Indian J Hematol Blood Transfus (Apr-June 2014) 30(2):81–84
DOI 10.1007/s12288-012-0214-3

REVIEW ARTICLE

Turnaround Time (TAT): Difference in Concept for Laboratory and Clinician

Hara P. Pati · Gurmeet Singh

Received: 14 August 2012 / Accepted: 25 October 2012 / Published online: 8 November 2012

Abstract Lab investigations are essential in patient management and qualities of the tests reports are emphasized. But there is another aspect of quality which is often overlooked and that is timeliness which is expressed as turnaround time (TAT). Mostly the laboratory services are directed at providing a rapid, reliable report at a reasonable cost. However, most laboratories put undue stress on only reliability, where as the clinician gives more stress on how soon (TAT) a report would be available to them. There is no clear definition of TAT, as to which period should be included in determining TAT for a specific test. For laboratory personnel, it would be from the time of receipt of sample in laboratory till report is generated. However, for a clinician, it would appropriate from the time of his/her requisition of a test till the report reaches him/her. The TAT would not be similar for routine tests versus in STAT/urgent tests. TAT would be different for ICU/emergency services. The causes of poor satisfaction level from lab users includes stat and routine test TAT and stat test TAT is considered by majority as the most important indicator of laboratories functioning. Hospital computerization with record of time from test request, sample collection, report generation and receipt of report by clinician would help in generating TAT. Analyzing outliers in TAT in a lab gives insight of causes delay in TAT and the areas need improvement. Laboratories in developing countries are yet to use TAT and analyze them for laboratory improvement.

H. P. Pati (✉) · G. Singh
Department of Hematology, AIIMS, New Delhi 110029, India
e-mail: harappati@yahoo.co.in

Keywords Turnaround time (TAT) · Therapeutic TAT · Laboratory TAT

Introduction

Laboratory investigations are essential to patient care and are conducted routinely. There have been a lot of focus on quality and how to improve it. Quality can be defined as the ability of a product or service to satisfy the needs and expectations of the customer [1]. Quality has always been associated with accuracy and precision. But there is another aspect of quality which is often overlooked and that is timeliness. Other aspects are availability, cost and relevance. All the laboratory services should be directed at providing a rapid, reliable report at a reasonable cost. Out of these, perhaps most of the emphasis is on reliability, focusing largely on accuracy and precision. The clinician requires a prompt service based on effective communication systems and rapid turnaround of test results. But now the clinician is more inclined to getting the result in a shorter time and is even ready to forgo a bit of accuracy for it [2]. The increasing use of *Point of care testing* instruments are a good example for it [3].

Laboratory personal give more importance to the quality by way of analytical accuracy and precision and least importance is given to turnaround time (TAT). However, service to patient by a hospital would be assessed by the rapidity of result delivery as seen by TAT. Therefore TAT is a very important tool by which a laboratory is assessed. The other contentious issue is of the definition of TAT i.e. inclusion of the time period, whether from the time of a test requested by the doctor or from the time of sample collection. The end point also should include the time of generation of report or it reaching the concerned doctor, to take decision in patient management.

Defining Turnaround Time

TAT can be defined as "Period for completing a *process cycle*, commonly expressed as an *average* of previous such periods" [4]. The term is generally used in shipping and airline industry implying the time the ship or plane is ready for the return journey. In medical laboratory setting it can be said to be the time taken to complete a test. Variety of approaches has been used to define TAT. It can be defined based on the test performed (e.g. Hemoglobin, Potassium), type of patient served (e.g. Emergency department, Intensive Care Unit etc.), priority (e.g. stat, urgent or routine) and last but not the least, the activities included (e.g. from the time of ordering or from the time of receipt of sample in laboratory).

Lundberg [5] described TAT as '*Brain to Brain TAT*' or "*total testing cycle*" and divided the whole process into nine smaller ones, each independent ones, bearing impact on TAT. These steps are ordering, collection, identification, transportation, separation, analysis, reporting, interpretation, and action [5]. Others have also used the term "*therapeutic TAT*" described as the interval between the time a test is ordered to the time when treatment decision are made based on the result available (Fig. 1).

A laboratory often defines TAT starting from the time it receives the sample to the time of dispatch of results. They argue, and it may be valid at times, that things such as time between ordering a test and sample collection, time between sample collection and transport to the laboratory is not in their hands and so beyond there control. Likewise the delay in physician analyzing the report and acting on it is also beyond their scope.

These differences in definition of TAT between the clinicians and laboratory was also summed up in 1998 College of American Pathologists (CAP) Q-probe programme according to which laboratories most commonly (41.1 %) defined TAT as time of receipt in the laboratory to time of report (internal processing time), followed by ordering of tests to result reporting (27.0 %) while the physicians most commonly (over 40 %) defined TAT as starting at the time of physicians request and only (9 %) as from the time of sample reaching the laboratory [6]. Regarding the end point physician and laboratory personals are closer together.

