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A STUDY OF PREANALYTICAL ERRORS IN THE CLINICAL BIOCHEMISTRY LABORATORY OF A MEDICAL COLLEGE HOSPITAL

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ABSTRACT

Pre-analytical phase is the most common source of errors in current laboratory practice. With the advent of technology that can implement high quality standards, the frequency of analytical errors has decreased. The aim of our study was to find out the prevalence of preanalytical errors relating to the request forms and sample quality in the clinical biochemistry laboratory of a Medical College Hospital. 4602 samples and their accompanying request forms from the in-patient and out-patient departments were included in the study. Request forms and samples were scrutinized for errors and the results were analysed. The overall prevalence of preanalytical errors was 55.7%, out of which 54.6% was related to request forms and 1.1% was related to specimen collection. Missing clinical diagnosis was the most common error(54.49%)related to request forms. Incomplete filling of request forms appears to be the most prevalent form of preanalytical errors, which can be attributed to lack of awareness among the health care professionals. This being easily preventable, there is an urgent need to sensitize the health professionals regarding the importance of properly filling the request forms.

KEY WORDS : Preanalytical errors, request forms, specimen, clinical chemistry.

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INTRODUCTION

An efficient and accurate laboratory service plays an important role in the modern health care system. Laboratory testing is a complex error prone process consisting of pre analytical, analytical and post analytical phases. A laboratory error may be defined as "any defect from ordering tests to reporting the results and appropriately interpreting and reacting on these".[1] The frequency of laboratory errors varies widely, and has been reported to range from 1 in 164 to1 in 330 events or laboratory results.[2] Though errors can occur at any phase, advances in instrumentation and automation has minimised the errors in the analytical phase and hence extra-analytical phases are currently the major sources of laboratory errors, of which the pre-analytical phase has the highest rate.[1-4]This high prevalence has forced individual laboratories collect data on their errors rates and to devise strategies to minimise them. Erroneous request forms and erroneous samples are important contributors to the errors in the preanalytical phase.[4-10] Hence this study was undertaken to find out the prevalence of these errors in the preanalytical phase in our Clinical Biochemistry Laboratory.

MATERIALS AND METHODS

This prospective study was carried out at the Clinical Biochemistry Laboratory of Chennai Medical College Hospital and Research Centre, Trichy over a period of two months . Requests for laboratory testing in our hospital are made by manually filling the printed requisition forms. Blood samples are collected by qualified technicians in a centralised collection centre using disposable syringes with hypodermic needles(open system). They are then transferred into the appropriate containers and then transported to the clinical biochemistry laboratory. In patients have their blood samples collected in the wards by the nursing staff and the samples are then sent to the laboratory. During the study period, 4602 samples from both the inpatient and outpatient departments and their accompanying request forms were included for the study. Samples from inpatients and outpatients were considered together. The request forms were carefully scrutinized for the presence of the information shown in table 1.Due permission was obtained from the Institutional Ethical committee for this study.

Table 1
List of information looked for in request forms

S NO	INFORMATION
1	Patients name
2	Patients age
3	Gender
4	Hospital identity number
5	Location (ward in case of inpatients and address in case of outpatients
6	Clinical diagnosis

The samples included in the study were screened independently by two qualified technicians. Firstly, the blood samples were inspected for their adequacy and whether they had been collected in appropriate containers. Then, after centrifugation the samples were checked for the presence of hemolysis and lipemia. In case of a disagreement, it was resolved by the laboratory physician. Whenever the analysis revealed grossly discrepant results, the possibility of the sample being diluted with IV fluids was clarified with the ward staff. The data were analysed by simple descriptive statistics using Microsoft excel software.

RESULTS

The results are shown in tables 2 and 3.

Table 2
Analysisof request forms(n=4602)

S.No	Information	Number of forms without the information	Percentage of forms without the information
1	Name	1	0.02
2	Age	33	0.71
3	Gender	81	1.76
4	Location	238	5.17
5	MRD no.	120	2.60
6	Diagnosis	2508	54.49

Table 3
Analysis of samples(n=4602)

S.No	Pre analytical error	Number of samples with the error	Percentage of samples with the error
1	Haemolysis	38	0.825
2	Lipemic sample	8	0.173
3	Insufficient sample	7	0.152
4	Samples diluted with IV fluids	2	0.04
5	Inappropriate container	0	0

All the specimens had been collected in appropriate containers. There were no inconsistency in identifying preanalytical errors among the technicians.

