Assessment of Biochemistry Laboratory Requisition Forms as a Contributory Factor to Preanalytical Errors in a Tertiary Care Teaching Hospital

Kapil Bhatia[1], Pallavi Bhatia[2], Manasvi Praveen Kumar[3]

ABSTRACT

Introduction: A general belief is that laboratory error occurs mostly in the analytical phase, however contrary to this errors occurring in pre-analytical phase are high and a major contributor to this is incomplete filling of the laboratory requisition forms. Incomplete information on the laboratory forms sometimes delays the communication with clinician which is important in life threatening medical conditions. Most of the studies have focused on the other aspects of pre-analytical errors and the emphasis on adequate filling of laboratory form is less. This study was undertaken to completely assess the biochemistry laboratory requisition forms received in a tertiary care teaching hospital.

Material and Methods: The study was designed to assess incomplete filling of biochemistry laboratory requisition forms as a contributory factor to pre-analytical errors. It was explorative and prospective study. Quality indicators were used to estimate the errors in filling up the laboratory forms.

Results: Of 865 requisition forms maximum error was seen in lack of information in clinical notes accounting to 58.80 %, followed by error in writing the age accounting to 36.99 %. Trends were similar in the laboratory forms received from Medicine, Surgery, Obstetrics and Gynecology and Pediatrics OPD's.

Conclusion: Our study shows there is need to understand the importance of filling the laboratory requisition form which can be achieved by proper sensitization of all personnel dealing with them through repeated education with special focus on quality indicators so that the errors related to incomplete filling up of the forms can be reduced to minimum.

Keywords: Preanalytical phase, Requisition form, Preanalytical errors

INTRODUCTION

Clinical laboratory testing comprises of three phases, the pre-analytical, analytical and post-analytical phase.[1] A general belief is that laboratory errors occurs mostly in the analytical phase, however advances in information technology, instrumentation, analytical techniques adopted and focus on quality control methods has lead to drastic reduction of the analytical errors in past decades.[2,3] Contribution of errors occurring in the pre-analytical and post-analytical phase is high. Pre-analytical phase which includes completion of laboratory requisition form, drawing of sample, sample handling and transportation of sample to laboratory itself contributes to 68.2 % of errors.[2,4,5] Among the various causes of pre-analytical errors, a major contributor is incomplete filling of the laboratory requisition forms accounting to 43%.[6] Incomplete information on the laboratory requisition forms sometimes makes interpretation of results complex and delays the communication with the clinician.[7] The problem is further compounded in patients with life threatening medical conditions in which the critical results have to be dispatched without delay.[8] Most of the studies have focused on the other aspects of pre-analytical errors and the emphasis on adequate filling of laboratory form is less. This study was undertaken to completely assess the biochemistry laboratory forms received in a tertiary care teaching hospital.

MATERIAL AND METHODS

The study was designed to assess the biochemistry laboratory requisition forms as a contributory factor to pre-analytical errors in a tertiary care teaching hospital. It was a explorative and prospective study. The study was conducted in Biochemistry laboratory of Bharati Hospital and Research Centre, Pune. Duration of the study was between 29/09/2015 to 12/10/2015 and all the OPD forms coming to the biochemistry laboratory between 09:00 AM to 04:00PM were included. Institutional ethical committee clearance was accorded to the study. Patient's confidentiality was maintained. International federation of clinical chemistry and laboratory medicine (IFCC) Working Group on Laboratory Errors and Patient Safety (WG-LEPS) Quality indicators were used to estimate the errors in filling up the laboratory requisition form.[9-11]

Standard parameters in the tool and analysis criteria

Name: Name having first and last name both was not considered error and given score 1(yes). If any component was found missing, it was considered as error and was scored 0 (no).

Age: If age was written with units like years/months/days then it was not considered as error and scored as 1 (yes). If unit was found not written, considered as error and scored as 0 (no).

Gender: If gender male / female was written, not to be considered error and scored 1 (yes). If not written was scored as 0 (no).

OPD No: The form with OPD No written was not considered to be an error and was given the score 1(yes), the form without OPD No was considered as error and given score 0 (no).

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Legible handwriting: If lab requisition form was easily readable to researcher without any extra effort was not considered as error and scored as 1(yes). If not readable easily considered as error and scored as 0 (no).

