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"Effect of Planned Teaching on Knowledge and Practice Regarding Capnography among Staff Nurses Working in Intensive Care Unit in a Selected Urban Hospital."

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Abstract:

Background: Capnography is the monitoring of the concentration or partial pressure of carbon dioxide in the respiratory gases. A significant proportion of airway complications occur in Intensive Care Units and Emergency Departments, and these more frequently cause patient harm/death and are associated with suboptimal care. Aim and objective: A study was planned to assess knowledge and practice regarding capnography among staff nurses working in intensive care unit. To assess the effect of planned teaching of staff nurses and to compare the knowledge and practice with their sociodemographic variables. Materials and Method: A descriptive evaluatory approach was used to assess the effectiveness of planned teaching on knowledge and practice regarding capnography among 30 staff nurses working in intensive care unit. The research design used was one group pre-test and post-test design. The sampling technique used was non probability convenient sampling. The posttest knowledge and practices of staff nurses was assessed after 5 days with the same tools. Results: The analysis and interpretation revealed that the planned teaching programme was an effective tool for improving the knowledge and practices regarding capnography among staff nurses. It is observed that statistically there is a significant difference between pretest and posttest mean of both knowledge and practice. Also, it is found that there does not exist any association of both knowledge and practice. Conclusion: Our result indicates that the planned teaching programme was an effective tool for improving the knowledge and practices regarding capnography among staff nurses.

Index Terms **– Effectiveness, knowledge, practice, Intensive care unit, nurses, planned teaching**

I. Introduction:

Ventilation and oxygenation are separate physiological processes. Ventilation is the act or process of inhaling and exhaling. To evaluate the adequacy of ventilation, a provider must exercise eternal vigilance. Chest rise, compliance (as assessed by the feel of the bag-valve mask), and respiratory rate are qualitative clinical signs that should be used to evaluate the adequacy of ventilation. Capnography, long the standard of care in the operating room and intensive care unit, can also be used to assess ventilation.[1]Capnography is the monitoring of the concentration or partial pressure of carbon dioxide in the respiratory gases.[2] A significant proportion of airway complications occur in Intensive Care Units and Emergency Departments, and these more frequently cause patient harm/death and are associated with suboptimal care. Hypoxia is the commonest cause of airway-related deaths. Obesity markedly increases risk of airway complications. Pulmonary aspiration remains the leading cause of airway-related anesthetic deaths, most cases having identifiable risk factors. Unrecognized esophageal intubation is not of only historical interest and is entirely avoidable. All airway management techniques fail and prediction scores are rather poor, so many failures are unanticipated. Avoidance of airway complications requires institutional and individual preparedness, careful assessment, good planning and judgement, good communication and teamwork, knowledge and use of a range of techniques and devices[3]. Airway incidents are among the most common reported in ICUs, with human error playing the most important role.[5] Knowledge of health care professionals regarding airway management is thus essential which must include the early recognition of cases through use of appropriate monitoring devices. Prevention is better than cure.

II. Background of the study:

Capnography is measured in millimeters of mercury (mmHg), with a normal range being 35-45 mmHg. Capnography differs from pulse oximetry in that pulse oximetry measures oxygenation of the blood, while capnography is a measurement of overall respiratory system function. The first capnography devices, developed in the 1960's, were large and practically impossible to use in the clinical setting. Today, capnography capabilities are integrated into the majority of field cardiac monitors, and stand-alone portable capnography devices are about the size of a deck of cards.[8] An extensive PubMed search lists 46 clinical applications of capnography overall, and can be divided into six major categories: Airway, Breathing, Circulation, Anesthetic Delivery

Apparatus, Homeostasis and Non-perioperative. Information obtained through capnography includes: CO2 production; lung perfusion; alveolar ventilation; respiratory patterns and elimination of CO2 from the anesthesia breathing circuit and ventilator Capnography directly measures the ventilatory performance of the lungs and indirectly presents measurements on the performance of metabolism and circulation. For example, an increased metabolism will increase the production of carbon dioxide increasing the ETCO2. A decrease in cardiac output will lower the delivery of carbon dioxide to the lungs, decreasing the ETCO2. Thus, it gives us a rapid and reliable method to detect life-threatening conditions such as malposition of tracheal tubes, ventilatory failure, circulatory failure and defective breathing circuits. An important use of capnography is as a non-invasive assessor of proper endotracheal tube placement.[9] Capnography was used at the time of endotracheal intubation in the neonatal intensive care unit (NICU) to determine whether capnography could more quickly and accurately identify endotracheal tube position than other clinical indicators of endotracheal tube position.

