Effect of Educational Intervention on Knowledge and Attitude of Central Line Care Bundle among Health Care Providers in Intensive Care Units

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Abstract:

Introduction: Central line Associated Blood Stream Infection (CLABSI) is a rising problem in the health care institutes in this modern era of medical science and technology causing maximum morbidity, mortality and economical malfunction. The study aims to assess the effect of educational intervention on knowledge and attitude of central line care bundle among health care providers in intensive care units. **Methods:** An interventional non-randomized research design was adopted in the study. Totally 96 health care providers from various intensive care unit were recruited for the study based on convenient sampling technique. Data collection was done in three phases; first phase was pretest by administering the questionnaire to the participants, followed by structured educational program by the investigator. After 2 weeks post test was conducted. **Results:** In the pretest 18.8% had inadequate knowledge, most of the participants had moderately adequate knowledge 64.6% and 16.6% had adequate knowledge. The pretest attitude result shows that 1% had unfavorable, 16.7% moderately favorable attitude and 82.3% had favorable attitude. After the educational intervention, the post-test knowledge level for inadequate, moderately adequate, and adequate were 0%, 19.8% and 77% respectively. Among all the participant0% had unfavorable, 10.4% had moderately favorable and 89.6% were having favorable attitude after the post test. The educational intervention was effective with $p<.001$ significance. There was significant correlation between the pretest and post-test knowledge level and attitude ($p<.05$) **Discussion:** The study concludes that proper communication of the CLABSI bundle and training and surveillance can reduce the CLABSI rate in the intensive care units.

Key words: Central line Associated Blood Stream Infection, health care provider, Central Line Care Bundle, educational intervention

Introduction:

Central venous lines are very crucial in intensive care units in patient care and management. Health Care Associated Infections (HAIs) are the most common public health problem throughout the world. Central lines are very common especially in intensive care units facilitating advanced patient care. But malpractice can cause high morbidity, morbidity, and financial burden.[9]According to International Nosocomial Infection Control Consortium (INICC), surveillance data (January 2010- December 2015; in 703 intensive care units in 50 countries) occurrence of CLABSI rate is 4.1 per 1000 central lines.[5] In India the CLABSI rate of 7.9 per 1000(prospective surveillance between July 2004 and March 2007, in 12 ICUs in seven Indian cities.[4]Central

line Associated Blood Stream Infection (CLABSI) is a rising problem in the health care institutes in this modern era of medical science and technology causing maximum morbidity, mortality and economical malfunction.[10]The Joint Commission also has introduced standard preventive tools for Central line associated blood stream infection. Health care workers in the intensive care unit are the core individual in direct patient care.[13] In recent time many studies provide different statistical data about the CLABSI incidence in India. In 2007 a study conducted by Mehta et al found the CLABSI rate 7.92/1,000 device days in India. [5] CLABSI rate of 0.48 per 1,000 central line (CL) days were reported in another study conducted in a teaching hospital in rural Gujrat by Singh et al.[6] Some other recent studies have shown many different CLABSI rates for example Chopdekar K et al and Singh S et al reported 27.0 and 16.0 per 1,000 CL days.[3,14]
In 2018, Khodare et alreported reduced rates of CLABSIs from 11.78/1,000 catheter days to 3.99/1,000 catheter days after implementing an insertion and a maintenance bundle.[2] Comparing to the world scenario the 2019 National and State Healthcare-Associated Infections Progress Report (Current HAI Progress Report) between 2018 and 2019 there was about 7% decrease in CLABSIs at the national level in acute care hospitals; significant reduction in NICUs (13%). About 3% decrease in central line device utilization was observed between 2018 and 2019 maximum decrease was seen in ICUs (3%).

In India, only a few health care setting has conducted audits or research studies regarding central line care bundle. The study will be effective for the health care provider for proper handling of central line by enhancing their knowledge and forming favorable attitude, thereby CLABSI rate may be minimized.The study objective was to assess the effect of educational intervention on knowledge and attitude of central line care bundle among health care providers in intensive care units.

