

Improving Laboratory Results Turnaround Time By Reducing Pre Analytical Phase

Mohamed KHALIFA ^{a,1} and Parwaiz KHALID ^{a,2}

^a*King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia*

Abstract. Laboratory turnaround time is considered one of the most important indicators of work efficiency in hospitals, physicians always need timely results to take effective clinical decisions especially in the emergency department where these results can guide physicians whether to admit patients to the hospital, discharge them home or do further investigations. A retrospective data analysis study was performed to identify the effects of ER and Lab staff training on new routines for sample collection and transportation on the pre-analytical phase of turnaround time. Renal profile tests requested by the ER and performed in 2013 has been selected as a sample, and data about 7,519 tests were retrieved and analyzed to compare turnaround time intervals before and after implementing new routines. Results showed significant time reduction on “Request to Sample Collection” and “Collection to In Lab Delivery” time intervals with less significant improvement on the analytical phase of the turnaround time.

Keywords. Reducing Laboratory Turnaround Time, Pre-Analytical Phase, Emergency Department, Hospitals.

Introduction

Turnaround time in laboratory testing has been defined as the time interval from the sample collection to the reporting of verified results, this is affected also by the time interval from placing the laboratory test request by the physicians to the process of sample collection [1]. Despite improvements in analytical testing systems due to automation and machinery innovations, little or no measurable improvements have been demonstrated for the pre-analytical phase of the lab turnaround time [2]. Some studies divided the total testing turnaround cycle into a series of nine steps, where the main two components of the pre-analytical phase of the lab turnaround time is the collection time and the transportation time [3,4]. Many efforts have been done to address samples’ transportation methods, such as the utilization of pneumatic tubes, as well as using system alerts to help nurses timely draw samples after requests are placed by physicians on the hospital information systems. Laboratory turnaround time remains an active issue that is potential for more improvements in modern healthcare [5].

Physicians in general, and more specifically at the emergency department, need timely results of laboratory tests before they can make effective clinical decisions whether to admit patients to the hospital, discharge them home or request further investigations. ER patients’ length of stay is highly influenced by the efficiency of

¹ Consultant, Medical & Clinical Informatics. Mohamed Khalifa; Email: khalifa@kfsshr.edu.sa

² Director, Clinical Services. Parwaiz Khalid; Email: pkhalid@kfsshr.edu.sa

reporting lab tests' results [6]. ER physicians' productivity and satisfaction are also affected by the timely reporting of results of critically important laboratory tests, where these tests can guide physicians to better manage their patients [7]. At King Faisal Specialist Hospital and Research Center in Jeddah, Saudi Arabia, we formed a multidisciplinary performance improvement team, based mainly on ER nurses and phlebotomists, which was successful in reducing the length of time between placing the request for laboratory tests by ER physicians and the availability of tests' results.

1. Methods

The performance improvement team main goal was to conduct orientation and training sessions for the ER nurses and phlebotomists on the importance of monitoring and efficiently responding to the HIS alerts after ER physicians place lab tests' requests and in the same time they introduced new routines for more efficient sample collection and transportation; focusing mainly on coordinating resources and teamwork, where some studies confirmed that nurses were least satisfied with stat test turnaround time and phlebotomy responsiveness [8]. The team was formed in the second quarter of 2013, the training extended to the third quarter of the same year, so we suggested analyzing and comparing data of the first two quarters to that of the last two quarters of 2013.

To collect the study data, we needed to generate a table from the hospital information system to list performed lab tests requested by the ER over the selected period of time; which was the whole 12 months of 2013, the study was conducted in March 2014. This table included basic data elements about lab tests such as test name, we used "Renal Profile" as a sample, requesting department, we selected the ER, collection and reporting priority, i.e. stat, test request date and time, sample drawn date and time, in lab delivery date and time, completion and verification date and time. Time intervals were calculated to show durations from request to sample collection, collection to in lab delivery and from in lab to completion and results verification, where lab test results are reported electronically through the hospital system. The date and time of placing requests and also of reporting back results are automatically captured by the HIS while those for collecting blood and delivering samples to the lab are captured into the HIS through barcode scanning of tube labels.

