had been applied with the use of one group pre-test/post-test was approach 45 nurses to examine the effectiveness of the nursing interventional program through assessing of nursing staffs' knowledge through the utilization of the knowledge test and evaluating of nursing staffs' practices through the utilization of practice checklist. Study instrument: The questionnaire is one of the means to help collect data that contribute to achieving the results expected by the study, so the researcher designed this questionnaire, which aims to clarify the study objectives and significance to evaluate nursing staffs' knowledge and practices toward prevention of indwelling catheter associated urinary tract infection. This questionnaire consists of three for parts which includes the following:

Part I: This section composed of socio-demographic information which includes age, gender, educational level, social status, and years of experience in nursing and training courses

Part II: This part was constructed to assess the nursing staffs knowledge about the prevention of indwelling catheter-associated urinary tract infection It consists of (20) multiple-choice questions distributed on four domains, the number of correct answers has been used to measure each nurse's level of knowledge, the rating score of answers was (1) for the correct and (0) for incorrect.

Part III: This part was constructed to assess the nurses' practices were observed during the morning, and night shifts. The observational checklist for nurses' practices was composed of (15) items distributed on two domains, these items were rated based on the Likert scale; (3) always; (2) sometimes; (1) never.

Content validity was determined by the study tools, which include the interventional program, the knowledge form, and the observational checklist, was determined by (12) experts, who have more than 10 years of experience in their fields, to verify the interventional program contents, nurses' knowledge questionnaire and practices checklist toward prevention of indwelling catheter-associated urinary tract infection. Reliability of the questionnaire (tools) was determined through the use of test and re-test approach obtained through evaluating 5 nurses selected from Al-Diwaniya Teaching Hospital and the interval period was four weeks. Reliability Coefficient revealed that (0.95) respectively of the knowledge test and (0.91) respectively of the practice test.

The data were analyzed using (SPSS) version 21 application of statistical analysis system. The information was evenly distributed. Frequencies, Percentages, Mean and Standard Deviation, Pearson's Correlation Coefficients, T-test (paired sample t-test) to determine the mean difference between the nurses' practices at two levels of measurements (pre-test and post-test), and Analysis of variance (One Way-ANOVA) to determine the association between the nurses' practices and some demographic characteristics. Statistical significance was defined as a p 0.05.

Result

Table 1 revealed that age of nurses (45) for a quasi-experimental design study at most 66.7% was from twenty to twenty nine years with Mean $\pm$ SD 30.68 ± 7.351 . According to gender, the all participants were male. A high percentage (n=28; 62.2%) of nurses are graduating from a nursing institute. Regarding the years of experience in nursing were with Mean $\pm$ SD 7.17 ± 7.043 . A more than fifty percent (n=26; 57.8%) of nurses were married. According to the training course the most nurses attended a training course with percentage (n=18; 40%) respectively just one time inside the Iraq, and form them 24.4% for one week and 15.6% more than one week.

Table (1): Participants Characteristics

Demographic Characteristics	Variables	Study Group (n=45)	
		f.	%
Age	20 – less than 30 years	30	66.7
	30 – less than 40 years	8	17.8
	40 – less than 50 years	5	11.1
	50 years and above	2	4.4
	Total	45	100.0
	Mean $\pm$ SD	30.68 ± 7.351	
Gender	Male	45	100.0
	Female	0	0
	Total	45	100.0
Education level	Nursing secondary school	10	22.2
	Nursing Institute	28	62.2
	Nursing Bachelor	7	15.6
	Postgraduate	0	0
	Total	45	100.0
Social Status	Married	26	57.8
	Single	18	40.0
	Widowed	0	0
	Divorced	0	0
	Separated	1	2.2
	Total	45	100.0
Years of experience	1- less than 6 years	29	64.4
	6- less than 16 years	9	20.0
	16- above	7	15.6
	Total	45	100.0

	Mean ± SD	7.17 ± 7.043	
Training course	Not participate	27	60.0
	One	18	40.0
	Two	0	0
	Total	45	100.0
Place	Not participate	27	60.0
	Inside Iraq	18	40.0
	Outside Iraq	0	0
	Total	45	100.0
Duration of the course	Not participate	27	60.0
	One week	11	24.4
	More than one week	7	15.6
	Total	45	100.0

f.: Frequency, No.: Number, %Percentage, M= mean, SD= stander deviation

Findings demonstrated in table 2 the evaluation of Nurse's practices preventing Indwelling Catheter-Associated with Urinary Tract Infections in Preprogram were poor practices while in Post program were high practices. Also the results showed there were highly significant statistical differences between pre and post program at $p < 0.001$ for nurse's practices about preventing Indwelling Catheter-Associated with Urinary Tract Infections in Pre and Post Program for the Study Group in Al-Diwaniyah Teaching Hospital.

