Study to Analysis the Turnaround Time of the Department of Biochemistry in CARE Hospitals, Banjara Hills, Telangana

By

GVVS Varun

Dissertation submitted in partial fulfillment of the requirements of the degree

MBA Hospital and Health Management

Academic year, 2018-2020

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This is to certify that **Dr. GVVS Varun** has completed a three-month duration dissertation study on the topic **"A Study to Analyse the Turnaround Time of the Department of Biochemistry in CARE Hospitals, Banjara Hills, Telangana"** from 11th Feb, 2020 to 10th May, 2020.

During this period of dissertation, **Dr GVVS Varun** has been found to be sincere, hard working with an attitude to learn.

We wish him a successful future and a brilliant professional career ahead.

For **Quality CARE India Limited**

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AGM – Human Resources

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This is to certify that the dissertation titled **"A Study to Analyse the Turnaround Time of the Department of Biochemistry in CARE Hospitals, Banjara Hills, Telangana"** and submitted by Dr. GVVS Varun, Enrolment No. IIHMR-U/01/2018-20/0748 under the supervision of Dr. Piyusha Majumdar for award of MBA in Hospital and Health Management in Health and Hospitals of the University carried out during the period from 11th February 2020 to 10th May 2020 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.

Signature

Dr. GVVS Varun

ACKNOWLEDGEMENT

It has been my privilege to have had this opportunity to complete my dissertation from a reputed organisation such as CARE Hospitals, Banjara Hills, Telangana. In the entire duration of my association with the organisation, I have gained immense knowledge in various departments of the hospital and has helped garner a better understanding of the on-ground processes that are implemented in a tertiary care institute.

I would like to express my gratitude to Mr Prashanth Vasisth, Project Manager, EVERCARE Group in providing me with this opportunity to undergo the dissertation process with such an esteemed institute.

I would like to sincerely thank my organisation mentor, Dr. Krishna Chaitanya Kandala, HOD – Clinical Health Informatics, CARE Hospitals, Banjara Hills for his invaluable inputs, guidance, enthusiasm and constructive discussion as a mentor. It was his constant counselling and support during the entire phase of the dissertation along with the academic zeal and thorough knowledge of the subject to bring about the best in me for which I shall be grateful to forever even during such uncertain times. He has not only helped me with the dissertation process but also has judiciously provided me with opportunities in other projects undertaken by the organisation.

My special thanks to the entire hospital staff of CARE Hospitals, Banjara hills with a special mention to the Hospital Information Systems team and the Department of Biochemistry team for their cooperation and support throughout my time here in CARE Hospitals, Banjara Hills, Telangana.

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ABBREVIATIONS

TAT – Turnaround Time

ER – Emergency Room

OPD – Out-Patient Department

IPD – In-Patient Department

LIS – Laboratory Information Systems

ABSTRACT

Title – A Study to Analyse the Turnaround Time of the Department of Biochemistry in CARE Hospitals, Banjara Hills, Telangana

Introduction –

There are many factors that determine a Hospital's ability to provide services that satisfy consumer needs, wants and expectations; Turnaround Time (TAT) is one such parameter that plays a role in assessing this standard.

TAT does not have a certified definition. Hence, we have taken the liberty to define it as:

The time elapsed between when a clinician orders a clinical/diagnostic test, to the time when he receives the results of the same.

Another classification of time in laboratory, differentiates the process into three phases: Pre-Analytical, Analytical, and Post-Analytical.

These divisions are frequently used to classify errors and delays, and hence, are often used for description of TAT. (1)

To achieve the desired TAT, all the above aspects of the laboratory testing process must be considered.

Objective –

The main objective of this study was to analyse the overall TAT in the Department of Biochemistry at CARE Hospitals, Banjara Hills and find the reason for delays, if any as well as provide suitable suggestions for the same

Methodology –

An observational cross-sectional study was conducted in CARE Hospitals, Banjara hills for a period of three months with an inclusion criterion of requisition of tests made from the ER, IPD and OPD to the department of Biochemistry between 10:00 AM to 6:00 PM. A total of 1140 samples were analysed out of which 900, 180 and 60 samples belonged to the IPD, OPD and ER respectively.