2. Results

SPSS software was used in the analysis and descriptive as well as inferential statistics were reported comparing the turnaround time intervals of the ER requested lab tests of the first two quarters to the last two quarters of 2013. There was a 20% decrease on the 90th percentile of the "Request to Drawn" time for last two quarters compared to the first two quarters of 2013. There was also a 10% decrease on the 90th percentile of the "Drawn to In Lab" time for last two quarters compared to the first two quarters of 2013. There was only a 3% decrease on the 90th percentile of the "In Lab to Complete" time for last two quarters compared to the first two quarters of 2013. Overall, there was a 9.4% decrease in the 90th percentile of the "Total Time" of the requested Lab tests for last two quarters compared to the first two quarters of 2013.

Table 1. Time intervals (in minutes) of the first six months (January to June 2013) for laboratory requests.

	Request to Drawn	Drawn to In Lab	In Lab to Complete	Total Time
Valid Values	3230	3230	3230	3230
Missing Values	0	0	0	0
Mean Time	28	32	45	104
50 th Percentile	18	24	41	91
90 th Percentile	55	52	67	149

Table 2. Time intervals (in minutes) of the last six months (July to December 2013) for laboratory requests.

	Request to Drawn	Drawn to In Lab	In Lab to Complete	Total Time
Valid Values	4289	4289	4289	4289
Missing Values	0	0	0	0
Mean Time	21	30	50	100
50 th Percentile	13	20	38	79
90 th Percentile	44	47	65	135

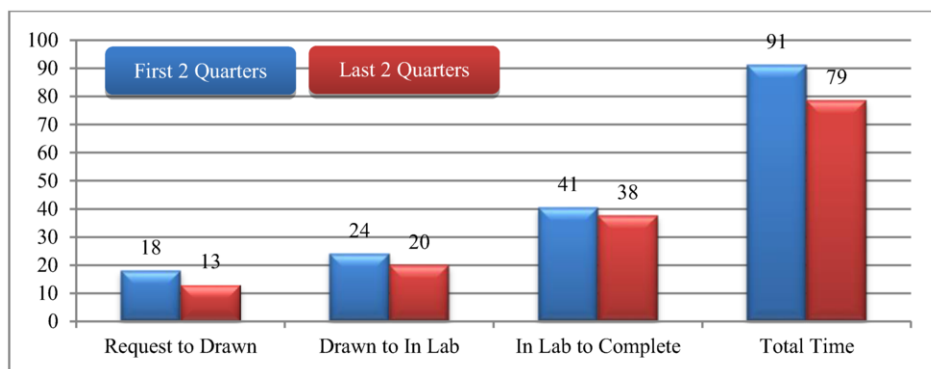


Figure 1. Comparing the 50th percentile of the turnaround time intervals (in minutes)

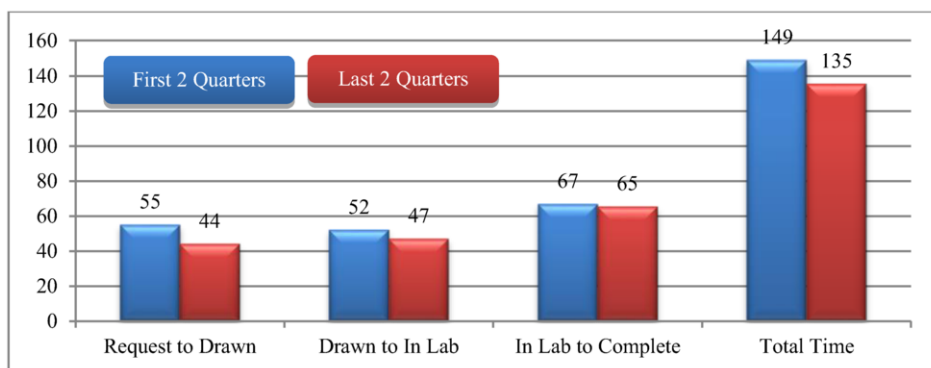


Figure 2. Comparing the 90th percentile of the turnaround time intervals (in minutes)

We also used the non-parametric Mann-Whitney U test to identifying statistically significant difference between the turnaround time intervals of lab tests requested before and after the implementation of the performance improvement training program.