Table (2): Evaluation and comparison between Pre and Post Tests for the Study Group According to Main Domains of the Nursing staffs' practices in preventing CAUTI

Main Domains of The Nursing staffs's practice in preventing Indwelling Catheter-Associated with Urinary Tract Infections	Pre Test		Post Test		C.S	
	m M	SD	m M	SD	t test	P. value
Domain 1: Nursing staff practice about urinary catheter insertion	1.476	.29686	2.692	.28238	-21.967-	.000
Domain 2: Nursing staff practice about catheterization follow up	1.450	.24772	2.652	.26635	-19.780-	.000
Total	1.463	.22122	2.672	.25649	-23.474-	.000

M = Mean of score, S.D=Standard Deviation, Eva=evaluation level, P = poor (1 – 1.66), IN= Intermediate (1.67 - 2.32), H = High (2.33 - 3). Sig.= Significance, N.S=Non Significant at $p > 0.05$, S= Significant at $p < 0.05$, H.S: High Significant at $p < 0.001$

Findings demonstrated in table 3 the evaluation of Nurse's Knowledge toward Indwelling Catheter-Associated with Urinary Tract Infections in Preprogram were moderate Knowledge while in Post program were Good Knowledge there were highly significant statistical differences between pre and posttest at $p < 0.001$ for the effectiveness of nursing interventional program through assessing of nursing

staffs knowledge through the utilization of the knowledge test in Pre and Post Program for the Study Group in Al-Diwaniyah Teaching Hospital.

Table (3): Evaluation and Comparison between Pre and Post Tests for the Study Group According to the Nursing staffs' knowledge in preventing CAUTI

Domains of The Nurse's knowledge in preventing Indwelling Catheter-Associated with Urinary Tract Infections	Pre Test		Post Test		C.S	
	M	SD.	M	SD.	t test	P. value
Domain 1: knowledge related to anatomy and physiology of the urinary system	.4178	.19457	.7911	.22545	-7.672-	.000
Domain 2: knowledge related to general information for folly catheter	.3511	.16600	.7333	.18586	-9.651-	.000
Domain 3: knowledge related to folly catheter insertion and nursing care	.5200	.21490	.8444	.15891	-7.758-	.000
Domain 4: knowledge related to UTI that causes from folly catheter	.5644	.23851	.6933	.16842	-2.474-	.017
Total nurses knowledge	.4633	.14863	.7656	.13477	-8.610-	.000

M = Mean of score, S.D=Standard Deviation, Eva=evaluation level, P = poor (0 – 0.33), M= Moderate (0.34 – 0.66), G = Good (0.67 - 1), Sig. = Significance, N.S=Non Significant at $p>0.05$, S= Significant at $p<0.05$, H.S: High Significant at $p<0.001$.

Findings demonstrated in table 4 there in no significant statistical differences between practices with nurse's education level at p- value > 0.05. And the results showed there in no significant statistical correlation between practices with nurse's age and years of experience at p- value > 0.05.

Table (4): Association between nurses' demographics with their practices in post program about prevention of CAUTI

Demographics		Sum of Squares	df	Mean Square	F	p. value	Sig.
Age	Between Groups	.876	18	.049	.627	.846	NS
	Within Groups	2.018	26	.078			
	Total	2.895	44				
Education level	Between Groups	.121	2	.061	.917	.407	NS
	Within Groups	2.773	42	.066			
	Total	2.895	44				
Years of	Between Groups	.714	14	.051	.701	.756	NS

experience	Within Groups	2.181	30	.073
	Total	2.895	44	

P=probability value, NS: Non-Significant at $P > 0.05$, S: Significant at $P < 0.05$, HS: Highly Significant at $P < 0.01$.

Findings demonstrated in table 5 there in no significant statistical differences between knowledge with nurse's education level at p- value > 0.05 . And the results showed there in no significant statistical correlation between knowledge with nurse's age and years of experience at p- value > 0.05 .

Table (5): Association between nurses' demographics with their knowledge in post program about prevention of CAUTI

Demographics		Sum of Squares	df	Mean Square	F	p. value	Sig.
Age	Between Groups	.249	18	.014	.655	.822	NS
	Within Groups	.550	26	.021			
	Total	.799	44				
Education level	Between Groups	.020	2	.010	.535	.590	NS
	Within Groups	.779	42	.019			
	Total	.799	44				
Years of experience	Between Groups	.227	14	.016	.851	.613	NS
	Within Groups	.572	30	.019			
	Total	.799	44				

P=probability value, NS: Non-Significant at $P > 0.05$, S: Significant at $P < 0.05$, HS: Highly Significant at $P < 0.01$.

