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Effectiveness of planned teaching programme on prevention of central line associated infection among staff nurses: A quantitative pre-test post-test research study

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Abstract
Introduction: Central line-associated infections (CLABSI) are a significant concern in healthcare settings, leading to increased morbidity, mortality, and healthcare costs. The study aim is to assess the Effectiveness of Planned Teaching Programme on Prevention of Central Line Associated Infection among Staff Nurses of a Selected Hospital, Guwahati Assam
Materials and Methods: A pre-experimental one group pre-test and post-test design was used to evaluate the effectiveness of a planned teaching programme among staff nurses. The study was conducted at Rahman Hospitals Pvt. Ltd, Guwahati, Assam. A total sample of 40 staff nurses was selected by utilizing non probability convenient sampling technique. Knowledge and skills were assessed using a questionnaire and observation checklist.
Results: The mean knowledge score increased from 12.77% to 17.65% and the mean skill score increased from 15.82% to 21.22% after the implementation of planned teaching programme. Majority of them 27 (67.5%) were aged between 20-25 years. Majority 39 (97.5%) were female. Majority 32 (80%) of the staff nurses were GNM. Majority 22 (55%) of staff nurses were working in general ward. Majority 24 (60%) of duration of work were 1-3 years. As per the experience (50%) of staff had experience with care of central line associated infection whereas another (50%) of staff has no experience with care of central line associated infection. Majority 30 (75%) had previous knowledge on prevention of central line associated infections. Majority 24 (80%) of staff nurses had information regarding prevention of central line associated infection from hospital protocol.
Conclusion: The study highlights the importance of planned teaching programmes in improving knowledge and skills among staff nurses. There was no significant correlation between knowledge regarding prevention of central line associated infection and skills of staff nurses on routine care of central line catheter. The study revealed that there was a significant association between staff nurses age and duration of work.

Keywords: Central line-associated infections, planned teaching programme, staff nurses, knowledge, skills

1. Introduction
The term central line associated infection refers to signs of infection that are visible to the patient, including the growth of the same bacteria in a culture taken from the tip of a central line catheter, a peripheral vein, or both, when no other source of infection is present [1].
In healthcare settings, CVC play an essential part in patient care, particularly in ICU. Nonetheless, 15% of patients experience difficulties from their central venous catheter and majority are mechanical (15-19%) [2]. The difficulties lead to extravagant hospital stays, increased rate of morbidity and mortality [3].
Infection rates can be decreased by teaching staff members how to care for patients with CVC in an aseptic manner.[4] According to sources, nurses with frequent training in managing patients with CVC exhibit superior understanding in this domain [5]. Furthermore, more education, training, and specializations of staff members are better qualified to provide vascular-line care protocols, and decrease of hospital acquired infection [6].

Evidence-based interventions, such as nurse bundles with education and staff and institution commitment, has shown to lower the prevalence of Central Line Associated Blood Stream Infections. According to Bianco *et al*., nurses can enhance their understanding, approach, and prepare for preventing CLABSI by implementing evidence-based policies and training [7].

Perumal V, Alheraish y A, Shahzad M, Maarof S, Perez M, Nair Pradeep [2022], conducted a study to assess nurse's knowledge, skills, and compliance related to CLABSI. In a cardiac clinic, prospective interventional trial was conducted. 80 registered nurses who was employed for a month and were registered with the Saudi Council were selected. For this investigation, interns and student nurses were not allowed. A competency-based checklist that was authorized by the hospital was used to assess the competencies of the nurse. Consequently, 51.25% was younger than the 25-34 age group. 35.5% and 68 women, respectively, had six to ten years of experience. The mean knowledge pre-test and post-test scores were (6.7+-1.09 and 6.8+-1.11), respectively, while the compliance scores were 8.3+-0, 97 and 8.1+-0.99, respectively. The findings indicate that nurses with over 5 years of practical experience have good CLABSI knowledge and compliance, and there is a substantial association between education level and CLABSI pre- and post-test [8].

Dyk D, Matusiak A, Cudak E, Wonjnicka G A and Dabrowska M W [2021] conducted a study to assess the knowledge of nursing staff working in ICU regarding the prevention of CLABSI. The nurse's knowledge was evaluated using a Polish type of the Labeau *et al*. questionnaire that has been updated. Over 80% of respondents had a university degree, and 95.73% of respondents were female. Over 82% of nurses surveyed regarded the knowledge as good or very good because majority of them (85.9%) had previous training on CVC guidelines. The study's nursing personnel lacked appropriate knowledge. Research indicates that CLABSI prevention in ICU should be standardized, staff nurses ought to receive ongoing education in this field [9].