Clinical notes: If clinical notes were found written, not considered as error and scored 1 (yes). If clinical notes found absent, considered as error and scored as 0 (no).

Diagnosis: If diagnosis of patient was written, it was not considered as error and scored as 1 (yes). If diagnosis was not written, it was considered as error and scored as 0 (no).

Standard Abbreviation: If standard abbreviation was written. It was not considered as error and scored as 1 (yes). If it was not written in form, it was considered as error and scored as 0 (no).

Doctor's name: If name was having first and last name both was not considered error and given score 1(yes). If any component was found missing, considered as error and scored 0 (no).

Doctor's signature: Lab requisition form with doctor's signature was not considered as an error and was given the score1 (yes), lab requisition form without doctor's sign was considered as error and scored as 0 (no).

STATISTICAL ANALYSIS

The information provided on laboratory requisition form was recorded on day to day basis in Microsoft Excel spread sheet windows 7 and evaluated using software package used for statistical analysis (SPSS) version 21. The results were interpreted as percentages, Defects per million (DPM), Sigma value and Sigma based performance level.

Calculation of performance as per sigma metrics –

DPM = (number of errors × 10,00,000)/total number of specimens

The DPM rate was converted to a sigma value based on calculators available online (http://www. westgard.com/six-sigma-calculators-2.htm.)

Performance levels based on the sigma metrics evaluation were used to compare our laboratory results

1. Very good: ≥ 5.0 sigma
2. Good: 4.0-<5.0 sigma
3. Minimum: 3.0-<4.0sigma
4. Unacceptable: <3.0 sigma

RESULTS

A total of 865 OPD requisition forms were included in the study. Out of 865 forms 245 requisition forms were from medical OPD, 163 requisition forms were from surgical OPD, 246 were from Obstetrics and Gynecology OPD, 85 forms were from Pediatrics OPD and rest 126 requisition forms were from various other OPD'S.

Of 865 requisition forms maximum error was seen in lack of information in clinical notes accounting to 58.80 %.This was followed by error in writing the age accounting to 36.99 %. as shown in Table 1 and Figure 1.

Besides the percentage error, DPM value, Sigma value and Sigma based performance were calculated and shown in various tables.

The maximum error from the medicine OPD requisition forms was seen in clinical notes accounting to 63.26 % followed by errors in writing the age accounting to 48.7 % as shown in Table 2 and Figure 2.

The trend of error from Surgical OPD which accounted for 163 forms were similar to medical OPD with maximum error of 48.41 % seen in not filling the clinical notes, followed by 33.74 % having error in proper filling the age related information as shown in Table 3 and Figure 3. Table 3 also includes the DPM value, sigma value and Sigma based performance of the quality indicators.

Requisition forms from Obstetrics and Gynecology were maximum accounting to 246.The maximum error was seen in writing the clinical notes upto 76.42 %. Second to follow was not correctly writing the age column accounting to 41.86 % as shown in Table 4 and Figure 4. Table 4 also includes the DPM value, sigma value and Sigma based performance of the quality indicators.

The data from Pediatrics OPD shows results similar to the results from the previous three OPD services with 38.82 % forms without filling the clinical notes, followed by age accounting to 15.29 % as shown in Table 5 and Figure 5. Table 5 also includes the DPM value, sigma value and Sigma based performance of the quality indicators. The data from Other OPD's shows that in 35.71 % forms the clinical notes were not provided, followed by age which was not provided correctly in 23.01 % of requisition forms as shown in Table 6 and Figure 6.

DISCUSSION

Pre-analytical phase of laboratory comprises of completion of laboratory requisition form, drawing of sample, sample handling and transportation of sample to the laboratory before its distribution within the laboratory.[12,13] It is the obligation of health care provider to give the complete information about the patients name, age, gender, OPD No., clinical notes, diagnosis, use of standard abbreviation, doctors name and signature in a clear and legible handwriting.

