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# Determination of Delay in Turnaround Time (TAT) of Stat Tests and its Causes: an AKUH Experience

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## Abstract

**Objective:** To evaluate the delay and reasons of delay of turnaround time (TAT) of stat tests in the section of clinical chemistry of the clinical laboratory.

**Setting:** Clinical Laboratory, Aga Khan University Hospital, Karachi.

**Patients and Methods:** In our study turnaround time (TAT) of stat tests were analyzed. Turnaround time was specified as the time from receipt of the sample till the final verification of results (sample receipt time to result verification time). Delays were categorized into 15 minutes, 16-30 minutes, 31 to 60 minutes and >60 minutes. It was also noted as to which time of the day was delay in reporting stat results occurred. Reasons for the delay were also looked into.

**Results:** Total 20079 stat samples were received from August 2001 till October 2001. Four hundred eight (2.03%) samples were reported after the acceptable turnaround time. Cumulative analysis of the excess TAT of stat tests showed that 0-15 minutes delay was noted in 68 (16.7%) samples, 16-30 minutes delay in 80 (19.6%) samples, 31-60 minutes delay in 76 (18.6%) samples and more than 60 minutes delay in 185 (45.3%) of samples. Most of the delay in reporting of stat test in three months time was surprisingly noted in the morning shift. Overall delay in reporting in morning shift was found to be of 242 (59.3 %) samples. In the evening and night shift 83 (20.3%) and 82 (20.1%) samples respectively were found to be delayed. Reasons for delay in TAT were as follows: n = 163 (40%) due to machine breakdown, n=147(36 %) due to delay in the maintenance of analyzers, n=73 (18 %) due to overlook of the staff during shift change (e.g. night shift to morning shift) and n= 25 (6%) due to computer shutdown.

**Conclusion:** We conclude that most of the delay in TAT of stat tests in our laboratory occurred for more than 60 minutes and was frequently seen in the morning shift. It was also noticed that machine breakdown was the most common reason for this delay. Regular audit of such data helps in the evaluation of the efficiency of the laboratory and hence corrective measures taken accordingly would be helpful in providing better service to the physicians and patients (JPMA 53:65;2003).

## Introduction

Along with accuracy and reliability, timely reporting of laboratory test results is now considered an important aspect of the services provided by the clinical laboratory. Whether or not, faster turnaround time can make any medical difference, patients and their physicians want reports as rapidly as possible. It has also been shown that outcomes

in certain situations such as operation theaters and in emergency departments have been affected by timely reporting of lab tests results.<sup>1</sup>

Hence, rapid laboratory turnaround times is important both from a medical and commercial point of view. A recent review of laboratory turnaround time indicated that analysis of this time interval has helped in determining the cause of delay, which is then followed by the improvement in turnaround time.

This issue is very important and in general, laboratories do not stress enough on its significance. Appropriate and timely clinical decisions depend on timely reporting, which in turn effects patient outcome. The statement “Justice delayed, Justice denied” can be rephrased in our setting as “Report Delayed, Treatment denied”.

The aim of this study was to evaluate the delay and reasons of delay of turnaround time (TAT) of stat tests in the section of clinical chemistry of the clinical laboratory.

## **Materials and Methods**

This retrospective cross-sectional study was conducted at Aga Khan University (AKU) from August till October 2001. AKU is 495 bedded hospital located in a populated area of Karachi City. It hosts an emergency department (ER) with 23 beds, intensive care unit (ICU) with 16 beds, coronary care unit (CCU) with 8 beds and neonatal intensive care unit (NICU) with 14 beds along with general and private wards with step-down and special care units.

Hospital laboratory caters to stat tests not only from inpatient but also received on outpatient basis. A stat test mostly comes from patients admitted in ER, ICU, CCU and Ni~CU. These tests usually are restricted to the chemistry and hematology section of the laboratory. It includes complete blood counts, coagulation studies, serum electrolytes, blood glucose, arterial blood gases, serum calcium, serum billirubin, urea, creatinine, cardiac enzymes (Troponin - I and CK-MB) and serum digoxin etc. In all, there are 33 parameters on Stat testing list in the section of clinical chemistry alone, including 17 chemistry analytes and 16 drugs.

The physicians order stat tests in the respective departments and blood is collected by house officers, residents, phlebotomist or nurses. This sample is then transported to the laboratory by the porter to the receiving bench of the concerned area of the laboratory. Outpatient stat samples are collected by the phiebotomist or brought from outside the hospital. All of these samples after processing of patient data is then taken to the automated analyzer, followed by verification, analyses and recheck if necessary, and finally computerized transmission of results to wards or in hard copy in case of outpatients.

It has been recommended that each laboratory should develop a written policy for handling initial and repeat critical values reports<sup>2</sup> and with the aid and assistance of computers, our center also follow a foolproof policy in this regard while reporting results to both in and out patients.

A recent review of the laboratory turnaround time indicated that the most common way to monitor TAT is by recording some starting point and end point, and then analyzing the difference between the two.<sup>3</sup> In our study turnaround time was specified as the time from the time of receipt of the sample till the final verification of results (sample receipt time to result verification time). This mainly included the receiving of the sample, feeding of

patient data in computer resulting in generation of an internal identification number, clotting time and separation of the serum, separation of the plasma (in case the sample is received in Flonde), labeling the sample as STAT, transport and distribution of samples on appropriate benches, re-verification of sample and patient data, analyses on automated analyzer, transmit the results from the analyzer to the laboratory information system and to verify the results in the computer. Acceptable TAT for stat tests in our laboratory is 2 hours.

