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Test requisition form- A check point in pre-analytical phase for laboratory errors

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ABSTRACT

Introduction: Quality in clinical laboratories cannot be understood by merely focusing on analytical aspects only; there is a need to put attention on pre-analytical and post-analytical aspects of laboratory testing to improve overall quality of laboratory diagnosis. In this study we try to evaluate the contribution of incompletely filled test requisition form in pre-analytical phase and how this error could be minimized which ultimately results into minimizing error in pre-analytical phase so to improve the quality of TTP. **Objective:** This study was designed to study the incomplete test requisition forms (TRF) received from different in-patient department (IPD) wards of hospital in biochemistry section of clinical chemistry laboratory (CCL) of hospital. **Materials and Methods:** Total 7671 TRF were in biochemistry section CCL from different IPD wards of hospital for the period of 3 months March to May-2015. Thereafter intervention, training was given and again the same error were observed, recorded, analyzed and compared for in 7843 TRF in 3 months from June to August-2015.**Results:** Total incomplete entry error in TRF during the pre-analytical phase of TTP was found to be 18.21 % in phase-1 before intervention which got reduced to 7.47 % in phase-2 after intervention. **Conclusions:** Therefore, clinicians and resident doctors should be made aware of consequences and results of not filling proper TRF and by introducing electronic test requisition entry they must be trained to adequately fill all the required information

Key Words: Incomplete, incorrect, laboratory test, pre-analytical phase, test request form, turnaround time

Introduction

Laboratory test performed in clinical laboratory is an important source of medical error that affects patient safety. [1-3] Therefore laboratory testing process must be constantly monitored and evaluated to ensure reliable test results for well-organized patient's supervision.

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There are three phases of total testing process namely: pre-analytical phase, analytical phase and post-analytical phase. As per International Organization for Standardization (ISO 15189:2007), pre-analytical phase definition begins from the starting step were the clinicians test order request including the examination, requisition, preparation of the patient, collection of the primary sample and transportation to and within the laboratory and ending when the analytical examination begins[4].From past few years there has been an increase concern seen towards quality improvement in laboratory testing and patient safety in health care. Accreditation agencies are expecting the clinical laboratories to take responsibilities towards the pre-analytical and post-analytical phases of total testing process where the most errors used to arise in comparison to the analytical phase.[5] Pre-analytical

and post-analytical phases are equally important for ensuring quality laboratory services,[6] but various study data shows that the laboratory errors primarily occur in pre-analytical phase, that influence patient safety and outcomes.[7, 8].Errors taking place in the pre-analytical phase almost account between 60 to 70 % [9] than the other phase's errors in the total testing process. This phase includes procedures which are not under the control of laboratory personnel and are performed outside the laboratory.

Though pre-analytical phase was less concerned and underestimated in the past decades, has emerged as highest phase errors taking place in total testing process due to human negligence, just before sample reaches the laboratory i.e. the preanalytical phase. [10-15] The test requisition form (TRF) is considered to be one of the foremost contact links between the laboratory personnel and the clinician. Incomplete or incorrect TRF is one of the major sources of error that comes under pre-analytical phase and it also affects the quality of total testing process. [16] When a clinician orders a laboratory test, a TRF is needed to be hand written or mark the test on TRF format and submitted along with samples to the laboratory. After analysis of sample for interpretation to be conclude from the laboratory test results is being communicated back to the clinician who has requested the test.[17]Incorrect or incompletely filled TRF with illegible handwriting along with test samples are retained by the clinical laboratory personnel which results into increases turnaround time for patients diagnosis, delay in treatment which makes communication delay with the test ordering clinician or may lead to misdiagnosis and wrong treatment which is a great concern towards patient safety in healthcare system.[18] Thus incomplete and incorrect test requisition forms represent a important problem for clinical laboratories and various approaches have been [6, 19] taken into consideration to solve this problem. The objective of this study was to compared, record, analyze and evaluate specific error related to incomplete TRF in the pre-analytical phase before and after intervention.