STATEMENT OF PROBLEM

"Effect of Planned Teaching on Knowledge and Practice regarding Capnography among staff nurses working in Intensive Care Unit in a selected Urban Hospital."

OBJECTIVES OF THE STUDY

1. To assess the knowledge of staff nurses regarding capnography before and after planned teaching.
2. To assess the practice of nurses regarding reading and interpreting ETCO2 waveforms before and after planned teaching.
3. To compare the knowledge and practices of staff nurses regarding capnography before and after planned teaching.
4. To determine the association between knowledge and practice scores with selected demographic variables like age, experience, and educational qualification.

HYPOTHESIS

Ho: There will be no difference in the knowledge and practice of nurses working in intensive care unit regarding capnography after planned teaching.

H_1: There will be a difference in the knowledge and practice of nurses working in intensive care unit regarding capnography after planned teaching.

III. Research Methodology:

In this study, one group pre-test and post-test design is used. The one group pre-test and post -test design is simple type of pre-experimental design. Essentially this design measures what has happened to the experiment group based on the way it was before the beginning of the experiment (pre-test state) and the difference achieved at the end of the experiment (post-test state).

3.1 Population and Sample

The study was conducted among the 30 nurses in ICUs of selected urban hospitals.

3.2 Data and Sources of Data

The data was collected with the help of non-probability convenient sampling. Knowledge and practice are assessed with objective type questions followed by Planned teaching on capnography was given on the same day. Audio visual aids used for planned teaching were power point slides. The effectiveness of planned teaching was assessed by conducting posttest after 5 days with the same tools of pretest.

3.3 Theoretical framework

The study aims at evaluating the effect of structured teaching programme on knowledge and practice regarding capnography amongst staff nurses. The frame work is based on Imogene King's goal attainment theory. It is divided into 3 systems: Personal system, Inter personal system, social system. Personal system refers to individuals which includes their perception, self, growth & development. Inter personal system refers to interaction between individual which comprise of interaction, communication, transactions. Social system refers to organized boundary system of social roles, behaviors and practices.

In this study, Personal system includes perception of the individual or staff nurses on capnography. It also refers to existing knowledge that staff nurses might or might not have Interpersonal system refers to interaction between investigator and nurses through self-administered questionnaire and observation checklist.

IV. RESULTS AND DISCUSSION

Table No. 1 - Distribution of sample according to their educational status.

N= 30

Sr. No.	Demographic characteristic	Frequency	Percent
1	**Educational status**		
	GNM	13	43.3
	Post BSc. nursing	6	20.0
	BSC nursing	11	36.7
	MSC nursing	0	0
	Total	30	100
2	**Experience in intensive care unit**		
	less than 1 yrs	0	0
	1 – 3 yrs	18	60.0
	3 – 5 yrs	12	40.0
	Above 5 yrs	0	0
	Total	30	100
3	**Age**		
	20-25 yrs	18	60.0
	26-30 yrs	11	36.7
	31-35 yrs	1	3.3
	36 yrs and above	0	0
	Total	30	100

Table no. 1 Represents data related to highest percentage of educational status shows that maximum 13 (43.3%), of the sample had completed GNM Course, 18 (60%) have experiences of 1- 3 years, 18 (60%) are the age of 20-25 years.

Table no -2: Assessment of samples in relation to knowledge regarding concept and mechanism of capnography.