Meeting Expectations on TAT

Expectation regarding the ideal times are different based on the specificity of test ordered (electrolyte, blood gas), the type of test (stat vs. urgent vs. routine) and type of patient (emergency vs. ICU vs. ward). There is no agreement among physicians about what should be an ideal TAT. Turn around time defined by laboratory is mostly different from that as required by the physician. In CAP Q-probe study of 1993 of physician goals and laboratory test turn around time of 722 institutions and 2,763 clinicians, it was seen that physician and laboratory consultant differed on turnaround time values for four common tests, namely hemoglobin, potassium, pO_2 and glucose. Expectations regarding TAT are different even among physicians from different field. Median times of TAT were 10 min for pO_2, 20 min for hemoglobin, and 30 min for potassium and glucose. 40 % laboratories had TAT goals between 50.1 and 60 min and 25 % had goals between 20.1 and 30 min for hemoglobin, potassium and glucose. For pO_2, a TAT goal was less than 20 min for most of the laboratories. It was further recommended that a realistic TAT should be established by increased interaction between clinicians and laboratory consultants [6].

In a 2001 report of CAP Q-probe study of Physician Satisfaction and Emergency Department Laboratory Test TAT [7], emergency department physicians chose the study-defined lower satisfaction categories of Often, Sometimes, Rarely, and Never for the questions concerning the laboratory being sensitive to stat testing needs (39.1 %) and meeting physician needs (47.6 %).Many of the physicians surveyed (42.9 %) believed that laboratory TAT was not satisfactory and caused delayed treatment and increased ED length of stay more than 50 % of the time [7]. But this believe has not been proved to be correct. A 5 week study by Parvin et al. [8] using hand held point of care device for measuring Na, K, Cl, glucose and blood urea nitrogen did

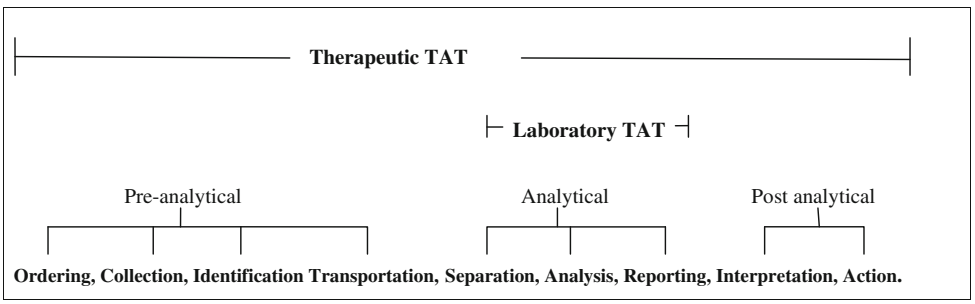

Fig. 1 Different types of TAT. Adapted from Hawkins RC. Laboratory turnaround time [14]

not find any significant difference in length of stay (LOS) in emergency department when compared to this test done in laboratory. Perception by physician need not be true and reflect in management of patients.

Satisfaction Level and TAT

A CAP Q-probe Hospital Nursing Satisfaction with Clinical Laboratory Services of 162 institutions, most satisfaction levels were seen with phlebotomy courtesy toward patients and nursing staff, accuracy of results and notification of abnormal results. But here also the *stat test turnaround time*, laboratory management responsiveness and accessibility, phlebotomy responsiveness to service requests, and *routine test turnaround time* were identified as area with low satisfaction levels and could be improved upon. Stat test TAT was considered by most participants as the most important indicator of laboratories functioning [9].

A CAP Q-probe study of analyzing data from 122 hospitals also showed that although Physicians were most satisfied with the quality/reliability of results and staff courtesy, of the five lab service categories that received the lowest percentage of satisfaction, most were related to turnaround time for inpatient stat, outpatient stat and routine tests [10]. It further proves that turn around time is a persistent source of concern for the physician.

Another study of CAP Q-probe, 5-year follow-up of routine outpatient test turnaround time, in 2003 of 67 institutes comparing TAT for complete blood count, thyroid test and basic metabolic panel between year 1997 and 2002 showed significant improvement in TAT for all three tests [11]. This can be assumed that the awareness towards TAT concept is increasing in the developed countries. But same cannot be said for developing country as there is no reliable data related to TAT is available.

Measuring and Analyzing TAT

Measuring TAT starts with establishing a definition of TAT for the specific institution. The most appropriate TAT is starting from the time a physician orders a test to the time he gets back the reports. The timing should then be recorded at every stage starting from ordering a test, followed by time of phlebotomy, time of receipt of sample in the laboratory, the time of report generated followed by dispatch of report and finally the time it is received by a caregiver. With computerization of the whole hospital in which each and every test requested has to be entered in the system before being done. We will have a true data of time taken at every step.

