Original Article

Dashboard Utilization for Improvement in Key Performance Indicators (KPI) in Clinical Laboratory of Tertiary Care Hospital, Lahore Pakistan

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ABSTRACT

Objective: To identify dashboard utilization for improvement in Key Performance Indicators in clinical laboratory of tertiary care hospital, Lahore.

Study Design: Descriptive observational study.

Place and Duration of Study: This study was conducted at the Pathology Laboratory of Tertiary Care setting for Four months from May to August 2020.

Materials and Methods: All the samples received were entered in Laboratory Information System, identified and analyzed for reasons documented for delayed turn-around time, total critical alert reported and total no. of rejected samples calculated.

Results: During 4 months of study period, 61696 samples were received, 51265 (83.09%) samples were included in the study, and 397 (0.77%) identified for documented reasons regarding key performance indicators. Out of these 397 identified samples, delayed Turnaround Time was noted in 146 (36.77), samples, total critical alerts were reported in 225 (56.6%) and 26 (6.54%) samples were analyzed as rejected. On an average, the frequency percentage of the samples analyzed was equal, but overall improvement was seen in July and August' 2020 as compared to May and June 2020, after the introduction of dashboard laboratory information system on 1st April 2020.

Conclusion: Quantitative analysis of some of the key performance indicators provided a layout of recently developed laboratory information system. The graph of KPI monitoring can be improved significantly by following standard operating procedures, using laboratory information system dashboard, coordination between the lab workers, proper training of technicians and phlebotomists. This can ensure compliance of quality lab services for patient care and safety.

Key Words: dash board, Key Performance Indicators (KPI), outcome indicator, patient safety, turnaround time (TAT)

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INTRODUCTION

A dashboard is a visual display of the most vital information needed to achieve one or more objectives, combined and organized on a single screen so that information can be monitored at a glance" [1].

Design of dashboard begins with defining objectives and determining key performance indicators to monitor the success of dashboards[2].

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Laboratory Key Performance Indicators (KPIs) measure the functioning of laboratory activities in terms of projects, processes, products or services. They are also used to track the performance of the inventory, devices, environment, data and results. Evidence of progress towards achieving a desired result indicate good KPIs. It evaluates what is intended to be measured to help inform better decision making and offers a comparison that gauges the degree of performance change over time. According to the available resources in any healthcare setting, it is unlikely to regulate all performance indicators altogether. For this purpose, critical and significant indicators are being focused on so to improve them step by step [3].

Static nature of performance reporting systems in health care sector has resulted in inconsistent, incomparable, time consuming, and presented reports that are not able to transparently reflect a clear picture that effectively support healthcare managers' decision makings [4]. Today, laboratory Information System (LIS) operates as

a tool for facilitating and safety assurance of the most of the "total testing process" (TTS) which includes pre-analytical, analytical and post-analytical phases. Well-designed laboratory information systems through embedded intelligent dashboard will have potential to reduce laboratory errors and specimen rejection rates in pre-analytical phase, which includes ordering, specimen collecting, identifying and labeling, handling transporting and turnaround time However, laboratory information system has limited capabilities for the management decisions [5]. The turnaround time (TAT) steps in performing a laboratory test were outlined by Lundberg, who described the brain to brain TAT or "total testing cycle" as a series of nine steps: ordering, collection, identification, transportation, preparation, analysis, reporting, interpretation and action. The term "therapeutic TAT" is sometimes used to describe the interval between when a test is requested to the time a treatment decision is made[6].

Nearly 80% of hospital-attached clinical laboratories receive complaints about delayed TAT. Reporting in time is a crucial indicator of quality services along with accurate, precise and reliable reports, thus each clinical laboratory should identify affecting factors to eliminate them for the enhancement of quality services inventory[7].

In our setup at the beginning of the year we shifted from the conventional old reporting system to LIS (laboratory information system) and HMS (hospital management system) through a third-party vendor. The transition was not easy to adopt by the end users and customers. The system had predesigned domains and dashboards which were rigid and did not accommodate for customer demands. Shift from paper to paperless process required a lot of brainstorming, gap analysis and innovative solutions for monitoring the KPIs. We used PDCA (Plan, Do, Check, Act) cycle as a standard tool on monthly basis for four months duration, to identify where improvements are needed, to set priority for quality improvement and create a local dashboard for KPI monitoring. This study was conducted to identify the challenges in clinical laboratory regarding order and application management; and dashboard utilization for improvement in key performance indicators[8].

MATERIALS AND METHODS

This observational descriptive study was conducted at Pathology Laboratory of a tertiary care setting from 1st May till 31st August' 2020. Requested tests with test requisition form (TRF) received and entered on database of laboratory information system (LIS). TAT of chemistry and hematology samples was calculated according to laboratory SOP of TAT, total critical alerts and total number of rejected samples were carefully screened according to laboratory SOP, and analyzed for any possible error. Reports issue and results entered on dash board software was analyzed for indicator mapping [9, 10].

For outpatients, phlebotomy is generally performed by experienced staff using a vacutainer system. On the other hand; for inpatients it is done by paramedics. The blood specimens transported to the laboratory by the hospital personnel, were assessed by experienced staff and either accepted or rejected depending on the rejection criteria of the laboratory SOP. The rejection criteria of the laboratory are hemolyzed, clotted specimens, insufficient volume, mislabeled, inappropriate/or empty tube, and damaged/or not received specimens [11].

All data was collected and analyzed statistically by SPSS 20.0. TAT, total critical alerts and rejected specimens of hematology and biochemistry were presented as frequency and percentage.