N = 30

Qn. no.	Knowledge regarding concept and mechanism of capnography	Pre test		Post test	
		F	%	F	%
1	What does capnography measure	24	80.0	28	93.3
2	How does a capnography system measure end tidal CO_2	6	20.0	26	86.7
3	In a normal person the $ETCO_2$ reading will be within ---------mmHg of $PaCO_2$	1	3.3	21	70.0
4	A normotensive patient has just been intubated, and monitor reading shows a $PetCO_2$ of 3mmHg.What does it indicate	20	66.7	20	66.7
5	What is the normal $ETCO_{2\ value}$	21	70.0	29	96.7
6	What does it indicate if the $ETCO_2$ level is less than 35mmHg	10	33.3	16	53.3
7	What will be the $ETCO_2$ reading of a patient who has decreased CO_2 levels	23	76.7	26	86.7
8	What will be the $ETCO_2$ reading of a patient who has increasedCO_2 levels	16	53.3	12	40.0
9	Following are condition which causes an increase in $ETCO_2$, except	13	43.3	20	66.7
10	Following are condition which causes decrease in $ETCO_2$ except	7	23.3	20	66.7
11	Reduction in $ETCO_2$ during CPR is associated with	15	50.0	22	73.3

Table no. 2 Maximum 24(80%) of the sample were aware about what capnography measure in the pre-test, which increased to 28(93.3%) in posttest. More than half 20(66.7%) replied right about a meaning of a normotensive patient has just been intubated, and monitor reading shows a $PetCO_2$ of 3mmHg in both pre-test and posttest. 21(70%) and 23(76.7%) were aware about the normal $ETCO_{2\ value}$ and the $ETCO_2$ reading of a patient who has decreased CO_2 levels in pre-test, which raised to 29(96.7%) and 26(86.7%) in posttest respectively for the same. Regarding the value of $ETCO_2$ reading of a patient who has increased CO_2 levels and condition which causes an increase in $ETCO_2$, very few no's of the samples 16(53.3%) and 13(43.3%) were aware in pre-test respectively, which changed to 12(40%) and 20(66.7%) in posttest respectively for the same. Minimum 10(33.3%) of the sample knew about indication for the $ETCO_2$ level is less than 35mmHg in the pre-test, which increased to 16(53.3%) in posttest. 7(23.3%) replied right about condition which causes decrease in $ETCO_2$ in pre-test, which raised to 20(66.7%) in posttest. 6(20%) replied right about the way capnography system measure end tidal $CO_{2\ in}$ pre-test, which raised to 26(86.7%) in posttest. Minimum 1(3.3%) of the sample knew about in a normal person the $ETCO_2$ reading will be within ---------mmHg of $PaCO_2$in the pre-test, which increased to 26(86.7%) in posttest. Increased in posttest values shows the increase in knowledge score and support the findings for effectiveness of planned teaching.

Table 5 – Assessment of samples in relation to knowledge regarding Physiology of capnography

N = 30

Qn. no.	Knowledge regarding Physiology of capnography	Pre test		Post test	
		F	%	F	%
12	How much is the angle between phase III and inspiratory downstroke in an $ETCO_2$ waveform	18	60.0	25	83.3
13	What does phase-III in an $ETCO_2$ waveform refers to	10	33.3	28	93.3
14	How many phases are there in an $ETCO_2$ waveform	18	60.0	28	93.3

Table no 3. More than half no of the samples 18(60%) each were aware about the angle between phase III and inspiratory down stroke in an $ETCO_2$ waveform and no of phases in an $ETCO_2$ waveform in pre-test, which raised to 25(83.3%) and 28(93.3%) in posttest respectively for the same Very few 10(33.3%) of the sample knew about meaning phase-III in an $ETCO_2$ waveform refers to in the pre-test, which increased to 28(93.3%) in posttest. Increased in post test values shows the increase in knowledge score and support the findings for effectiveness of planned teaching.

Table no. 4 - Effectiveness of planned teaching programme by comparing pretest and posttest of knowledge and practice scores of staff nurses regarding capnography.

N = 30

Sr. No.	Comparison of Knowledge and practice		Mean	S.D.	MD	SEMD	Calculated "t" value	*p* value
1	**knowledge**	Pre test	9.17	2.276	6.97	0.316	22.03	0.001
		Post test	16.13	2.193				
2	**practice**	Pre test	3.27	1.143	1.33	0.194	6.88	0.001
		Post test	4.60	0.724				