Materials and methods

This study was conducted over a duration of six months in, i.e., from March-2015 to August-2015 in the biochemistry section of clinical chemistry laboratory of Dhiraj Hospital. The hospital receives on an average more than 2.2 lakhs samples from in-patient department (IPD) per year from around which 60 % of samples are coming for biochemistry analysis. The study was divided in two different phase, one before intervention (March-2015 to May-2015) for three months and other for next three months (June-2015 to August-2015) after intervention. In the study total number of test requisition forms came to biochemistry section of CCL during phase-1 and phase-2 were included in the study after inclusion and exclusion criteria.

Inclusion criteria

Single requisition form filled for multiple departmental (pathological/microbiological) tests were considered.
Only blood samples for biochemistry section were taken into consideration.
Incomplete TRF with single or multiple deficient entries was considered after getting complete details.

Exclusion criteria

Fluid, urine samples coming for biochemistry section were not considered. Incomplete TRF was not considered along with sample if proper information was not available.TRF without payment slips or samples were not considered.

Data collection

Samples with filled test requisition forms (TRF) were received in the CCL receiving area for registration and numbering before being processed for analysis. TRF from the clinicians and along with specimen from the patients were checked at receiving area for the adequacy and appropriateness prior to analysis. TRF was visually verified for required information for the field that is filled correctly and completely as per the NABL guidelines. [20] In the study number of TRF was considered instead of samples size.

Table 1: Details of incomplete and incorrect TRF observed during the study

Incomplete or wrong name of patient
Age/months/days not mentioned
Gender not mentioned
Registration No. not written
No date of collection
No time of collection
Ward not mentioned
Incomplete or no clinical history
No medicinal history
Test mentioned incorrectly
Test mentioned in short forms
Test not mentioned
Type of specimen not defined
Priority of test not marked
Name of clinician not mentioned
Signature of clinician not done
Illegible handwriting

Entries of all the properly filled request forms with appropriate samples received were recorded and maintained in the sample receiving register while entries of incompletely and incorrectly filled TRFs (for biochemistry section) along with samples were recorded on the pre-analytical error study performa before intervention for first three months.

Similar entries were observed and recorded in the register after training related to errors as an intervention for next three months.

Results

During the study period, 7671 test requisition forms (TRF) were examined in Phase-1 (before intervention) and 7843 TRF was observed during phase-2 (after intervention). Recorded data were compiled in tabulated form (Table-2) and after analysis frequency (%) and difference in frequency (%) was calculated. Data from both the phases (before and after intervention) were compared to analyze the decrease in the error related to the incomplete or incorrect entry of TRF. The number of errors while making entry in TRF and there frequency (%) where tabulated in table-2 for both Phase-1 and Phase-2. It was observed that total error occurring from incomplete TRF was found to be 18.21 % in phase-1 before intervention which got reduced to 7.47 % in phase-2 after intervention. In this study illegible handwriting was observed to be first highest error while completing TRF around 157 (2.05 %) in phase-1 which was reduced to 91 (1.16 %) in phase-2 after training, whereas signature of clinician were absent in 143 (1.86 %) TRF before intervention which was reduced to 67 (0.85 %) after intervention. All the other possible error entries while completing TRF are tabulated in Table-2.

Table 2: Frequency (%) and its difference in errors observed during incompletion of TRF in Phase-1 and Phase-2

Incomplete/incorrect test requisition form details	Phase-1 TRF n-7671		Phase-2 TRF n-7843		Difference in frequency (%)
	No. of Observations	Frequency (%)	No. of Observations	Frequency (%)	
Incomplete or wrong name of patient	3	0.04	1	0.01	0.03
Age/months/days not mentioned	103	1.34	40	0.51	0.83
Gender not mentioned	91	1.19	41	0.52	0.66
Registration No. not written	77	1.00	24	0.31	0.70
No date of collection	68	0.89	22	0.28	0.61
No time of collection	71	0.93	26	0.33	0.59
Ward not mentioned	84	1.10	29	0.37	0.73
Incomplete or no clinical history	139	1.81	53	0.68	1.16
No medicinal history	136	1.77	72	0.92	0.85
Test mentioned incorrectly	14	0.18	7	0.09	0.09
Test mentioned in short forms	126	1.64	32	0.41	1.23
Test not mentioned	10	0.13	2	0.03	0.10
Type of specimen not defined	16	0.21	7	0.09	0.12
Priority of test not marked	63	0.82	31	0.40	0.43
Name of clinician not mentioned	96	1.25	41	0.52	0.73
Signature of clinician not done	143	1.86	67	0.85	0.98
Illegible handwriting	157	2.05	91	1.16	0.89
Total	1397	18.21	586	7.47	10.74