The study was divided into three phases depending on the time frame of the requisition of the test. Phase 1 samples were analysed between 10:00 AM to 12:30 PM, Phase 2 samples were analysed between 12:31 PM to 3:45 PM and Phase 3 samples were analysed between 3:46 PM to 6:00 PM.

The overall TAT was broken down into the Pre-Analytical Stage, Analytical Stage and Post-Analytical Stage for each phase to see the contribution made by each stage as well as the limitations associated with them.

The data was collected through a predesigned checklist and secondary data obtained from the LIS.

Results –

The highest overall average TAT for the Department of Biochemistry was recorded in the Out-Patient Department with an average turnaround time of 3 hours 14 minutes and 23 seconds followed by the In-Patient Department with a time of 2 hours 25 minutes and 7 seconds whereas the lowest in the Emergency Room with a time of 2 hours 9 minutes and 42 seconds.

The overall contribution amongst the three stages to the overall average TAT was mainly due to the Pre-Analytical and Post-Analytical Stage that was cumulatively 58.92 %, 67.33 % and 59.27 % for the ER, OPD and IPD respectively.

Another major finding was the increase in the TAT during Phase 1 (10:00 AM – 12:30 PM) across all the three phases which was mainly due to the increased workload during these hours.

Conclusion –

This study was carried out with the aim to analyse the turnaround time recorded in the Department of Biochemistry of CARE Hospitals, Banjara Hills. It was performed across three stages that contribute to the overall turnaround time of a laboratory test namely the Pre-Analytical Stage, Analytical Stage and the Post-Analytical Stage and significant effort needs to be put across all the three stages as they are interrelated so as to achieve results which in turn lead to quality of care as well as patient satisfaction.

It was noticed that the major delay in the overall TAT was recorded during Phase 1 when attributed to time as a factor. Other major causes of delay in TAT were attributed to irregularities in policies due to reduced senior management involvement in monitoring and policy making, equipment breakdown, shortage of manpower as well as inadequate utilisation of LIS.

Improving TAT is a continuous process and we need to have a wholesome approach for reducing the obstacles for optimum TAT.

INTRODUCTION

There are many factors that determine a Hospital's ability to provide services that satisfy consumer needs, wants and expectations; Turnaround Time (TAT) is one such parameter that plays a role in assessing this standard.

TAT does not have a certified definition. Hence, we have taken the liberty to define it as:
The time elapsed between when a clinician orders a clinical/diagnostic test, to the time when he receives the results of the same.

Another classification of time in laboratory differentiates the process into three phases:

- Pre-Analytical
- Analytical, and
- Post-Analytical.

These divisions are frequently used to classify errors and delays, and hence, are often used for description of TAT. (1)

- The Pre-Analytical Testing Phase is the first process that includes ordering of lab test, generation of bill, collection of sample/specimen, and transportation to the respective lab.
- The Analytical Phase can be defined as the actual laboratory testing process, which ultimately yields the test results.
- The Post-Analytical Phase includes generation and certification of the final report, followed by dispatch to the end user.

To achieve the desired TAT, all the above aspects of the laboratory testing process must be considered.
This study is focused on improving the laboratory workflow by analysing the process flow of the laboratory and the overall TAT.

RESEARCH QUESTIONS

- What is the average TAT across all three phases of laboratory testing for the IPD, OPD and ER?
- What are the reasons for increased TAT, if any?
- How can the process be improved in order to minimize delays?

OBJECTIVE

This study has been conducted in order to improve the quality of services at the Department of Biochemistry in CARE Hospital, Banjara Hills.

To meet this objective, the following steps were to be taken:

- Develop an understanding of the Process Flow at the Department of Biochemistry, across the ER, IPD and OPD.
- Calculate the TAT in each phase (Pre-Analytical, Analytical and Post-Analytical)
- Identify the reasons for delay, if any.
- Suggest measures to improve the overall TAT.

