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Effectiveness of pocket reference on arterial blood gas analysis among the staff nurses working in critical care units

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Cover Page Footnote

The researchers acknowledge the contribution and cooperation provided by the authority of the institution and the participants of the study.

Original article

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Abstract

Introduction: Nurses play an important role in early detection of high-risk clients with acid-base imbalance in critical care units. **Methods:** Present study was conducted using Pre - Experimental one group Pre-test and Post-test design. Purposive sampling technique was used to select 30 staff nurses from different areas of critical care units. Demographic Proforma, Knowledge Questionnaire, and Observational Checklist were used to collect the data. **Results:** It was found that majority (70%) was female, majority (60%) belongs to the age group of 26 to 35 years, and most of them (46.66%) were with B Sc nursing qualification. Significant difference was found between Pre-test and Post-test knowledge scores ($t_{(29)}$ =9.50) at .05 level of significance. Significant difference was found between the pre-test and post-test skill of staff nurses in arterial blood gas (ABG) analysis for both Strip I: Respiratory Acidosis ($t_{(29)}$=14) at .05 level of significance and Strip II: Respiratory Alkalosis ($t_{(29)}$= 20.2) at .05 level of significance. There was moderate positive correlation (r=.77) between the Pre-test knowledge and Pre-test skill regarding ABG Analysis. **Conclusion:** Study findings indicate that Pocket Reference was effective in improving the knowledge and skill of staff nurses on ABG Analysis.

Key Words: Pocket Reference, ABG Analysis, Staff nurses, Critical Care Units.

Introduction

Effectiveness of gaseous exchange and ventilation can be assessed by ABG analysis. According to Simpson (2004) in critical care units Nurses play an important role in early detection of high-risk clients with acid-base imbalance. Jeffrey (1999) reported that to master the complex concept of Acid-base balance and ABG Analysis one requires a great deal of study. Faria & Taylor (1997) in their study developed a systematic approach for interpreting ABG analysis that helped the nurses to analyze the ABG confidently thereby making them able to choose appropriate nursing action.

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During the clinical experiences in ICU, the investigator found that majority of patients' ventilation is being monitored by ABG analysis. Though the nurses take an active part in collecting ABG samples, their knowledge in interpreting ABG reports is inadequate. Keeping this in view, the investigator developed keen interest in educating the staff nurses with the help of Pocket Reference regarding ABG Analysis, which would help the staff nurses to develop and refine their existing skill and knowledge, which would lead to improvement in quality.

Materials and Methods

The researchers used Pre-Experimental one group Pre-test Post-test design and evaluative research approach for the present study. The study was conducted in Central Referral Hospital, Sikkim, a 300 bedded multispecialty Hospital. The staff nurses working in critical care areas of the hospital were selected using purposive Sampling technique depending on their availability during the data collection time as well as their willingness to participate. A sample size of 30 was

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decided based on review of literature and availability of time for data collection.

Tools for data collection:

The following instruments were used for data collection-

Tool 1: Demographic Proforma included five variables i.e., Age, Gender, Educational qualification, Area of posting and Exposure to any In-service education program related to ABG Analysis.

Tool 2: Knowledge questionnaire on ABG Analysis consisted of 20 multiple-choice questions with four options and one correct answer for each. Each correct answer scores one and each incorrect answer scores zero. The score was categorized arbitrarily as Adequate (>80%) and Inadequate (<80%).

Tool 3: Observational checklist- As two standardized ABG Strips (Strip I :Respiratory Acidosis and Strip II :Respiratory Alkalosis) were used to assess the skill of staff nurses on ABG Analysis, two separate observational checklists were developed for Strip I and Strip II consisting of five items with option "yes" or "no". Each correct step scores one and each incorrect step scores zero. The total maximum score was five and categorized as skilled (100%) and not skilled (<100%).

Validity of tool

Validity of the entire tool was obtained from five experts comprising one anaesthetist, one from medicine department, and three nursing faculty members from medical surgical nursing department. There was 80 to 100% agreement in all items. Slight modification was done and the tool was ready for use.

Reliability

Reliability of the knowledge questionnaire was established by using split half method and the reliability co-efficient was calculated using spearman Brown's Prophecy formula, which was found to be 0.81. Thus, the tool was found to be reliable.

The Inter-observer reliability method was used to establish reliability for the observational checklists on ABG Analysis. Pearson's correlation formula was used and the reliability coefficient was 0.86 for observational checklist of Strip I and 0.91 for Strip II respectively, which indicates the tools were highly reliable.

Pocket Reference on ABG Analysis

A Pocket Reference on ABG Analysis was developed that consisted of five steps of ABG analysis in a sequence of determining pH value to rule out acidosis and alkalosis; to determine respiratory components i.e., $PaCO_2$ and PO_2 to rule out respiratory alkalosis and acidosis and to determine metabolic components by assessing bicarbonate level to rule out metabolic alkalosis and acidosis.

Data collection procedure

Data were collected after obtaining the ethical approval from the Ethical clearance committee of Assam Down Town University, Panikhaiti, Guwahati. On the first day, Pre-test was conducted by using knowledge questionnaire and two strips i.e., Strip I: Respiratory Acidosis and Strip II: Respiratory Alkalosis. On the same day, Pocket Reference was distributed followed by demonstration on use of Pocket Reference on ABG Analysis. On 8th day, Post-test was conducted by using the same knowledge questionnaire and observational checklist.