Table 3: Incomplete TRF, its possible consequences and degree of seriousness on patient health and safety

Incomplete/incorrect test requisition form details	Possible consequences	Degree of seriousness
Incomplete or wrong name of patient	Sample not accepted, delay in analysis, increased turnaround time (TAT)	Mild to severe
Age/months/days not mentioned	Although sample accepted but could not be interpreted	Mild to moderate
Gender not mentioned	Samples accepted for analysis	None to moderate
Registration No. Not written	Sample not accepted, delay in analysis, increased TAT	Mild to moderate
No date of collection	Sample not accepted, delay in analysis, increased TAT	Mild to moderate
No time of collection	Sample not accepted, delay in analysis, increased TAT	Mild to severe
Ward not mentioned	Sample accepted but delay in reporting result due to interpretation	Mild to severe
Incomplete or no clinical history	Sample accepted but delay in reporting result due to interpretation	Mild to severe

No medicinal history	Sample accepted but delay in reporting result due to interpretation	Mild to severe
Test mentioned incorrectly	Wrong analysis of test, delay in treatment, increased TAT	Moderate to severe
Test mentioned in short forms	Wrong analysis of test, delay in treatment, increased TAT	Mild to severe
Test not mentioned	Sample not accepted, delay in analysis, increased TAT	Mild to life threatening
Type of specimen not defined	Sample accepted and analyzed	Mild to severe
Priority of test not marked	Sample accepted and analyzed	Mild to life threatening
Name of clinician not mentioned	Sample accepted and analyzed, delay in reporting result	Mild to severe
Signature of clinician not done	Sample accepted and analyzed, delay in reporting result	Mild to severe
Illegible handwriting	Sample accepted and analyzed	Mild to severe

In this study possible consequences were evaluated related to incomplete filling of TRF error that lead to possible degree of seriousness on patient's safety. (Table-3) It is found test not mentioned and specimens priority not mentioned were the two error entry that comes under mild to life threatening consequences whereas few errors like age/month/days not mentioned, date of collection not mention and registration number not mentioned have mild to moderate effect. Other errors of incomplete TFR lead to mild to severe degree of seriousness whereas gender not mentioned and type of specimen not mentioned does not have any effect. Remaining all possible consequences were considered under mild to severe category related to patient health and safety. All the frequency (%) errors observed during incomplete filling of TRF are shown in graphical presentation in figure-1.