Azlan NA and Aung KT [2021] conducted a study to assess the level of knowledge, attitude and skill of nurses on catheter related bloodstream infection and to investigate the association between knowledge and attitude of ICU nurses. 86 ICU nurses from two ICUs at Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang, Malaysia, participated in "a cross-sectional study" and Purposive sampling method was applied. Data were gathered using a questionnaire with participant demographic information as well as knowledge, attitudes, and skills of ICU nurses. Using descriptive and inferential statistics (Chi square test) the data was analysed. A 100% response rate was attained, and 94.2% of ICU nurses had a positive attitude and a good degree of expertise when it came to care of patients with CVC in ICU. Correlation between the knowledge and skills of PG ICU nurses was observed. The outcome makes it abundantly evident that most ICU nurses possessed good knowledge, attitudes, and practice [10]. Verma R, Rahman J, Hasmi S [2024], conducted a pre-experimental study to assess the effectiveness of structured teaching programme in terms of knowledge regarding CLABSI prevention among nursing officers in a selected hospital, Delhi. Thirty nursing officers working in the Medical, Surgical, Neonatal, and Paediatric ICU of the hospital were selected using the purposive sampling approach. CLABSI infection was the subject of an organized teaching program. The structured knowledge questionnaire about CLABSI prevention was used to assess the learning objectives of nursing officers. A post-test was carried out after a systematic education program was delivered, and the results showed that none of the nurses had poor knowledge, while the majority (23, 76.66%) had adequate knowledge and 7 (23.33%) had fairly adequate knowledge. Following the training, the majority of nursing officers exhibited a relatively adequate level of knowledge regarding CLABSI prevention, indicating the efficacy of STP [11].

2. Methodology

The objectives of the study is to compare the knowledge and skills of staff nurses before and after the implementation of planned teaching programme and demonstration of routine care of central line catheter. Also to determine the correlation and association between the pre-test and post-test knowledge and skills score after the implementation of planned teaching programme and demonstration of routine care of central line catheter.

Research approach adopted for the study was evaluative research approach using pre-experimental one group pre-test post-test design. The study was conducted in Rahman Hospitals Pvt. Ltd. Guwahati, Assam. A total of 40 staff nurses were selected by using non-probability convenient sampling technique. A formal approval was obtained from the authorities and ethical consent was obtained from the samples to conduct the study.

The tools developed and used for data collection were Structured knowledge questionnaire regarding prevention of central line associated infection and observational checklist for skills on routine care of central line catheter. The structured knowledge questionnaire is divided into two parts such as Part-A (Demographic performa/Information), Part-B (Knowledge assessment). The structured knowledge questionnaire on prevention of central line associated infection contains 24 questions which include the incidence in India, sign and symptoms and the preventive measures. Every correct answer was scored one (1) mark and for every incorrect answer it was scored zero (0). Observational checklist on skills of routine care of central line catheter comprises of 24 items with yes (1) score and no (0) score. These items were related to proper hand washing, proper use of gloves, proper use of bins, and proper use of removing old dressing. The tools were administered to 20 staff nurses and Karl's Pearson correlation coefficient formula was utilized to calculate the reliability of the structured knowledge questionnaire on the prevention of central line-associated infection using the split half method. The reliability coefficient of 0.83 indicated that the questionnaire was reliable. Karl's Pearson correlation coefficient formula was used to assess the Inter-Rater method's reliability of the observational checklist for routine care of central line catheter skills. Result indicated that the checklist's reliability was 0.95. Pilot study was conducted on 10 staff nurses and non-probability convenient sampling technique was used. The data was analyzed using both descriptive and inferential statistics.

3. Results

The majority of staff nurses 27 (67.5%) were aged between 20-25 years. Majority 39 (97.5%) were female. Majority 32

(80%) of the staff nurses were GNM. Majority 22 (55%) of staff nurses were working in general ward. Majority 24 (60%) of duration of work were 1-3 years. As per the experience (50%) of staff had experience with care of central line associated infection whereas another (50%) of staff has no experience with care of central line associated infection. Majority 30 (75%) had previous knowledge on "prevention of central line associated" infections. Majority 24 (80%) of staff nurses had information regarding "prevention of central line associated" infection from hospital protocol.