In this retrospective study of delay in TAT of stat tests, data for 3 months (i.e. August 2001 till October 2001) in clinical chemistry section of the laboratory was analyzed. Delays were categorized into 15 minutes, 16-30 minutes, 31 to 60 minutes and >60 minutes. It was also noted, as to which time of the day was the delay in reporting stat results. Reasons for the delay were also looked into.

## Results

Total 20079 stat samples were received from August 2001 till October 2001. Four hundred eight (2.03%) samples were reported after the acceptable turnaround time. During this period majority of reporting was delayed for more than 60 minutes. The breakup for delay in reporting of stat tests for this period is given in table 1.

**Table 1. Breakup report for delayed TAT of stat tests.**

Month	Total samples	0-15 minutes	16 -30 minutes	31-60 minutes	>60 minutes
August	126	23 (18.2%)	18 (14.3%)	19 (15.1%)	66 (52.4%)
September	143	25 (17.4%)	36 (25.2%)	30 (20.9%)	54 (37.7%)
October	139	20 (14.4%)	26 (18.7%)	27 (19.4%)	65 (46.7%)
<b>Total</b>	<b>408</b>	<b>68 (16.7%)</b>	<b>80 (19.6%)</b>	<b>76 (18.6%)</b>	<b>185 (45.3%)</b>

Cumulative analysis of the excess TAT of stat tests showed that 0-15 minutes delay was noted in 68 (16.7%) samples, 16-30 minutes delay in 80(19.6%) samples, 31-60 minutes delay in 76 (18.6%) samples and more than 60 minutes delay in 185 (45.3%) of samples. Most of the delay in reporting of stat test in three months time was surprisingly noted in the morning shift. Overall delay in reporting in morning shift was found to be of 242(59.3%) samples. In the evening and night shift 83 (20.3%) and 82 (20.1%) samples were found to be delayed respectively.

Frequency of sample delay in each shift is given in table 2.

**Table 2. Frequency of sample delay in each shift.**

Month	No .of samples	Morning shift	Evening shift	Night shift
August	126	83 (65.8%)	22 (17.5%)	21 (16.7%)
September	143	68 (47.6%)	44 (30.8%)	30 (20.9%)
October	139	91 (65.5%)	17 (12.2%)	31 (22.3%)
Total	408	242 (59.3%)	83 (20.3%)	82 (20.1%)

Reasons for delay in TAT were as follows: n = 163 (40%) due to machine breakdown, n=147(36%) due to delay in the maintenance of analyzers, n=73 (18 %) due to overlook of the staff during shift change (e.g. night shift to morning shift) and n= 25 (6%) due to computer shutdown.

## **Discussion**

One of the most visible and talked about areas of laboratory service is how fast a test result is returned to a caregiver.<sup>3</sup> Although stat tests are one of the most important features of clinical laboratory performance, the indexed literature is devoid of significant discussion on this subject.<sup>4</sup>

In our study we have used receipt of patient sample to verification time to monitor our TAT of stat tests. Laboratory managers often equate TAT with this time interval as this is most directly under the control of laboratory managers, but it should be kept in mind that this reports only the analytical and post- analytical process of testing.<sup>5</sup>

Our study reveals an outlier rate of 2.03 % while other studies have reported it to be 10.4%.<sup>3</sup> Most of the centers have used up to four analytes only in calculating delays in reporting time<sup>6</sup>, however in our study we have included the whole battery of stat tests provided by our section which approaches to 33 analytes.

It was found that most of the delay in TAT of stat test was more than 60 minutes. Most common reason for this delay was found to be machine breakdown followed by problems in machine maintenance and overlook of technical staff. This was in contrast to the reasons for the delay in analytical phase reported in other studies.<sup>3</sup> These have been attributed to shortage of highly trained personnel as the largest single cause in delay. Other reasons for delay in receipt to verification time reported in other studies are due to technical delays i.e. difficulty with instrument, specimen delay i.e. abnormal results requiring verification, laboratory accidents and clerical delay which involves data entry etc.<sup>3</sup>

Another unexpected and interesting finding in our study was that most of the delay in

TAT of stat tests occurred in the morning shift, while maximum staff strength is available at the disposal of the section. Increase in workload at this time could well be a reason for delay in TAT at this time of the day. A College of American Pathologist Q - Probes Study has reported that preanalytic TAT increases during the day, which however indicates delays in transport and collection stages.<sup>7</sup>

Among other factors, which have been found to affect TAT of any laboratory, it is the size. It has been reported that results were available sooner in non-teaching than teaching and in smaller rather than larger institutions.<sup>8</sup>

Emergency department physicians are generally not satisfied with the laboratory services<sup>9</sup> but in our case the interaction has been quite successful. Verbal feedback in informal manner was obtained from incharge of emergency room in this regard.

The figures in delay of TAT available in the literature from the western world are quiet higher as compared to our figures. The management of the section, regular quality assurance, meeting with the technical staff and strict vigilance are the key reasons of these low figures in our setting. However these low figures do not justify the delays to be acceptable. The delay percentage prompted us to get a new automated analyzer and hopefully the delay percentage will be significantly reduced in the near future. A follow up study of similar nature with statistical analysis is required to prove the above hypothesis.

We conclude that most of the delay in TAT of stat tests in our laboratory occurred for more than 60 minutes and was frequently seen in the morning shift. It was also noticed That machine breakdown was the most common reason for this delay.

Regular audit of such data helps in the evaluation of the efficiency of the laboratory and hence corrective measures taken accordingly would be helpful in providing better service to the physicians and patients.

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