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BLOOD SAMPLING PROCESS: IMPACT OF NURSING TRAINING TOWARDS REDUCTION OF SAMPLE ERROR

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ABSTRACT

Background: The most common sources of error in the pre analytical phases are considered to be at the stage of patient preparation and sample collection. In order to reduce the pre analytical errors, we aimed to determine the level of nurse's knowledge about the pre analytic phase before and after planned training. ***Materials and Methods***: This descriptive study was conducted among 100 staff nurse in Apollo hospitals, Guwahati. Purposive Sampling technique was used to select the required staff. The data was collected through structured knowledge questionnaire to assess the knowledge of the staff, an observational checklist to assess the compliance of the process and survey method to evaluate the impact of nursing training towards reduction of sample error. ***Results:*** The pre-test results depicted that majority 41% of the staff had good knowledge regarding sampling process, 37% had fair knowledge, 18% had excellent knowledge and 4% had poor knowledge. The post test results depicted that majority of the staff, 69% had excellent knowledge, 28% had good knowledge and 3% had fair knowledge. The compliance rate assessed based on 16 criteria showed 97% compliance to sampling process. The study also revealed that there was significant reduction in the total number of sample error post training on phlebotomy from 34 sample errors (Jan – March 2022) to 9 sample error post training (April-June 2022). ***Conclusion***: The findings of the present study concluded that the majority of the staff had good knowledge regarding blood sampling process but the practice carried out by the staff were not fully compliant towards reduction of sample error. Yet there was a significant reduction of blood sample error reported from phlebotomy department.

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INTRODUCTION

In this era of medical practice, the number of patients seeking advice for their medical issues is growing on every day basis. With this increasing figure, the number of clinical investigations and medical tests being offered to the patients are also increasing. Laboratory test contribute the vital role toward patient health in which, diagnostic and therapeutic decision rely on. Adequate preparation of patient, specimen collection, and handling are essential requirements for accurate test results.[1] According to National Cancer Institute (NCI), blood draw is a procedure in which a needle is used to take blood from a vein, usually for laboratory testing. It is also called as phlebotomy and venipuncture. Blood sampling is one of the most prevailing procedure done in every healthcare setting for diagnostic evaluation and prognostication.

The three main phases in laboratory testing include pre-analytical, analytical and post-analytical. Of these, the pre-analytical phase is the major source of errors in lab tests. The variables of pre-analytical phase include collection of specimen, handling and processing. Since the blood collection is the first step, any error in this step will jeopardize the whole test results, no matter how accurately these are analyzed in the laboratory[2].Inappropriate pre-analytical procedures of collection, handling or storing blood samples may results in hemolysis, making reliability of the results doubtful.[3] Step wise methodical venous blood sampling has an assurance to complete satisfactory clinical diagnosis and suitable treatment plan may only be designed according to the outcome of the tests.[4] Pre-analytic errors account for 60% to 75% of all lab errors. These errors happen before the specimen even reaches the laboratory, usually during collection period. These errors might lead to incorrect laboratory reports which can seriously impact in patient's treatment which might threaten the

precious life of patient. Common errors in blood sample collection include incorrect identification, wrong tube, insufficient sample quantity, clotting, hemolysis, and contamination[2]. Some studies have found that there are higher error rates in blood samples when collected by nurses and other non-laboratory personnel. This happens not from nurses' lack of ability but from their lack of knowledge and adherence to laboratory collection practices. Though many factors are considered during blood collection, the chance of error is high unless nurses are well educated about the procedure[2]. To reduce this risk of sampling errors, all staff undertaking phlebotomy must receive training and competence assessment. These training should state the importance of blood sample collection from a free flowing venipuncture site, the tube filled to capacity and adequately mixed. The phlebotomist must complete the tube label before leaving the patient, checking that the identification details are correct verbally with the patient and against the identification wristband or equivalent[5]
Title: Blood Sampling process: Impact of nursing training towards reduction of sample error.

Objective of the study

1. To identify the sample errors.
2. To assess the compliance of blood sampling process.
3. To evaluate the knowledge of nurses and impact of nursing training towards reducing sample errors.