In our study (n=865) it was seen the most common error was not filling up the clinical notes which accounted to 57.80 %. This error was also highest if the main OPD departments were considered separately i.e. in Medical OPD (n=245) 63.26 % requisition forms were without clinical notes, Surgical OPD (n=163) 48.41 % requisition forms were without clinical notes, Obstetrics and Gynecology OPD (n=246) 76.42 % requisition forms were without clinical notes and was the highest among all the departments, Pediatrics OPD (n=85) 38.82 % requisition forms were without clinical notes, other OPD'S (n=126) 35.71 % were without the clinical notes. These results in our study were consistent with studies of Karunanandham et al[14], Nutt et al[15] and Nakhleh et al.[16] If clinical notes are written in the laboratory requisition form then it becomes easy for the laboratory physician to interpret the results especially which are abnormally high or low and allows them to dispatch the report quickly without consulting the clinician. This becomes very important if the patient is critically ill. This not only helps in providing the treatment at the earliest, it also reduces the rerun of the test and saves on the finances of the laboratory.

The second most common error seen in our study was not filling the age or the age was written without the units like years/months/days. This accounted to 36.99 % of the total errors. Among the various OPD'S the age error was highest in the requisition forms from medicine OPD. Writing the age

S.No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	865	17	1.96%	19653	3.6	Minimum
2	Age	865	320	36.99%	369942	1.9	Unacceptable
3	Gender	865	134	15.49%	154913	2.6	Unacceptable
4	OPD No.	865	19	2.19%	21965	3.6	Minimum
5	Legible Handwritting	865	14	1.61%	16185	3.7	Minimum
6	Clinical notes	865	500	57.80%	578035	1.4	Unacceptable
7	Diagnosis	865	29	3.35%	33526	3.4	Minimum
8	Standard Abbreviation	865	29	3.35%	33526	3.4	Minimum
9	Doctor Name	865	36	4.16%	41618	3.3	Minimum
10	Doctor Sign	865	36	4.16%	41618	3.3	Minimum

Table-1: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from all OPD

S. No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	245	8	3.26%	32653	3.4	Minimum
2	Age	245	120	48.97%	489796	1.6	Unacceptable
3	Gender	245	40	16.32%	163265	2.5	Unacceptable
4	OPD No.	245	9	3.67%	36735	3.3	Minimum
5	Legible Handwritting	245	6	2.44%	24490	3.5	Minimum
6	Clinical notes	245	155	63.26%	632653	1.2	Unacceptable
7	Diagnosis	245	14	5.71%	57143	3.1	Minimum
8	Standard Abbreviation	245	14	5.71%	57143	3.1	Minimum
9	Doctor Name	245	18	7.34%	73469	3	Minimum
10	Doctor Sign	245	18	7.34%	73469	3	Minimum

Table-2: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from Medicine OPD

S. No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	163	1	0.61%	6135	4.1	Good
2	Age	163	55	33.74%	337423	2	Unacceptable
3	Gender	163	18	11.04%	110429	2.8	Unacceptable
4	OPD No.	163	0	0	0	>5	Very good
5	Legible Handwritting	163	1	0.61%	6135	4.1	Good
6	Clinical notes	163	79	48.46%	484663	1.6	Unacceptable
7	Diagnosis	163	2	1.22%	12270	3.8	Minimum
8	Standard Abbreviation	163	2	1.22%	12270	3.8	Minimum
9	Doctor Name	163	1	0.61%	6135	4.1	Good
10	Doctor Sign	163	1	0.61%	6135	4.1	Good

Table-3: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from Surgery OPD.

S. No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	246	8	3.25%	32520	3.4	Minimum
2	Age	246	103	41.86%	418699	1.8	Unacceptable
3	Gender	246	69	28.04%	280488	2.1	Unacceptable
4	OPD No.	246	10	4.06%	40650	3.3	Minimum
5	Legible Handwritting	246	6	2.43%	24390	3.5	Minimum
6	Clinical notes	246	188	76.42%	764228	0.8	Unacceptable
7	Diagnosis	246	5	2.03%	20325	3.6	Minimum
8	Standard Abbreviation	246	5	2.03%	20325	3.6	Minimum
9	Doctor Name	246	15	6.09%	60976	3.1	Minimum
10	Doctor Sign	246	15	6.09%	60976	3.1	Minimum

Table-4: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from Obstetrics and Gynecology OPD