Table 1: Frequency and percentage distribution of staff nurses according to demographic variables, N=40

S. No	Demographic Variables	Frequency	Percentage
1	**Age in years**		
	a. 20-25	27	67.5
	b. 26-30	11	27.5
	c. 31-35	1	2.5
	d. Above 35	1	2.5
2	**Gender**		
	a. Male	1	2.5
	b. Female	39	97.5
3	**Education qualification**		
	a. GNM	32	80
	b. B.Sc Nursing	7	17.5
	c. Post basic	1	2.5
	d. B.Sc Nursing	0	0
	e. M.Sc Nursing		
4	**Area of work**		
	a. General ward	22	55
	b. ICU	12	30
	c. Semi ICU	1	2.5
	d. Cabin	5	12.5
5	**Duration of work**		
	a. Less than 1 year	13	32.5
	b. 1-3 years	24	60
	c. 3-5 years	2	5
	d. Above 5 years	1	2.5
6	**Experience with care of central line**		
	a. Yes	20	50
	b. No	20	50
7	**Previous knowledge on prevention of central line associated infections**		
	a. Yes	30	75
	b. No	10	25
8	**Source of information**		
	a. Workshop	0	0
	b. Classroom teaching	6	20
	c. Internet	0	0
	d. Hospital protocol	24	80

Table 2: Frequency and percentage distribution of level of knowledge regarding prevention of central line associated infection, N-40

Level of knowledge	Pre-test		Post-test	
	F	%	F	%
Inadequate	2	5	0	0
Moderately adequate	32	80	10	25
Adequate	6	15	30	75

Table 3: frequency and percentage distribution of level of skills of staff nurses on routine care of central line catheter, N=40

Level of skill	Pre-test		Post-test	
	F	%	F	%
Inadequate	12	30	0	0
Adequate	28	70	40	100

Table 4 (a): effectiveness of planned teaching programme on knowledge regarding prevention of central line associated infection, N=40

	Mean	Mean Difference	Std. Deviation	T-Value	P-Value
Pre-test	12.77	4.87	2.98	12.02	0.001
Post-test	17.65		1.74		

Significant at $p<0.05$, tabulated t-value = 3.93

To determine level of significance for knowledge, the t-test was computed. The results showed that the mean post-test knowledge score (17.65) was higher than the mean pre-test knowledge score (12.77) with a mean difference of (4.87).

Additionally, the calculated value (t=12.02 at DF=39, P=0.001) at the < 0.05 level of significance indicated that the difference was statistically significant.

Table 4 (B): Effectiveness of planned teaching programme on skills of staff nurses on routine care of central line catheter, N=40

	Mean	Mean Difference	Std. Deviation	T-Value	P-Value
Pre-test	15.82	5.40	5.09	7.29	0.001
Post-test	21.22		2.48		

Significant at $p<0.05$, tabulated t-value=3.93

To determine the level of significance for skills, the t-test was computed. The results showed that the mean post-test skill score (21.22) was higher than the mean pre-test skill score (15.82) with a mean difference of (5.40), and that the difference was statistically significant at the < 0.05 level of significance (t=7.292 at DF=39, P=0.001).

The above Table 5 shows the relationship, determined by Karl Pearson correlation, between skills of staff nurses on routine care of central line catheter and their knowledge regarding prevention of central line-associated infections. Pre-test Knowledge and Skill showed a weak positive association (r=0.07, P=0.65) and was statistically not significant, according to the findings.

Table 5: Correlation between knowledge regarding prevention of central line associated infection and skills of staff nurses on routine care of central line catheter, N=40

Variables	Correlation coefficient (r)	P-Value
Pre-test Knowledge and Skill	0.07	0.65

Table 6 (a): Association between pre-test level of knowledge regarding prevention of central line associated infection among staff nurses with selected demographic variables, N=40

S. No	Demographic Variables	Pre-test Knowledge			$\chi 2$ Value	DF	P-Value
		Inadequate	Moderate	Adequate			
	Age in years						
1	a. 20-25	1	22	4	19.98	6	0.003*
	b. 26-30	0	9	2			
	c. 31-35	1	0	0			
	d. Above 35	0	1	0			
	Gender						
2	a. Male	0	1	0	0.26	2	0.88^{NS}
	b. Female	2	31	6			
	Education qualification						
3	a. GNM	2	27	3	5.53	4	0.24^{NS}
	b. B.Sc. Nursing	0	4	3			
	c. Post basic B.Sc. Nursing	0	1	0			
	d. M.Sc. Nursing	--	--	--			
	Area of work						
4	a. General ward	2	17	3	8.34	6	0.21^{NS}
	b. ICU	0	10	2			
	c. Semi ICU	0	0	1			
	d. Cabin	0	5	0			
	Duration of work						
5	a. Less than 1 year	0	11	2	20.26	6	0.002*
	b. 1-3 years	1	19	4			
	c. 3-5 years	0	2	0			
	d. Above 5 years	1	0	0			
	Experience with care of central line						
6	a. Yes	1	16	3	0.00	2	1.00^{NS}
	b. No	1	16	3			
	Previous knowledge on prevention of central line associated infections						
7	a. Yes	1	25	4	1.06	2	0.59^{NS}
	b. No	1	7	2			