The p-value of the test was less than 0.05, statistically significant, for each of the three time intervals; “Request to Drawn”, “Drawn to In Lab” and “In Lab to Complete” as well as for the total time of the lab tests requested by the emergency department comparing the first two quarters of 2013 (January to June) to the last two quarters of 2013 (July to December) with significant reduction of about 10% overall.

3. Discussion

Timeliness is considered an essential quality indicator for laboratory tests where many studies show that it can shorten patients' length of stay in ER [9]. The total laboratory results turnaround time is influenced by many factors which has direct effects on the occurring delay, mainly due to the pre-analytical phase, which is usually extended due to weak compliance of nurses to draw samples immediately when requested, in addition to the slow transportation of samples from the ER to the central hospital Lab, while using point of care testing or automated samples transportation mechanisms can significantly reduce the turnaround time and ER patients' length of stay [10]. The implementation of a point of care satellite laboratory in the Emergency Department, for the most commonly requested tests, can also improve the turnaround time and ER patients' length of stay [11]. Nurses training only cannot sustain the improvement in the turnaround time even if initially succeeded in reducing the pre-analytical phase [12].

References

- [1] K. S. Rudat, J. Henry & J. Mosley, Improving laboratory results turnaround time, *Best practices and benchmarking in healthcare: a practical journal for clinical and management application* **1**, 1995, 301-306.
- [2] R. Prusa, J. Doupovcova, D. Warunek & A. K. Stankovic, Improving laboratory efficiencies through significant time reduction in the preanalytical phase, *Clinical Chemistry and Laboratory Medicine* **48**, 2010, 293-296.
- [3] G. D. Lundberg, Acting on significant laboratory results, *JAMA*, **245**, 1981, 1762-1763.
- [4] M. A. Crook, Near patient testing and pathology in the new millennium, *Journal of clinical pathology* **53**, 2000, 27-30.
- [5] R. C. Hawkins, Laboratory turnaround time, *The Clinical Biochemist Reviews* **28**, 2007, 179.
- [6] L. L. Holland, L. L. Smith & K. E. Blick, Reducing Laboratory Turnaround Time Outliers Can Reduce Emergency Department Patient Length of Stay An 11-Hospital Study, *American journal of clinical pathology* **124**, 2005, 672-674.
- [7] S. J. Steindel & P. J. Howanitz, Physician satisfaction and emergency department laboratory test turnaround time: observations based on College of American Pathologists Q-Probes studies, *Archives of pathology & laboratory medicine* **125**, 2001, 863-871.
- [8] B. A. Jones, M. K. Walsh & S. G. Ruby, Hospital nursing satisfaction with clinical laboratory services: a College of American Pathologists Q-Probes study of 162 institutions, *Archives of pathology & laboratory medicine* **130**, 2006, 1756-1761.
- [9] S. J. Steindel, Timeliness of clinical laboratory tests, *Arch Pathol Lab Med* **119**, 1995, 918-923.
- [10] R. P. Murray, M. Leroux, E. Sabga, W. Palatnick & L. Ludwig, Effect of point of care testing on length of stay in an adult emergency department, *The Journal of emergency medicine* **17**, 1999, 811-814.
- [11] E. Lee-Lewandrowski, D. Corbo, K. Lewandrowski, J. Sinclair, S. McDermot & T.I. Benzer, Implementation of a point-of-care satellite laboratory in the emergency department of an academic medical center: impact on test turnaround time and patient emergency department length of stay, *Archives of pathology & laboratory medicine* **127**, 2003, 456-460.
- [12] A. Kurec & K. L. Wyche, Institute for Quality in Laboratory Medicine Series-Controversies in Laboratory Medicine: Nursing and the Laboratory: Relationship Issues That Affect Quality Care, *Medscape General Medicine* **8**, 2006, 52.