REVIEW OF LITERATURE

1- **Robert C Hawkins**, in his research paper titled '*Laboratory Turnaround Time*' (2007) set out with the aim being to provide a benchmark of data for setting TAT goals, while stating the importance of monitoring TAT in order to improve quality. His study included the summarizing of measures, definitions and approaches to reduce TAT. In the study, the results suggested that a 90% completion time of less than 60 minutes was an acceptable initial goal. (1)

2- **Hara P Pati et al** in their article titled '*Turnaround Time (TAT): Difference in Concept for Laboratory and Clinicians*' (2014) stated that more importance was normally given to the reliability of tests from the laboratories point of view. Whereas, a clinician gave more importance to how soon a report would be made available to them. In the article, it was realized that there was no clear definition of TAT. For different interested parties

such as patients, clinicians and laboratory personnel, TAT had a different meaning. (3)

3- **Joan H. Howanitz and Peter J Howanitz** in their study '*Timeliness as a quality attribute and strategy'* (2001) stated the importance of timeliness in reporting results at clinical laboratories. Test Results directly affect the patients, and the average length of stay at the hospital. It also affects the clinician and their time taken to provide healthcare services to each patient. The study found that the overall laboratory TAT would be improved substantially by monitoring all the steps involved in reporting, and hence need to monitored diligently. (4)

4- **Kent A. Spackman** in his article '*Workstation Technology in Pathology'* (1994) identified that as Hospitals grow in size, the computer software and hardware used is integral to improving the productivity and quality of the laboratory services. It is essential to train laboratory personnel to understand the laboratory software and hardware being utilized. (5)

5- **Pamela G Manorin** in her article *'Turnaround Times in Laboratory: A Review of Literature'* (1999) stated that complaints about test TAT were accounted for by more than 80% of laboratories. The major findings caused by the delayed TAT were increase in patient dissatisfaction as well as an increase in the length of stay in the hospitals by the patients. (7)

6- **Alain Truchaud et al** in their research paper titled '*New tools for laboratory design and management'* (1997) carried out their study by emphasizing on the need to establish quality goals across all the three phases of laboratory testing prior to the selection of automated tools or advanced technologies. The systems approach in a simplified manner was given more importance than the usually adopted traditional disciplines in the study. (6)

7- **Andrew Worster** in his article *'A Role for Root Cause Analysis in Laboratory Medicine'* (2007) was able to attribute the increase in length of stay for the patient was directly proportional to the delay in laboratory testing. The what, why and how of the issues related to performance were identified using root cause analysis. Only a few studies have made use of this approach as a solution tool. Although, amongst its limitations, generalisation to other organisations would be ineffective. (8)

8- **Bruce A. Jones et al** in their article *'Physician satisfaction with clinical laboratory services,* found the satisfactory levels expressed by physicians towards laboratory test results accuracy and reliability and dissatisfactory levels towards turnaround time and an area of with the opportunity for improvement. (9)

9- **Abhinav Dileep Wankar** in his research article *'Study of determination of laboratory turnaround time in tertiary care hospital in India'* (2014) found that there were a number of reasons that contributed to the overall turnaround time. All the three stages namely, Pre, Analytical and Post-Analytical stages need to be monitored and improvements should be made to achieve set standards. (10)

10- **Dr. Bhagyashree K Bhuyar** in her article *'Monitoring of Turnaround time (TAT) in Biochemistry Laboratory of a tertiary care hospital in Karwar'* (2017) analyses all the three stages that represent the overall laboratory turnaround time to understand their contributions individually. The Post-Analytical stage represents an opportunity of improvement by implementing an automated process for delivery of verified reports post analyses. (2)

METHODOLOGY

The study was carried out in the Department of Biochemistry Laboratory Services of CARE Hospitals, Banjara Hills, Telangana.

Research Design – Cross-Sectional Observational Study.

Duration of The Study – The study was conducted for a period of three months (11th February – 10th May 2020).

Study Population –

- **Inclusion Criteria -** All the reports generated from:
- The Department of Biochemistry received from the ER, IPD and OPD.
- Laboratory tests ordered between 10:00 AM to 6:00 PM.
- At CARE Hospitals, Banjara Hills.

- **Exclusion Criteria –** All reports generated from:
- The Department of Clinical Pathology, Histopathology, Cytopathology, Hematology, Microbiology and Serology.
- Laboratory tests ordered after 6:00 PM to 10:00 AM.
- At other units of CARE Hospitals.

Study Tools – The data for the study was collected through:

- Checklist
- Secondary data from Laboratory Information Systems in use at CARE Hospitals, Banjara Hills.

Sample Size – A total of 1,140 samples were analysed from the Department of Biochemistry for this study. These included:

NAME of the Department	Number of samples studied
Emergency Room	60
In – Patient Department	180
Out – Patient Department	900
Total	N = 1140

Table 1: Sample size distribution

Sampling Technique – The data analysed was selected at random from the available secondary database of the LIS.