*-Significant; NS-Not significant at 0.05 level of significance

The above Table 6 (a) represents association between pre-test level of knowledge regarding prevention of central line associated infection among staff nurses with selected demographic variables which was tested by using chi-square test. Knowledge regarding prevention of central line associated infection among staff nurses were significantly associated with age and duration of work at ($p<0.05$ level) but other demographic variables such as gender, educational qualification, area of work, experience with care of central line and Previous knowledge on prevention of central line associated infections were found to be not significantly associated ($p<0.05$ level) with pre-test level of knowledge regarding prevention of central line associated infection.

Table 6 (b): association between pre-test level of skills of staff nurses on routine care of central line catheter among staff nurses with selected demographic variables, N=40

S. No	Demographic Variables	Pre-test Knowledge			$\chi 2$ Value	DF	P-Value
		Inadequate	Moderate	Adequate			
	Age in years						
1	a. 20-25	6	21	4.79	3	1	0.19^{NS}
	b. 26-30	6	5				
	c. 31-35	0	1				

	d. Above 35	0	1				
2	**Gender** a. Male b. Female	 0 12	 1 27	0.44	1	2	0.51^{NS}
3	**Education qualification** a. GNM b. B.Sc. Nursing c. Post basic B.Sc. Nursing d. M.Sc. Nursing	 10 2 0 --	 22 5 1 --	0.46	2	3	0.79^{NS}
4	**Area of work** a. General ward b. ICU c. Semi ICU d. Cabin	 6 4 0 2	 16 8 1 3	0.81	3	4	0.85^{NS}
5	**Duration of work** a. Less than 1 year b. 1-3 years c. 3-5 years d. Above 5 years	 5 7 0 0	 8 17 2 1	1.74	3	5	0.63^{NS}
6	**Experience with care of central line** a. Yes b. No	 5 7	 15 13	0.48	1	6	0.49^{NS}
7	**Previous knowledge on prevention of central line associated infections** a. Yes b. No	 10 2	 20 8	0.63	1	7	0.43^{NS}

NS-Not significant at 0.05 level of significance

The above Table 6 (b) shows the relationship between pre-test levels of skills on routine care of central line catheter among staff nurses with selected demographic variables using chi-square test. The findings revealed that demographic variables such as age in years, gender, educational qualification, area of work, duration of work, experience with care of central line and Previous knowledge on prevention of central line associated infections of staff nurses were found to be not significantly associated at (p<0.05 level) with pre-test level of skills of staff nurses on routine care of central line catheter.

4. Discussion

The study reveals that planned teaching programme on prevention of central line associated infection among staff nurses and demonstration on routine care of central line catheter was found effective. The result is supported by a study carried out by Sheikh MA, Gul T, Sharma B and Kaur S (2022) to assess the efficacy of a planned education program on skill related prevention of central line associated blood stream infection among staff nurses in a selected hospital in Kashmir with regard to preventing infections with central lines [12].

The study also reveals that there is no significant correlation between the knowledge regarding prevention of central line associated infection and skills of staff nurses on routine care of central line catheter. Similarly, the result is supported by a study carried out by Almahmoud RS, Alfarhan MA, Alanazi WM, Alhamidy FK, Balkhy HH, Alshamrani M *et al*. (2020) to evaluate the practices and knowledge of central line insertion and maintenance in adult intensive care units at a tertiary care hospital in Saudi Arabia, a cross-sectional study. The results shows weak correlation between knowledge and practice [13].

The study also reveals that staff nurse's age and duration of work were found to be significantly associated with pre-test level of knowledge regarding prevention of central line associated infection and pre-test levels of staff nurses' skills on routine care of central line catheter was not significantly associated with demographic Performa.

5. Conclusion

From the findings of the present study among staff nurses, conclusion can be drawn that planned teaching programme on knowledge regarding prevention of central line associated infection and skills of staff nurses on routine care of central line catheter is effective.

6. Recommendations

The following recommendations are made as a result of the knowledge acquired during the course of study and the results obtained.

- The study can be replicated in large sample of staff nurses regarding prevention of central line associated infection.
- The study can be done in different setting.
- A descriptive study may be carried out to evaluate staff nurses competencies

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