Analysis of the data is a bit different from analysis lab values because the distribution is non Gaussian and so it would be inappropriate to use mean and standard deviation to describe TAT. And so non parametric values like median and tail size (skew) are taken into consideration. The TAT graph generally has a positive skew suggesting that there is more number of events which prolong the TAT than those shortening it. 90th percentile of the total values is generally taken as cutoff values meaning that a time by which 90 % of the time the process is completed. They are also known as outliers and have been increasingly used to analyze the cause of delay and area in need for improvement of TAT.

In a CAP Q-probe analysis, Using Outlier Events to Monitor Test TAT in a study in 496 laboratories, it was observed that analyzing outlier gave new insights into the reason for delay in TAT. It was also suggested that the laboratories monitoring TAT should use these outlier events as an adjunct to routine TAT monitoring to find out causes unique to each laboratory [12].

Analysis should further be performed by breaking the TAT into Lundberg's originally described nine processes. The preanalytical phase (Fig. 1) can be shortened by entering the test online and generating the labels at the same time. The main area concern is the time taken for samples transport to the laboratories which is done manually at most places. The solution offered varies from establishing satellite laboratories near ED or ICU to use of point of care devices to use of pneumatic tubes for transport. Westbrook et al. [13] showed that TAT is a significant contributor the LOS and computerized order entry significantly reduced TAT thereby reducing LOS.

In conclusion, TAT is an important parameter for the laboratory as well as for the hospital assessing the laboratory service. A single definition of TAT is not adequate for all types of test or for all types of setting. The definition of TAT that needs to be applied should be based on the type of patient served (ICU/emergency/casualty service), STAT/urgent or routine service. There are several constrains from a purely laboratory point of view like lab practice of collecting samples and doing test on a single day of a week (to reduce cost, efficient use of time of technicians) without compromising the patient service. The hospital need to evolve their own TAT/more than one TAT in consultation with both the laboratory personnel and the clinicians (the users) for using TAT as a quality parameter for the lab services. Computerization, speedy transport would further help in reducing TAT. Review of TAT outliers is equally important to reduce cause of delay in TAT.

References

1. Bergman B, Klefsjo B (1994) Quality: from customer needs to customer satisfaction, 1st edn. McGraw-Hill, Maidenhead
2. Watts NB (1995) Reproducibility (precision) in alternate site testing. A clinician's perspective. Arch Pathol Lab Med 119:914–917
3. Howanitz JH, Howanitz PJ (2001) Laboratory results. Timeliness as a quality attribute and strategy. Am J Clin Pathol 116:311–315
4. http://www.businessdictionary.com/definition/turnaround-time
5. Lundberg GD (1981) Acting on significant laboratory results. JAMA 245:1762–1763
6. Howanitz PJ, Cembrowski GS, Steindel SJ, Long TA (1993) Physician goals and laboratory test turnaround times. A College of American Pathologists Q-Probes study of 2763 clinicians and 722 institutions. Arch Pathol Lab Med 117:22–28
7. Steindel SJ, Howanitz PJ (2001) Physician satisfaction and emergency department laboratory test turnaround time. Arch Pathol Lab Med 125:863–871
8. Parvin CA, Lo SF, Deuser SM, Weaver LG, Lewis LM, Scott MG (1996) Impact of point-of-care testing on patients' length of stay in a large emergency department. Clin Chem 42:711–717
9. Jones BA, Walsh MK, Ruby SG (2006) Hospital nursing satisfaction with clinical laboratory services: a College of American Pathologists Q-Probes study of 162 institutions. Arch Pathol Lab Med 130:1756–1761
10. Jones BA, Bekeris LG, Nakhleh RE, Walsh MK, Valenstein PN (2009) Physician satisfaction with clinical laboratory services: a College of American Pathologists Q-Probes study of 138 institutions. Arch Pathol Lab Med 133:38–43
11. Valenstein P, Walsh M (2003) Five-year follow-up of routine outpatient test turnaround time: a College of American Pathologists Q-PROBES study. Arch Pathol Lab Med 127:1421–1423
12. Steindel SJ, Novis DA (1999) Using outlier events to monitor test turnaround time a College of American Pathologists Q-Probes study in 496 laboratories. Arch Pathol Lab Med 123:607–614
13. Westbrook JI, Georgiou A, Lam M (2009) Does computerised provider order entry reduce test turnaround times. A before-and-after study at four hospitals. Stud Health Technol Inform 150:527–531
14. Hawkins RC (2007) Laboratory turnaround time. Clin Biochem Rev 28(4):179–194