Methods:

An interventional non-randomized research design was adopted in the study. The study was conducted in six intensive care units (ICUs) that wasneurology medicine ICU, neurology surgery ICU, trauma care ICU, urology ICU, Cardiothoracic and vascular surgery ICU and Reginal cancer center ICU of JIPMER.The study population was the health care providers whoever directly involved patient care like nursing in-charge, senior nursing officers (SNO) and nursing officers (NO), interns and junior residents) who are working in the Neurology medicine ICU, neurology surgery ICU, trauma care ICU, urology ICU, CTVS ICU and RCC ICU.Convenient Sampling Technique, every consecutive fulfilling the eligible criteria was included in the study. Totally 96 (Sample size was calculated using a standardized formula for comparison of two dependent means. The sample size required to detect a clinically significant difference of two units in the attitude score between the pre and post intervention 96 assuming a standard deviation of 5 units, power 90% at 1% level of significance.

Description of tool and scoring procedure:

The tool used for the study was self-administered questionnaire which was developed by the investigators. It consists of three parts. Part 1. Socio-demographic variables include gender, age, professional qualification, year of experience in study setting, total years of experience, experience in ICU, formal training or workshop attended on central venous line. There was no score given for these variables. Part 2. knowledge-related questions, totally eighteen deal with CLABSI bundle, focused on insertion and maintenance bundle by Centers for Disease Control and prevention (CDC); Each correct response was awarded one score and no score was assigned for the incorrect answers. Based on the total score the level of knowledge was categorized as follows, <9 (<50%) noted as inadequate knowledge, 9 to 13 (50-75%) stated as moderately adequate and >13 (>75%) mentioned as adequate knowledge. Part 3. Attitude-based statements presented in 5 points Likert's scale, six positive and two negative statements related to central line care (CLABSI) bundle. In the positive statements strongly agree carries 5 scores, agree carries 4, uncertain carries 3, disagree carries 2 marks and strongly disagree carries 1 mark respectively. For negative statements reverse score was given respectively.

The level of attitude categorized as <20 (50 %) denoted as unfavorable attitude, 20-30 (50%– 75%) stated as moderately favorable, and >30 (75%) mentioned as favorable attitude. The tool was validated by three experts from the nursing and microbiology department.The reliability of the tool used in the study was assessed by split half method. The value was found to be 0 .81 and the internal consistency for the score is acceptable.

Intervention:

After the pre-assessment on the same day the educational intervention (based on guidelines for the prevention of intravascular catheter related infection,2011) was carried out among the participants that contains definition of CLABSI, sources of infection, effects of CLABSI in health care settings, care bundle for central line, checklist recommended in JIPMER, preventive measures related to insertion and maintenance, new strategies to prevent CLABSI were explained with the help of power point presentation, didactic lecture and pamphlets to the participants in small groups, for approximately 15 to 20 minutes in the intensive care units. The content validity of the structured educational material was obtained from experts from nursing and microbiology department.

Data collection procedure:

Pre-assessment was done by self-administered questionnaires to assess the knowledge and attitude on the CLABSI. The questionnaire was provided in both pen and paper and as Google form as convenient of the participants. After the pre-assessment, the structured educational intervention was administrated to the participants. The post assessment was done with the same questionnaires after two weeks of the educational intervention. Descriptive and inferential statistics were used for data analysis in the 25th version of the SPSS software.

Results:

Among the **96**participants most of the 65 (67.7%) of study population were in the age group more than 23-33years with mean age of 31.77 years. Half of the health care providers were male 49 (51%). Most of the participants belonged to nursing professionals 59 (61. 4%).Majority had than 5 years' experience in JIPMER 50 (52.1%) and most of them had less than 5 years' experience in ICUs 75 (78.1%).

Table 1 shows that level of knowledge of central line care bundle among health care providers in intensive careunit before and after the educational intervention.

Table 2 Reveals the pre and post - test level of attitude of central line care bundle among health care providers in intensive careunit.