df = 29, level of significance is 0.05 for 't' table value of 2.05

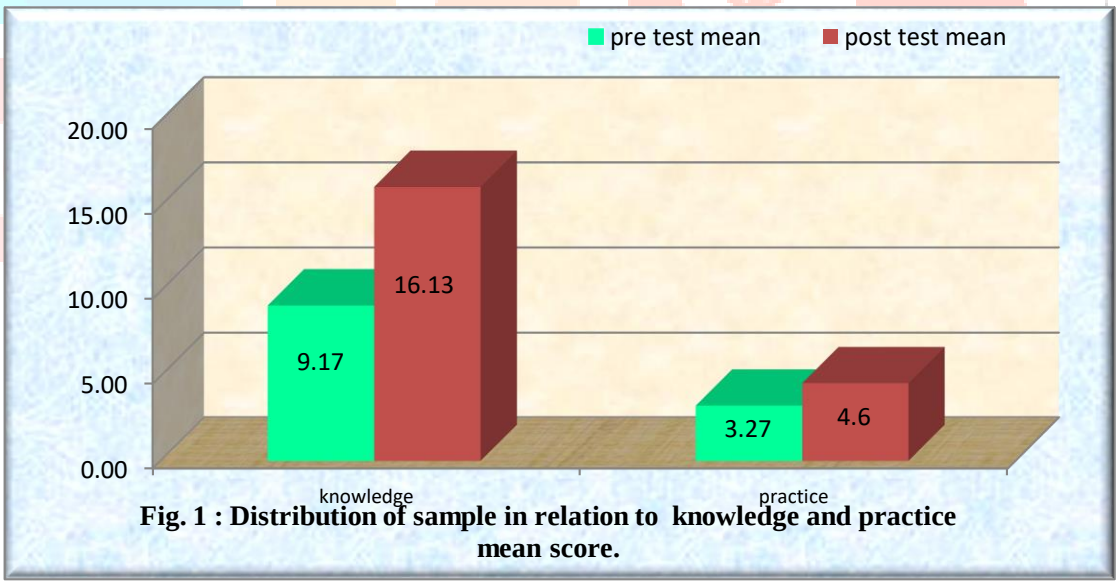

Fig. 1 : Distribution of sample in relation to knowledge and practice mean score.

Table no. 4 and fig. 1 can be interpreted as follows: The data displayed in table 9 shows that there is a significant difference in the mean of pre and posttest knowledge and practice scores of the sample. Before calculating the 't' value Null hypothesis (H_0) and alternate hypothesis (H_1) was stated. The two tailed 't' value for 0.05 level of significance is at 2.05 for degree of freedom of df = 29.

Table 5 - Association of demographic variable Education with Knowledge and Practice mean.

N = 30

Association of Education with Knowledge and Practice		n	Mean	df	Calc. F value	Table F value	*p* value
Knowledge	GNM	13	8.92	2, 27	1.878	3.35	0.172
	P.BSc. nursing	6	8.00				
	BSc. nursing	11	10.09				
Practice	GNM	13	3.08	2, 27	0.512	3.35	0.605
	P.BSc. nursing	6	3.17				
	BSc. nursing	11	3.55				

Table no. 5 Based on the 'f' test for unpaired sample the calculated f value for knowledge is 1.879 and practice is 0. 512.While table value is 3.35 significant at 0.05 levels. Calculated 'f' value is less than the table f value at 0.05 levels for knowledge and practice for education, so Ho is accepted.

Table no. 6 - Association of demographic variable Experience with Knowledge and Practice mean.

N = 30

Association of Experience with Knowledge and Practice		n	Mean	df	Calc. F value	Table F value	*p* value
Knowledge	1 – 3 yrs	18	8.89	1, 28	0.66	4.19	0.422
	3 – 5 yrs	12	9.58				
Practice	1 – 3 yrs	18	3.00	1, 28	2.58	4.19	0.119
	3 – 5 yrs	12	3.67				

Table 12 shows association of knowledge and practice score with demographic variable Experience.

Based on the 'f' test for unpaired sample the calculated f value for knowledge is 0.66 and practice is 2.58. While table value is 4.19 significant at 0.05 levels. Calculated 'f' value is less than the table f value at 0.05 levels for knowledge and practice for Experience, so Ho is accepted. Hence, we can conclude that there is no significant difference between the means of knowledge and practice score among groups of Experience, which suggest that there is no association between knowledge and practice score with Experience.

V. Acknowledgment

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