RESULTS

The study was conducted from 1st May to 31st August 2020, and total samples received in 4 months along their request forms were 8248, 11689, 19059, and 20434 respectively. In May 7369 (89.34%), June 10911 (93.34%), July 15901(83.43%), and 17094 (83.65%) samples in August were analyzed for KPI (Table 1). Frequency distribution in 4 months was identified in 397 (0.77%) samples, as given in table 2.

Table No.1: Frequency Distribution of Study Samples in Four Months

Sr No	Sample Detail	May (%)	June (%)	July (%)	August (%)	Total
1.	Total received	8248 (13.87)	11689 (19.66)	19,059 (30.89)	20,434 (33.12)	61,696
2.	Selected / included for study	7369 (89.34)	10911 (93.34)	15901 (83.43%)	17094 (83.65)	51,265 (83.09)
3.	Samples identified for KPI	110 (1.49)	92 (0.84)	90 (0.56)	105 (0.61)	397 (0.77)

Chi-square= 63.54

p-value=<0.00001 (p<0.05, significant)

Table No.2: Frequency distribution of indicators in 4 months (n=397)

Sr. No.	Indicators	May & June	July & August	Total frequency (%)
1.	Turnaround time for analysis [a]	75 (18.89)	71 (17.88)	146 (36.77)
2.	Total critical alert reported [b]	115 (28.96)	110 (27.70)	225 (56.67)
3.	Total no. of rejected samples [c]	12 (3.02)	14 (3.52)	26 (6.54)
	Total	202 (50.88)	195 (49.11)	397 (99.98)

Chi-square= 0.25, p-value= 0.88 (p<0.05) not significant

a: 1) Payment for test in cash, 2) Test repetition, 3) Reagent related, 4) Equipment breakdown,

5) Reporting software held up.
b: 1) Total Bilirubin > 257 ummol/L, 2) Glucose < 2.2->25mmol/L, 3) Potassium <2.5->6.9mmol/L, 4) Calcium <1.6->3.2mmol/L, 5) Hemoglobin <7->27gm/dl, 6) Platelet count <30->1000x10^3/uL, 7) WBC <1->35x10^3/uL.
c:1) Hemolyzed, 2) Insufficient, 3) Clotted, 4) Mislabeled, 5) Not received, 6) wrong sample

DISCUSSION

Laboratory works well when quality management systems have outcome indicators that relate to patient safety and medical management of patient. The most important issues about the management of clinical laboratories in the hospital are sample rejection, delayed TAT and non-communication of critical results [12]. The results of our study are consistent with other studies that also indicated inadequate samples, clotted, hemolyzed, wrong samples, and or delayed sample transport affecting the preanalytical phase of TAT [13, 6].

The design of this study is the result of number of meetings that took place from 1st Jan till end of April 2020 between physician's end users of LIS and lab director and IT team to select KPI and improve dashboard of LIS. From the list of 10 KPI, initially three were shortlisted namely Turn-around-time (TAT), Total critical alert reported, total rejected samples. The aim was to monitor the data with PDCA cycle as a quality tool. QA officer and pathologists made few suggestions and collaborated closely with nurses, doctors, receptionist and technologists. Customized screens for rapid ordering were put in LIS which enabled the ordering electronically, patient location tracking was updated, moreover Automate lookup of information on volume, container, and special precautions for handling specimens was made part of dashboard. Barcodes and barcode readers were introduced at each station, Interface of instrument to computer was done on priority and automatic printing of results in different locations of hospital was facilitated. Tracking of samples, transport in the main lab and elimination of preanalytical errors was emphasized through staff training and in service [14].

Shift from old system of reporting to new LIS was challenging. Manual records were sketchy and haphazard. IT team collaborated in putting the indicators in the Dashboard. Data of May June was collected and analyzed for nonconformity, due to the covid 19 crisis, a lot of lapse in data was found at end of April first PDCA quality tool was used to put in place laboratory workflow monitors to gauge process of improvement in KPIs. Number of problems were highlighted, training sessions were organized to familiarize staff with working of LIS, protocols were made to follow SOPs, and experienced staff was tasked with more complex work stations and lack of coordination in preanalytical phase was addressed [15, 16].

Orientation of newly hired paramedics was carried out regarding patient sampling, shifting of sample to the main reception and expedition of urgent samples were fast tracked within the lab. Rejection rate of samples was closely monitored and root because analysis was done periodically and necessary action was taken in real time by informing about nonconformity of sample. Requesting a new sample, using dash board to document the whole process. Various studies have documented, preanalytical prolonged TAT of outpatient and inpatient samples is around 70% of overall delay. Increased preanalytical TAT was primarily due to delayed transportation and rejection of samples to the laboratory [16]. Reagent related, Equipment breakdown and Reporting software held up constituted almost 30% delay. Incidence of delay in turnaround time improved over time with active PDCA cycle. [8].

The frequency percentage of the total samples identified for analyses was 0.77, showing significant p-value. On the other hand, a decreasing frequency was noticed in later months i.e. July and August 2020 (17.88%), as compared to May and June 2020 (18.89%) for the studied indicators, indicating the difference was not significant. It illustrates that second PDCA cycle upgraded the laboratory functioning by monitoring KPIs through dashboard utilization[12].

CONCLUSION

Continuous monitoring the development and progress of designed dashboard is of great importance and is an ongoing quality improvement process. Analysis of the healthcare management system is a contribution to quality assurance with integration of more KPIs to improve hospital clinical laboratory performance. It is necessary that hospital laboratories must ensure conformity regarding standard operating procedures, the laboratory information system, the cooperation of healthcare staff and training of paramedics, to promote evidence-based research with social impact.

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Author's Contribution:

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