MATERIALS AND METHODS

A descriptive study was carried out on Blood Sampling Process among the staff nurse and patients in Apollo Hospitals, Guwahati, India.

Research Approach: Quantitative approach.

Research Design: Quasi experimental study.

Study Setting: The study was conducted in Apollo Hospitals Guwahati.

Duration of the study: 3 months.

Sample Size: 100 Staff nurse.

Sampling Method: Purposive Sampling.

Inclusion criteria: Staff Nurse working in Apollo Hospitals, Guwahati.

Exclusion criteria: Nursing personnel who are not direct patient care providers.

Procedure methodology & Data Collection method: Before starting the data collection, detail information about the study was shared among the participants. Informed consent were obtained before proceeding to collect data. Based on the objectives of the study, two tools were used to gather necessary data from the sample. Sample error numbers were gathered from incident management system.

1. **Structured knowledge questionnaire**: To assess the knowledge of the staff on sampling process, pre-test using structured knowledge questionnaire comprising of 16 multiple choice questions with a score of '1' against each correct answer and '0' against the incorrect answer was applied.

Post training, knowledge of staff was reassessed using the same tool.

Knowledge score level was graded as –

Excellent	≥13
Good	9-12
Fair	5-8
Poor	≤ 4

Maximum score=16
Minimum score=0

2. **Observational Checklist**: The checklist contains 16 points against which '1' score is given for compliance and '0' for non-compliance.

Statistical Methodology: Data analysis was done with the help of descriptive statistics after collection.

RESULTS

The data was organized, analyzed and presented as:

Section I: Findings related to knowledge score of the staff nurse regarding sampling process

The knowledge score obtained by the staff on pre-test ranges from 3-15 and score of post-test range between 8-16.Out of a total score of 16 with a mean of 9.48 in pre-test and 13.32 in post-test and median 10 in pre-test and 14 in post-test. The standard deviation of pre-test calculated was 3.08, post-test Standard deviation calculated was 1.93 which shows that there was mild dispersion of the knowledge score.

Table 1. Distribution of range, mean, median and standard deviation of knowledge score of the staff regarding sampling process

n=100

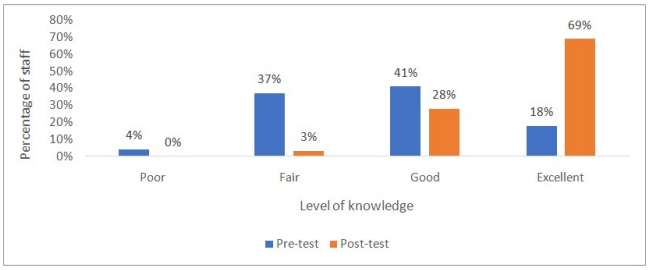
Variable	Range	Mean	Median	Standard deviation
Pre-test Knowledge	3-15	9.48	10	3.08
Post-test knowledge	8-16	13.32	14	1.93

The pre-test results depicted that majority 41% of the staff had good knowledge regarding sampling process, 37% had fair knowledge, 18% had excellent knowledge and 4% had poor knowledge. The post test results depicted that majority of the stay 69% had excellent knowledge, 28% had good knowledge and 3% had fair knowledge.

Table 2: Frequency and percentage distribution of knowledge assessment of the staff nurse

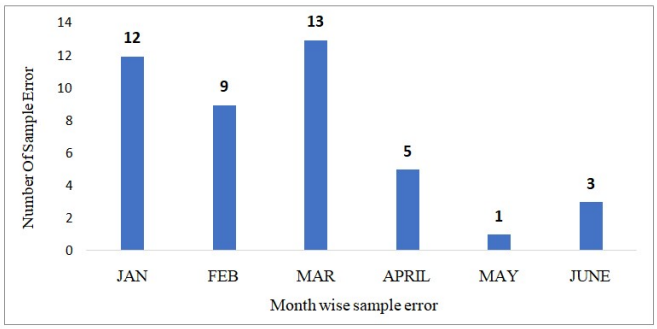
n=100

Level of knowledge	Pre-test Frequency	Percentage (%)	Post-test Frequency	Percentage (%)
Poor	4	4%	0	0%
Fair	37	37%	3	3%
Good	41	41%	28	28%
Excellent	18	18%	69	69%