S. No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	85	0	0.00%	0	>5	Very good
2	Age	85	13	15.29%	152941	2.6	Unacceptable
3	Gender	85	0	0	0	>5	Very good
4	OPD No.	85	0	0	0	>5	Very good
5	Legible Handwritting	85	1	1.17%	11765	3.8	Minimum
6	Clinical notes	85	33	38.82%	388235	1.8	Unacceptable
7	Diagnosis	85	7	8.23%	82353	2.9	Unacceptable
8	Standard Abbreviation	85	7	8.23%	82353	2.9	Unacceptable
9	Doctor Name	85	1	1.17%	11765	3.8	Minimum
10	Doctor Sign	85	1	1.17%	11765	3.8	Minimum

Table-5: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from Pediatrics OPD

S.No.	Quality Indicator	Total no of lab forms	Total no of errors	Error in percentage	DPM Value	Sigma Value	Sigma based performance level
1	Patient's Name	126	0	0.00%	0	>5	Very good
2	Age	126	29	23.01%	230159	2.3	Minimum
3	Gender	126	07	5.55%	55556	3.1	Minimum
4	OPD No.	126	0	0.00%	0	>5	Very good
5	Legible Handwritting	126	0	0.00%	0	>5	Very good
6	Clinical notes	126	45	35.71%	357143	1.9	Minimum
7	Diagnosis	126	1	0.79%	7937	4	Good
8	Standard Abbreviation	126	1	0.79%	7937	4	Good
9	Doctor Name	126	1	0.79%	7937	4	Good
10	Doctor Sign	126	1	0.79%	7937	4	Good

Table-6: Showing total errors, error percentage, DPM value, sigma value and sigma based performance level as per the Quality indicators in Laboratory Requisition Forms from Other OPD

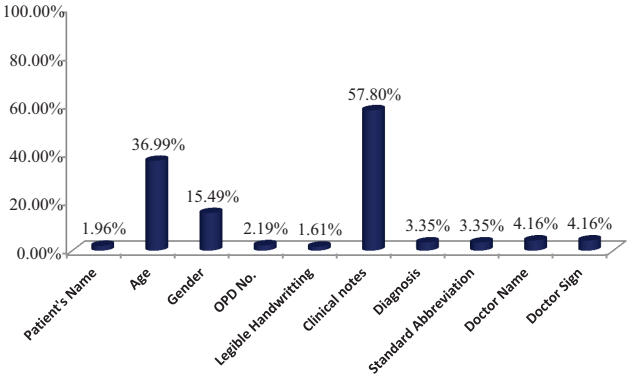

Figure-1: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from all OPD

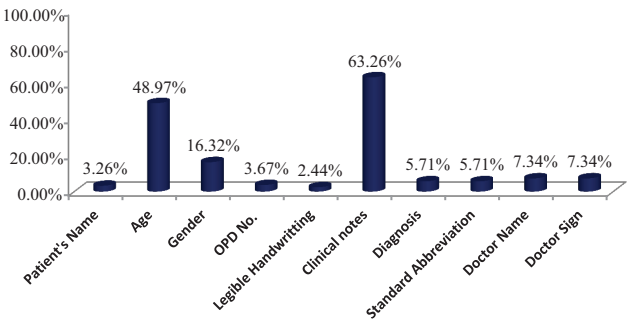

Figure-2: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from Medicine OPD

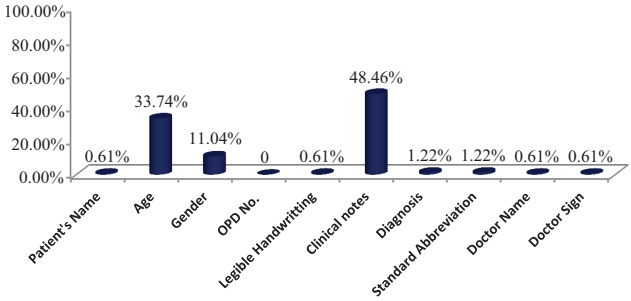

Figure-3: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from Surgery OPD

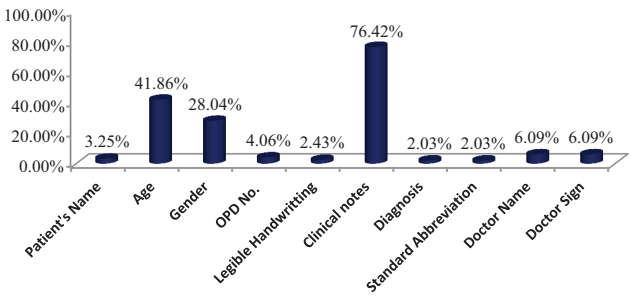

Figure-4: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from Obstetrics and Gynecology OPD