DISCUSSION

In our study, out of 4602 request forms, only one(0.02%) did not carry the patients name. Information about the age and gender were lacking in 0.71% and 1.76% of the request forms respectively.5.17% of request forms lacked details regarding the location of the patient. 2.6% of the request forms did not have patient's hospital identification number. The most frequently missing information in our study was the patient's clinical diagnosis and it was to the extent of 54.49%. The most frequent preanalytical error identified in the specimen was hemolysis being found in 0.83% of the samples. The second most common specimen related error made out in this study was lipemia at a frequency of 0.17%. Only two samples(0.04%) were admixed with IV fluids. Studies conducted by Neelam et al[11] in a neuropsychiatry Institute of North India and Adegoke et al[10] in a Nigerian hospital with regards to the completeness of the request forms had reported the following percentages as to the type of information missing in the request forms: 0% for name; 1.41% and 13.6% for information about age/date of birth; 1.32% and 0.2% for gender; 3.6% and 0.3% for location;0.99% and 4.4% for hospital number and 61.2% and 6.8% for diagnosis respectively. Jyothi Prakash Sapre et al[12] had reported a much less percentage of incomplete filling of request forms sent to a hematology and clinical pathology laboratory. With regards to specimen related errors, Lippi et al[13] had reported a hemolysis frequency of 0.77% and 0.38% for OP and IP respectively. Samples had been collected in inappropriate containers for 0.04% and 0.03% of OP and IP respectively in their study. Plebani et al[14] in their study in a stat laboratory reported that 20.6% of specimens had been collected from infusion route. Binita Goswami et al[4] reported a lipemia frequency of 0.7% and a frequency of 7.5% for insufficient sample.Manual filling of request forms can lead to insufficient information being provided.[6,7,9-11]In our study, only one form lacked the patients name which could probably be an oversight. Since, for many analytes the reference intervals are age and sex dependent, absence of these information can give rise to problems in validating the results. Information regarding the location of the patient helps a clinical chemist to communicate critical values and therefore its absence may lead to delays in initiating life saving measures. Hospital identification number, helps the laboratories to avoid misidentification problems. The most frequently missing information in our study was the patients clinical diagnosis. Knowledge of the clinical diagnosis helps a clinical chemist to validate the results and correlation of results with the clinical condition serves as a means of ensuring quality control. It also justifies the relevance of the requested tests. The absence of such information makes a clinical biochemist grope in the dark when an abnormal value is encountered and forces him to contact the requesting physician. This results in waste of time and manpower. The lack of information in the request form could either be due to the sheer volume of cases or lack of knowledge about their significance or inexperience or a casual attitude, among the requesting clinicians. Many of the request forms were found to have been filled by nursing staff which could well be another reason for their incompleteness. The lack of information regarding diagnosis may also be related to the collection of specimen immediately after admission. In our study the most frequent preanalytical error identified in the specimen was haemolysis which can occur when blood is collected before the alcohol disinfectant has evaporated from the skin, is collected with excessive aspiration force, is rapidly forced through a large bore needle, when the blood containing tube is shaken vigorously and when the specimen is centrifuged before the clotting process is complete. Presence of haemolysis can cause optical interference during analysis and also can affect the concentration of analytes which are present intracellularly at different levels. The presence of haemolysed specimens indicates the lack of knowledge about this variable among the phlebotomists or noncompliance with the standard blood collection protocol. The second most common preanalytical error made out in this study was lipemia which may be due to sample collection after food intake or the individual suffering from dyslipidaemias. It can cause light scattering and therefore interfere with analysis. The presence of hemolysis or lipemia necessitates obtaining a fresh specimen. This could potentially be harmful for critically ill patients as the turn around time gets prolonged. It also adds to laboratory waste and expenditure. Collection of specimen from infusion routes results in dilution of the blood sample and hence a false decrease in the analytes' concentration. the All the samples have been collected in the appropriate containers using proper anti-coagulants wherever necessary. This reflects that the phlebotomists were aware about these factors. The strength of the study are that this is a prospective study carried

out without informing the health professionals(doctors and nurses), phlebotomists and that verification of the data and identification of errors were carried out by two senior technicians independently under the supervision of laboratory physician. The limitations are the non-identification of the persons responsible the errors, non-analysis of the impact of the errors on patients.

CONCLUSION

Incomplete filling of request forms appears to be the most prevalent form of preanalytical errors. Providing clinical laboratories with the necessary information help avoid time delays and confusion in managing patients. Also, it aids the laboratories in their quality control programmes and helps them avoid wastage. This study highlights the urgent need for sensitising the health care professionals about these facts and help hospitals improve their service.

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CONFLICT OF INTEREST

Declared none.

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