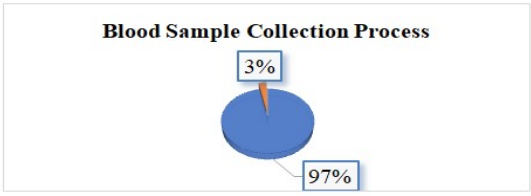
Graph 1. ***Graph showing knowledge score of the staff regarding sampling process***

Section II: Findings related to compliance rate of the staff in practice of sampling process (refer graph 2): The compliance rate was assessed based on 16 criteria, the result of the present study showed 97% compliance to sampling process whereas 3% non-compliance.



Graph 2. Graph showing compliance rate of staff to blood sampling process

Section III: Findings related to reduction in sampling error. (Refer graph 3): Incidences of Sample error was assessed from January to June 2022. The analysis showed significant reduction in sample error post training of staff on phlebotomy.



Graph 3. Graph showing sample error from January 2022 – June 2022

DISCUSSION

Blood sampling is one of the most prevailing procedure done in every healthcare setting for diagnostic evaluation and prognostication. Although a huge numbers of samples are collected for different investigation however lack of appropriate knowledge of blood sampling process make the samples inappropriate for testing.[6] In the clinical laboratory, the pre analytical phase errors accounts for up to 60-70 % of total laboratory errors; 26% of these may have detrimental effects on patient care, which leads to unnecessary investigations or inappropriate treatment, increase in lengths of hospital stay ultimately can result in patient's dissatisfaction with healthcare services.[7] The major findings of the study were discussed in relation to findings of the other studies.

Section I: Findings related to knowledge score of the staff nurse regarding sampling process (refer graph 1, table 1): The pre-test results depicted that majority 41% of the staff had good knowledge regarding sampling process, 37% had fair knowledge, 18% had excellent knowledge and 4% had poor knowledge. The post test results depicted that majority, 69% of staff had excellent knowledge, 28% had good knowledge and 3% had fair knowledge. These findings were supported by the results of the study conducted by Mumtaz Abbas, Mosedi Namane on "The effect of phlebotomy training on blood sample rejection and phlebotomy knowledge of primary health care providers in Cape Town : a quasi-experimental study (2017)" which revealed that post training on phlebotomy, the average knowledge score of health care providers increased from 63% to 96% at Community health center A, 58% to 93% at Community Health Center B.[8]

Section II: Findings related to compliance rate of the staff in practice of sampling process (refer graph 2): The compliance rate was assessed based on 16 criteria. The result of the present study showed 97% compliance to sampling process whereas 3% non-compliance.

The findings of the study is supported by the results of the study conducted by Aykal Guzin,Esen Hatice,yegin ayesenur on "The results of a close follow-up of trainees to gain a good blood collection practice" which found there was 96% compliance to sampling process after the training on phlebotomy,4% non-compliance to sampling process.

Section III: Findings related to reduction in sampling error: The findings of the study showed that there was significant reduction in the total number of sample error post training on phlebotomy from 34 sample errors (Jan – March 2022) to 9 sample error post training (April-June 2022). These findings were supported by the results of the study conducted by Hijab Batool on "Impact of Supervised Phlebotomy Training Programme on Performance Skills of Phlebotomy Staff (2017)." The study revealed that there was significant reduction in sample error post training, the number of sample errors were 419 in a six month period before the training period which was reduced to 159 errors in six months after training.[9]

CONCLUSION

The findings of the present study concluded the majority of the staff had good knowledge regarding blood sampling process but the practice carried out by the staff were not fully compliant towards reducing sample error, yet there was a significant reduction of blood sample error reported from phlebotomy department. However, further interventions and re-interventions are highly required so as to adhere to the standardized process and prevent errors in the near future. To sustain the practices among nurses in order to prevent sample error few practices are continuously in placed, i.e. process check by charge nurses and above, continuous training to reinforce the staff on sample collection process and discussion about the incidences (near-miss) are the major one.

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