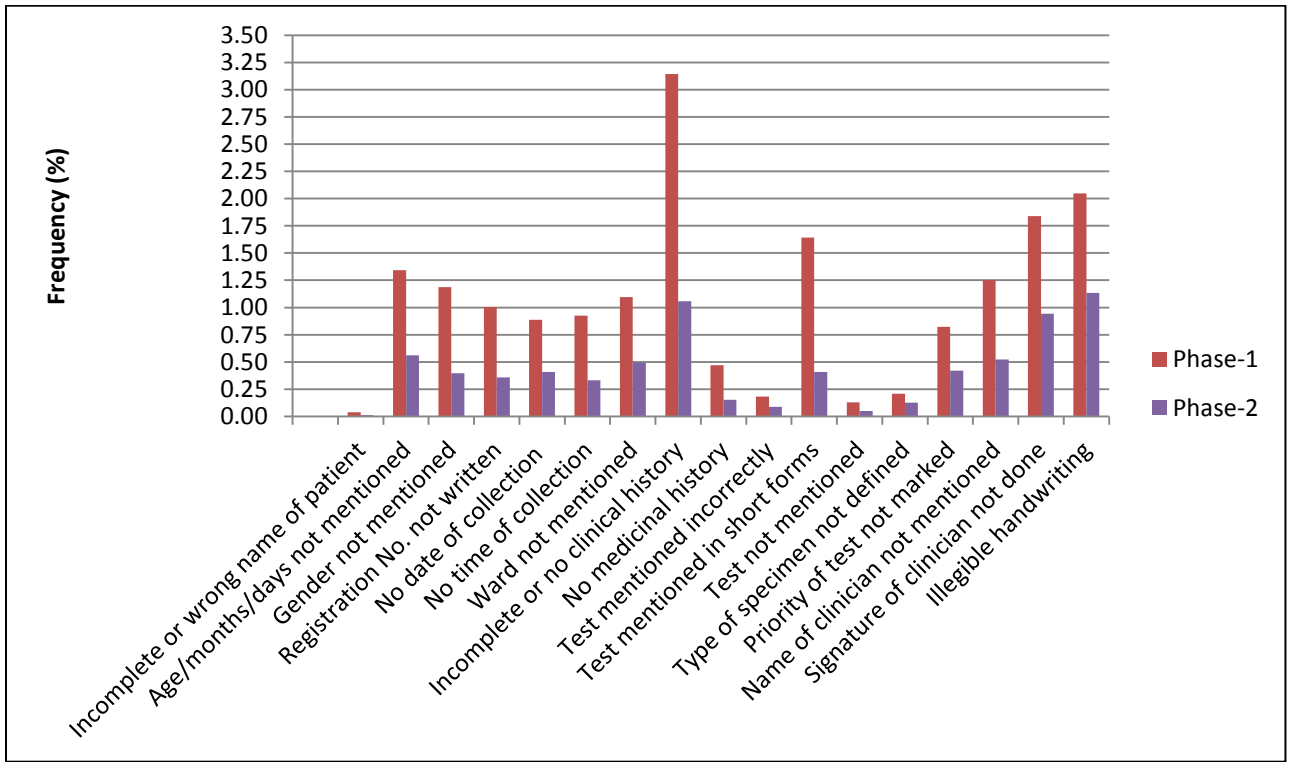

Fig 1: Frequency (%) errors for incompletely filled TRF in both the phases

Discussion

From the result it is clear that incompletely filled TRF by clinicians leads to error in the pre-analytical phase of total testing process. It was also observed that majority of TRF lack one or more type of information required.

The major error noticed in this study while filling TRF was illegible handwriting is 2.05 %. In few of the study not related to TRF but concerned to pre-analytical errors, illegible handwriting error was accounted around 89.25 % [21] whereas concerned to TRF one of the study showed around 1.65 % error in illegible handwriting. [22]

The reason for this error could be bad handwriting, writing in speed due to heavy workload, instead of filling the form by clinician or resident doctors or interns if paramedical staff were given the task of writing the details in TRF who have poor handwriting. This error of illegible handwriting could be easily be minimized with use of electronic and computerized entry system along with use of barcode on samples.

The second highest error related to entry in TRF found in this study was missing clinician's signature or signature not done by clinician. The frequency error was observed in around 141 form (1.84 %) in phase-1 and got reduced to half around 67 (0.85 %) in phase-2. (Table-2) The reason for missing signature could be case of emergency while dealing with patients. Although we cannot say that every time the above reason could be same, sometime it could be not attentive towards work or fear of miss use of the signatures. To avoid such laziness or paper work use of short initials of clinicians could be introduced along with ward intercom telephone number that could be written by anyone interns, resident doctors or paramedical staff after getting authority. One of the studies showed 4.3 % error in doctor sign [6] and other study showed almost 3.36 % [22]

The third highest error noticed in the study was clinical history not mentioned which was 1.84 % in phase-1 and got reduce to almost 1/3rd around 0.68 % in phase-2. (Table-2) Incomplete or no clinical history may results into wrong interpretation of result or delay in interpretation ultimately resulting delay in transcribing report result, increased TAT and might also leads to start of wrong treatment towards patient.

Few studies showed that no clinical history was mentioned on around 62.1 % [23], 61.2 % [24] and 6.8 % [6] TRF. In comparison to the above studies in this study the error of not mentioning clinical history was only 1.84 % in phase-1 and 0.68 % in phase-2.

From various literatures searched on incomplete TRF, few studies showed data as shown in Table-4. All the studies were observational in comparison with this study in which interventional training was given and again the same errors taking place were observed, recorded and analyzed.