Table 3 shows that, the mean score of effectiveness of educational interventionon knowledge in the pre-test and post was 10.64 ± 2.562 and 14.93± 1.737 respectively.

Table 4: showscorrelation between pretest level of knowledge and attitude of central line care bundle among health care providers in intensive careunit

Discussion:

In the pretest among the 96 number of the participants, the findings show that 18(18.8%) had inadequate, 62(64.6%) had moderate and 16(16.6%) had adequate knowledge on central line care bundle. Therefore, it can be interpreted that most of the participants had moderately adequate knowledge on central line care bundle and very few of them had adequate knowledge. Among all the participants 1(1%) had unfavorable, 16(16.7%) had moderately favorable attitude and 79(82.3%) and 79(82.3%) were having favorable attitude. From the pretest attitude scoring it is clear that maximum number of the participants had favorable attitude towards the central line care bundle and very few of them were having unfavorable attitude.

In the pretest the mean of the knowledge level was 10.64 with standard deviation of 2.562 and post-test mean of the knowledge level was 14.93 with standard deviation 1.737. Mean difference of the post-test

knowledge was -4.2813 with a "t" value of -16.58 and p<0.001 i. e. highly significant.For attitude towards the central line care bundle the participants mean score in the pretest was 32.74 with standard deviation 3.545 and the post-test mean were 35.27 with standard deviation of 3.184. The post-test mean difference is –2.5313 with "t" value of -5.995 and p<0.001 i. e. highly significant.

After the educational intervention that was introduced to the participants on central line care bundle, post-test was conducted after 2 weeks with the same questionnaire. In the post test result, maximum number of participants, 77(80.2%) had adequate knowledge, and 19 (19.8%) had moderately adequate knowledge. Among the 96 participants most of the participants 86(89.6%) had favorable attitude and 10(10.4%) had moderately favorable attitude. Therefore, comparing the paired "t" test value of pre-test and post-test knowledge and attitude there is a significant difference, hence the educational intervention was proved to be effective enough to improve the knowledge regarding central line care bundle and to bring out favorable attitude of the health care providers. The present study findings supported by the following studies.

Sakshi et al, conducted a pre- experimental study titled "Effectiveness of education program regarding central venous catheter (CVC) care bundle in terms of knowledge and practice of nursing personnel" in 2019 among 35 nurses in a liver coma ICU to assess pre and post-test knowledge after implementing a structured educational program regarding central venous catheter. The result shows significant difference (p<0.001) in mean scores of knowledge pretest and post-test were 19.57±3.43 and 24.94±4.78 respectively and for practice (pretest 39.17±2.86 & post-test 47.11±1.87) regarding CVC bundle. The study findings prove improvement in knowledge and practice after the educational intervention. [7]Acharya et al conducted a quasi-experimental study in 2019 to assess impact of nursing education among 34 nurses and assess their knowledge, noncompliance percentage with hand hygiene along with the CLABSI rate, and practices of the nurses related to central venous care. The findings show that CLABSI rate during pre-intervention phase was 12.5% per 1000 catheter days and pretest score was 15.9 +/− 3.35. CLABSI rate post intervention reduced significantly (p=0.02). Missed opportunity for hand washings were reduced from 53.4% to 33.75. [12]Amini et al conducted a quasi-experimental study in 3 phases in a 834 bedded in Tehran. In the 1st phase baseline data was collected, in the second phase a focused presentation, and one-page self-study page was provided the nurses, resident physicians, students, fellows, as well as attending physicians that aims to prevent CLABSI. In the third phase, post test data was collected to assess the CLABSI rate. The study findings show that the CLABSI infection rate was reduced from 18.1% to 6.5% after the educational intervention. [11]Correlation of knowledge and attituderegarding central line care bundle among health care providers in intensive care unit. Mean and standard deviation of the pretest level of knowledge and attitude is (10.24±2.562) and (32.74±3.545) with Karl Pearson correlation value r is 0.249 for p value 0.014 that is statistically significant. For posttest the mean and standard deviation of knowledge and attitude are (14.93±1.737) and (35.27±3.184) and the r value was found to be .202 for p value 0.049 that is statistically significant.