Results

Majority (70%) of the samples were females, 60% of them belonged to the age group of 26 to 35 years and most of them (46.66%) were with B Sc Nursing qualification. In terms of area of posting most of them (33.3%) were from Neonatal intensive care unit and 60% of the staff nurses were not exposed to any in-service education programme related to ABG Analysis.

As depicted in Table 1, in relation to knowledge, in Pre-test, three (10%) of the staff nurses were having adequate knowledge whereas in the Post-test 29 (96.6%) percent of the staff nurses had adequate knowledge on ABG Analysis. In relation to skill, all (100%) of the staff nurses, had inadequate skill in analysis of both strip I and Strip II. In the post-test skill for strip I, all (100%) had adequate skill. But in the analysis of strip II, 29(96.6%) had adequate skill and is

Table 2 depicts significant differences between pre-test and post-test knowledge scores at .05 level of significance. Thus, indicating the Pocket Reference on ABG Analysis was effective and the knowledge of staff nurses was improved.

The significant difference between the pre-test and post-test skill scores was found out using Paired *t* test. As the two separate strips (Strip I: Respiratory Acidosis and Strip II: Respiratory Alkalosis) were used to assess the skill of staff nurses on ABG Analysis, paired t-test was computed for the pre-test and the post-test skill for both the strips and is presented in Table 2.

The data in Table 3 showed a significant difference between the pre-test and the post-test skill of staff nurses on ABG analysis for both Strip I: Respiratory Acidosis ($t_{(29)}$=14) and Strip II: Respiratory Alkalosis ($t_{(29)}$=20.2). This clearly indicated improvement of the skill of staff nurses on ABG Analysis and the increase in skill is not by chance. There was a moderate positive

Table 1:

Frequency and Percentage Distribution of Pre-test and Post-test of Knowledge and Skill of Staff Nurses Regarding ABG Analysis

Variables	Pre - test (n=30)				Post-test (n=30)			
	Adequate		Inadequate		Adequate		Inadequate	
	f	%	F	%	f	%	f	%
Knowledge	3	10	27	90	29	96.6	1	3.3
Skill:								
Strip I	0	0	30	100	30	100	0	0
Strip II	0	0	30	100	29	96.6	1	3.3

Table 2:

Paired t-test showing Comparison of Pre-test and Post-test knowledge score of staff nurses on ABG Analysis *N* =30

Knowledge Score	Mean ± SD	t value	df	p value
Pre-test(K1)	11.9 ± 2.85			
Post-test(K2)	17.93 ± 5.45	9.50	29	.001

($t_{(29)}$=9.50*), p* < .05.

Table 3:

Paired t- test Showing Comparison of Pre-Test and Post-Test Skill for Strip I and Strip II

Skill Score		Mean & Standard Deviation	t value	df	p value
Strip I	Pre-test(P1a)	2.1±0.36			
(n=30)	Post-test (P2a)	4.2±0.63	14	29	.001
Strip II	Pre-test(p1b)	2.53±0.58			
(n=30)	Post-test (p2b)	4.76±0.59	20.2	29	.001

Table 4:

Association between Knowledge Level of Staff Nurses and Selected Variable *N*=30

Demographic variables	Pre-test Knowledge		Chi-Square	df	p value
	Adequate	Inadequate			
Age					
20-30 years	0	18			
31-40 years	3	9	5	1	.02
Gender					
Male	0	9		1	
Female	3	18	1.42		.23
Educational qualification					
General Nurse Midwife	0	6			
B Sc. Nursing	1	11			
Post Basic B Sc. Nursing	2	10	1.29	2	.52
Area of posting for the staff nurses					
Intensive Care Unit	0	9			
Semi Intensive Care Unit	0	5			
Neonatal Intensive Care Unit	2	8	2.96	3	
High Dependency Unit	1	5			.39
Exposure to In-service education program					
Yes	1	10			
No	2	17	0.01	1	.89

correlation (r = .77) between the pre-test knowledge and the pre-test skill regarding ABG Analysis. Hence, it is concluded that knowledge and skill are dependent of each other.

Significant association was found between the knowledge of staff nurses regarding ABG Analysis and the age as depicted in Table 4.

Data in Table 4 depicts that knowledge level of staff nurses was independent of demographic variables like age, gender, and educational qualification.

Discussion

The present study attempted to assess the effectiveness of pocket reference on ABG analysis among the staff nurses working in critical care units. In the present study during the pre-test it was found that 90% of the staff nurses had inadequate knowledge regarding ABG analysis, similar finding was reported by Youssef, Yahia, Ali & Elhabashy, (2013) where 100% of the studied subjects demonstrated unsatisfactory knowledge and practical level in relation to ABG sampling.

It was found that the staff nurses had improved their knowledge and skill regarding ABG analysis and therefore the Pocket Reference on ABG analysis was found to be effective. This present study finding is supported by the findings of the study conducted by Corbridge (2008) where it was found that there was a significant improvement in ABG knowledge among the nurses after viewing the on-line module.

Conclusion

The ABG analysis and interpretation is a very important task of critical care unit nurses that they very often come across. Therefore, they must be skilled and knowledgeable to analyze and interpret it correctly. The present study found that the pocket reference was effective in improving knowledge and skill of nurses regarding ABG Analysis. Such training modules improve the skill of nurses that further lead to better patient care.

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