Discussion

This study used a purposive clinical trial design to test the effectiveness of nursing interventional program through assessing of nursing staffs' knowledge through the utilization of the knowledge test and evaluating of nursing staffs' practices through the utilization of practice checklist. The present study samples consist of 45 nurses with age mean $\pm$ SD was 30.68 ± 7.351 . The findings of this study are congruent with those of Mukakamanzi, (2017), who conducted a study among nurses over the age of 30 (Mukakamanzi,2017).

In terms of educational attainment, the most of nurses (28.2 percent) were graduates of a nursing institute. Wambui's study (2021) that found 42 percent of participants had a diploma (Wambui,2021). According to the data, the majority of the research sample was completed at a nursing institute. In terms of years of experience, the study's findings revealed that the mean SD was 7.17 ± 7.043 . The study included Benny et al., (2020), who conducted a study in Mangaluru among staff nurses with a mean working experience of 6.49 ± 2.37 years (Benny et al.,2020). The practices observation displayed that the overall evaluation of nurses' practices regarding indwelling catheter-associated with urinary tract infections was low with the statistical mean $\pm$ SD ($1.463 \pm .221$).

After implementing the interventional program, the study revealed a remarkable development in the nursing staff practices towards preventing indwelling

catheter-associated with urinary tract infections, where the overall evaluation of nurses' practices was high with a statistical mean $\pm$ SD ($2.672 \pm .256$). That there are highly statistically significant differences between the practices mean scores in pre and post-test (at p value $p < 0.001$), where the practices mean scores in post-test were better than it in the pre-test. Durant (2017) found a substantial difference between pre-and post-test results in clinical predictors of CAUTI, specifically IUC use, and CAUTI rates (Durant,2017). The findings of this study agree with those of Mukakamanzi (2017), who conducted a study that found that nurses had good knowledge, a positive attitude, and good perceived practice regarding CAUTI prevention (Mukakamanzi,2017). The interventional program had a good impact on the nurses' behaviors in terms of avoiding indwelling catheter-associated urinary tract infections, according to the research.

The study revealed that the nursing staff knowledge regarding preventing indwelling catheter-associated with urinary tract infections was poor. Where the statistical mean of the overall knowledge of nurses participating in the study was ($.4633 \pm .148$) and the overall evaluation of their knowledge was low. A paired t-test indicated a significant difference ($p < .0001$) in the nurses' overall score between the pre-and post-test, according to Gesmundo, M (2016), who conducted a study in New Zealand. The nurses' pre-and post-test ratings on the four catheter care components were likewise significantly different ($p < .05$) (Gesmundo,2016).

Nurses' knowledge gaps were significantly reduced as a result of the CAUTI education program. The study includes Benny et al., (2020), who conducted a study in Mangaluru to examine staff nurses' knowledge of CAUTI prevention in a chosen Mangaluru hospital. The majority of nurses (80.85 percent) had average awareness of CAUTI prevention, with 11.2 percent having poor knowledge and a minority (7.231 percent) having high knowledge. At the 0.05 level of significance, there was a link between knowledge and age (0.013), educational qualification (0.018), and experience with CAUTI patients (0.00) (Benny et al.,2020).

The current study showed that there is no a statistically significant relationship just between the nursing staffs' knowledge and demographic data (age, gender, and years of experiences in CCU, RCU; medical and surgical wards). Regarding the practices, the study showed that there was no statistically significant relationship between nursing staffs' practices and their demographic data. Wambui's study (2021), which found no significant relationship between nurse-related characteristics (knowledge and attitude) and nurse compliance ($p > 0.05$) (Wambui,2021).

The study revealed that there is no statistically significant correlation between nurses' years of experience in (CCU, RCU and medical and surgical wards) with their knowledge and practices toward indwelling catheter-associated with urinary tract Infections (at $P > 0.05$) respectively. According to Hassan (2018), there is no significant association between nurses' educational levels and their practices (p-value =0.07) (Hassa,2018). Chithra and Raju (2017) discovered a statistical association between nurses' expertise and their educational level (p-value =0.033) (Chithra and Raju,2017).

Conclusion

Conclusion from the discussion that the study results accepted the Alternative hypotheses and an interventional program has a significant effect on nursing staffs' knowledge and practices about preventing Indwelling Catheter-Associated with Urinary Tract Infections. This study revealed that prior to the interventional program, the nurses had erroneous in practice about preventing indwelling catheter-associated with urinary tract infections. The study demonstrates that the interventional program has a positive impact on the improvement of the nursing staffs' knowledge concerning indwelling catheter. This result indicates that the interventional program was effective for almost all age groups. This result indicates that the knowledge and practices of the nursing staff regarding the indwelling catheter-associated with urinary tract Infections are not affected by years of experience.

Financial Disclosure

There was no financial disclosure.

Conflict Of Interest

None to declare

Ethical Clearance

All experimental protocols were approved by the Al-Diwaniya Health Directorate in Iraq, and all experiments followed the permitted procedures.

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