The study shows that there is a significant association between pretest knowledge and professional qualification with chi square value 31.33 for a p of value 0.001 that is highly significant (p<0.05). Pretest attitude did not have significant association with professional qualifications of the health care providers.There was a significant association between the pretest knowledge and total years of experience, years of experience in intensive care units with chi square value of p<0.05.Pretest score for attitude did not have association with professional qualifications of the participants. Other socio-demographic variable did not have significant association with pretest knowledge and attitude score.Manzo et alreported a significance association between socio-demographic variables (professional category, working hour, training received, form of acquisition of knowledge) are significantly associated (P<0.05) with knowledge regarding the bundle strategy among 255 professionals. Nurses have highest knowledge (n=47,94.0%) compared to technicians (n= 137, 77.4%) and medics (n=19, 67%) [1,8]

Conclusion:

Central line associated bloodstream infection (CLABSI) is one of the common complications in critical care units. In conclusion, the findings of the study provide a clear evidence that educational interventions have a significant role to bridge the gap of knowledge and creating a favorable attitude among the health care providers towards the central line care bundle(CLABSI).

Table 1: Level of knowledge of central line care bundle among health care providers in intensive careunits (N = 96)

Level of knowledge of central line care bundle	Pre test		Post test	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Inadequate (<9)	18	18.8	0	0
Moderately adequate (9-13)	62	64.6	19	19.8
Adequate (>13)	16	16.6	77	80.2

Table 2: level of attitude of central line care bundle among health care providers in intensive careunits (N = 96)

Level of attitude of central line care bundle	Pre test		Post test	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Unfavorable attitude (<20)	1	1	0	0
Moderately favorable (20-30)	16	16.7	10	10.4
Favorable (>30)	79	82.3	86	89.6

Table 3: Effect of Educational Intervention on Knowledge and Attitude of Central Line Care Bundle among Health Care Providers in Intensive Care Units (N=96)

Effectiveness of educational intervention	Test	Mean	SD	Mean difference	Paired 't' value	Df	'p' value
Knowledge	Pre-test	10.64	2.562	-4.2813	-16.58	**95**	**0.001***
	Post-test	14.93	1.737				
Attitude	Pre-test	32.74	3.545	-2.5313	-5.995	**95**	**0.001***
	Post-test	35.27	3.184				

***p < 0.001 highly significant**

Table 4: Correlation between pre-test and post-test level of knowledge and attitude of central line care bundle among health care providers in intensive careunit

(N=96)

Test	Variable	Mean	SD	Karl pearson correlation r value	'p' value
Pretest	Knowledge	10.64	2.562	0.249	**0.014***
	Attitude	32.74	3.545		
Post test	Knowledge	14.93	1.737	0.202	**0.049***
	Attitude	35.27	3.184		

*** p < 0.05 highly significant**

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Author contributions

CP involvement in the study are concepts, design, definition of intellectual content, clinical search, clinical studies, data analysis, statistical analysis, manuscript preparation and guarantor. MJK has been involved in concept design, clinical studies, experimental studies, data analysis, manuscript editing and manuscript review. ASS has been involved in concept design in clinical search, review the data analysis, clinical studies and manuscript preparation.

Conflict of Interest:

The authors declared no potential conflicts of interest.

Ethical issues:

Permission was obtained from the Nursing Research Monitoring Committee and Institute (JIPMER) Ethical Committee, Human studies under. Project no.JIP/CON/IEC/M.Sc/2019/MSN1prior to data collection.

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Research Highlights

1) What is the current knowledge?
   - Central line associated blood stream infections (CLABSI) is a major health concern in the health care setting.
   - Many studies have been conducted on central line care bundle but intervention based studies are limited.
2) What is new here?
   - It is effective for the health care provider for proper handling of central line by enhancing their knowledge and forming favorable attitude, thereby CLABSI rate may be minimized.
   - The health care workers to adhere to the guideline in the ICUs will enhance better practice leading towards minimizing the CLABSI burden.

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