correctly is important because for many biochemical parameters the normal range changes with the age of the patient. Our results were consistent with the study carried by Oyedeji et al.[17] Total error related to gender in our study was 15.49 % with maximum error from the Obstetrics and Gynecology OPD which shows that it is assumed that the requisition forms from Obstetrics

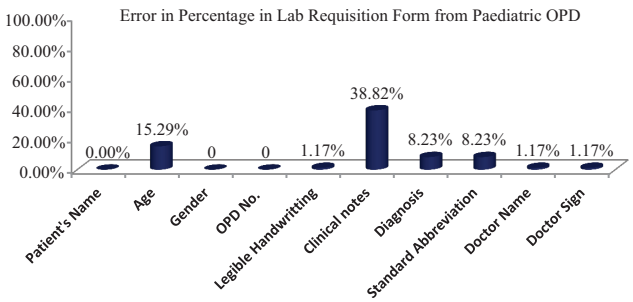

Figure-5: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from Pediatrics OPD

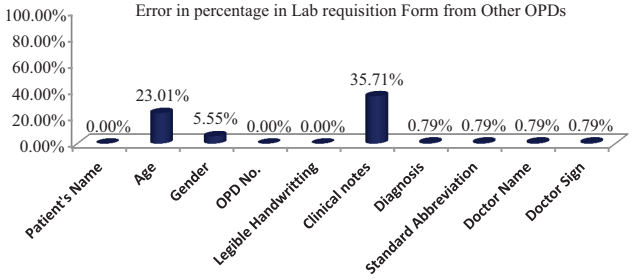

Figure-6: Graphical presentation of total errors as per the Quality indicators in Laboratory Requisition Forms from Other OPD

and Gynecology OPD will be from females. Minimum error of gender was seen from the pediatrics OPD requisition forms. Interestingly in our study the least common error was legible handwriting which accounted to only 1.61 % only. Our results related to legible handwriting were consistent with Adegoke O A et al[8] study which showed error of 2.7 %. The reduced percentage of error in our study was also comparable to the study conducted by Chawla et al[18] which showed the percentage error of 0.1 % only. This shows in spite of busy schedules of doctors the handwriting of doctors was clear and legible. In our study the errors related to Patients name and OPD No were 1.96 % and 5.20 % respectively. Our results were consistent with the study carried by Gyawali et al[19] which showed error in writing name of patient to be around 0.142 %. This information becomes important if two patients have similar names. The error related to not writing the standard abbreviations in our study was 3.35 %. This is important aspect of filling the laboratory form as non standard abbreviations are difficult to decipher both by laboratory physician and laboratory paramedic staff. This wastes lot of time especially if the results are highly abnormal. With the introduction of rubber stamp the error related to doctors name and signature have come down. In our study these errors were 4.16 % both for doctors name and signature. Our study is consistent with the study carried by Adegoke O A et al[8] which shows that in only 4.3 % cases doctors name was not written on the requisition form as compared to the study by Khoury et al[20] which showed that doctors name cannot be identified in 17 % of the cases. Providing doctors name on the requisition forms helps the laboratory physician to contact the clinician in case of requirements like informing the critical reports immediately, discussion related to some medical aspects so that the treatment can be started at the earliest and patient is benefitted. This makes the communication between the laboratory physician and clinician much more closer.

CONCLUSION

Performance in the Pre-analytical phase can be quantified by using Quality indicators irrespective of whether they are expressed as percentage error, DPM value, Sigma value or Sigma based performance level. Our study shows there is need to understand the importance of filling the laboratory requisition form. This can be achieved by proper sensitization of all personnel dealing with the laboratory requisition forms through repeated education with special focus on all Quality indicators and their importance so that the pre-analytical errors as a result of incomplete filling of laboratory forms can be reduced to minimum. Besides this laboratory should be firm in their sample rejection criteria's. Thus working on both these areas will help the laboratories to improve their services.

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