Although all the above errors mentioned results into mild to severe degree of seriousness that affects patient's health and safety, but test not mentioned and priority of specimen not marked could result into life threatening seriousness towards patient's health. (Table-3) In the first case sample is not accepted that results in delay in reporting of results with increased turnaround time where in second case specimen are analyzed as per the routine time instead of emergency and therefore delay in reporting results on priority as it was not mentioned on TRF. Though both the errors got reduced to half after intervention when observed, there shall be continuous educational training at periodic intervals to reduce errors in an effective way. The clinicians should be made aware by sharing the knowledge on incomplete TRF and should be trained and educated on the possible difference. Thus it should become mandatory to fill all the information on TRFs like partial or confirmed diagnosis, previous investigation reports and treatment, not to write short forms or abbreviations for test ordered and everything should be written in a clear and legible handwriting. Even the rejection criteria for specimens by laboratories should be made strict in case of incomplete filling of TRF. To minimize the errors there should be implementation of newer information technology like barcode system or electronic requisition form to increase the quality of patient care.

Thus incomplete TRF entry a part of pre-analytical phase error leads to increased turn-around time for laboratory diagnostics, inconvenience towards patients for repeat specimen collection and increases economical burden to the hospital. Proper training at periodic interval at each and every step of pre-analytical phase for laboratory staff and clinicians (including intern and resident doctors) would definitely minimize not only the errors but also reduces the TAT in making clinical decisions as well as save financial burden towards hospital[25].

Table 4: Comparison of different studies related to incomplete filling of TRF

Type of entry deficiency in TRF	Adegoke *et al.* [6] (%)	Makubi *et al.* [23](%)	Chillar *et al.* [24](%)	Present study (IPD) Phase-1 (Before Intervention)
Incomplete or wrong name of patient	-	-	-	0.04
Age/months/days not mentioned	13.6	7	1.41	1.34
Gender not mentioned	-	-	-	1.19
Registration No. not written	4.4	3	0.99	1.00
No date of collection	63.5	67.7	13	0.89
No time of collection	-	-	-	0.93
Ward not mentioned	-	13.3	3.6	1.10
Incomplete or no clinical history	6.8	62.1	61.2	1.84
No medicinal history	-	-	-	1.77
Test mentioned incorrectly	-	-	-	0.18
Test mentioned in short forms	-	-	-	1.64
Test not mentioned	-	-	-	0.13
Type of specimen not defined	-	-	82.2	0.21
Priority of test not marked	-	-	-	0.82
Name of clinician not mentioned	3.4	11.3	13.1	1.25
Signature of clinician not done	4.3			1.84
Illegible handwriting	-	-	-	2.05

Limitations

While studying on incomplete TRF error of pre-analytical phase few limitations were there. First the study was specifically conducted in the biochemistry section of clinical laboratory which does not includes TRF for pathology and microbiology specimen, whereas common TRF was considered. Second the precautionary procedures and monitoring on those issues were not analyzed. Third the communication gap between laboratory personnel and clinician was not quantified. Fourth the single TRF with multiple incorrect or incomplete entries considered but was not quantified.

Conclusion

This study concludes that TRF is a main mode of information from clinician to laboratory personals related to patient condition that there exists an inadequacy in filling the test requisition form by the clinician's point of view, so there exists a need to develop standard operating procedure for complete and accurate filling of the test requisition form. This can be achieved by increasing the awareness about the error of TRF through repeated guidance, instruction, training programs, consideration and receiving their feedback with special focus on the most important errors on test requisition forms. The complete and accurate filling of TRF plays an important role not only to the clinicians but also to the laboratory personnel to interpretate the test result, to communicate with the doctor who has requested the test. Finally complete and correct filling of TRF will also reduce the first step of pre-analytical phase error and thus ultimately reduce the turnaround time with precise diagnosis, prognosis or treatment towards patients.Even implementation of electronic test requisition forms with mandatory fields should be introduced which could reduce the frequency of incomplete test request forms and incidence of errors could be minimized. Similarly in the modern world of technology the TRF should contain the contact details of doctors and even patients so if and when required to contact they can be communicated in case of emergency.

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