Laboratory Workflow –

The workflow of the three Departments from where the requisitions for the laboratory tests were analysed. These departments were –

1. Emergency Room Workflow –
2. In – Patient Department Workflow –
3. Out – Patient Department Workflow –

Figure 1: ER Workflow

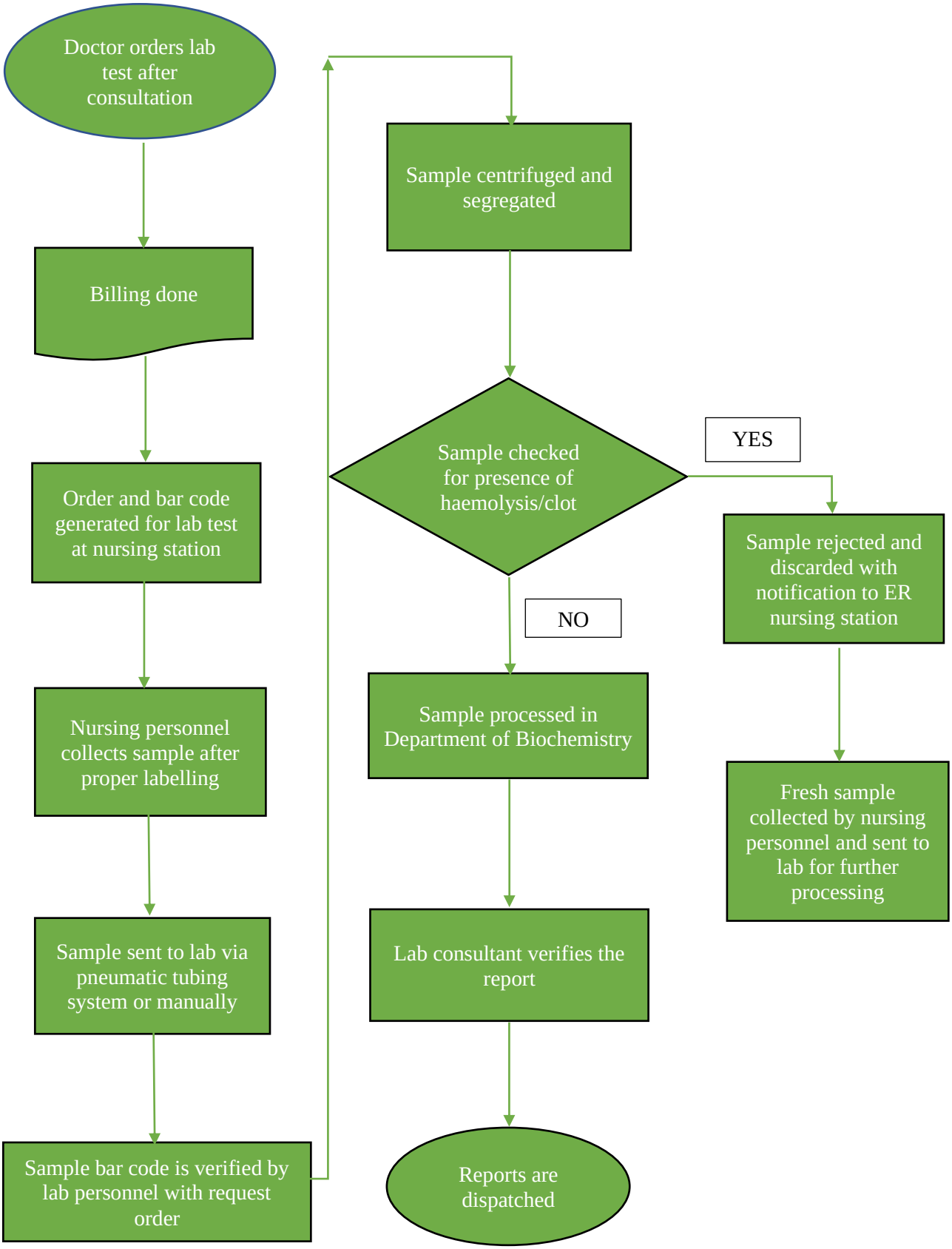


Figure 2: OPD Workflow

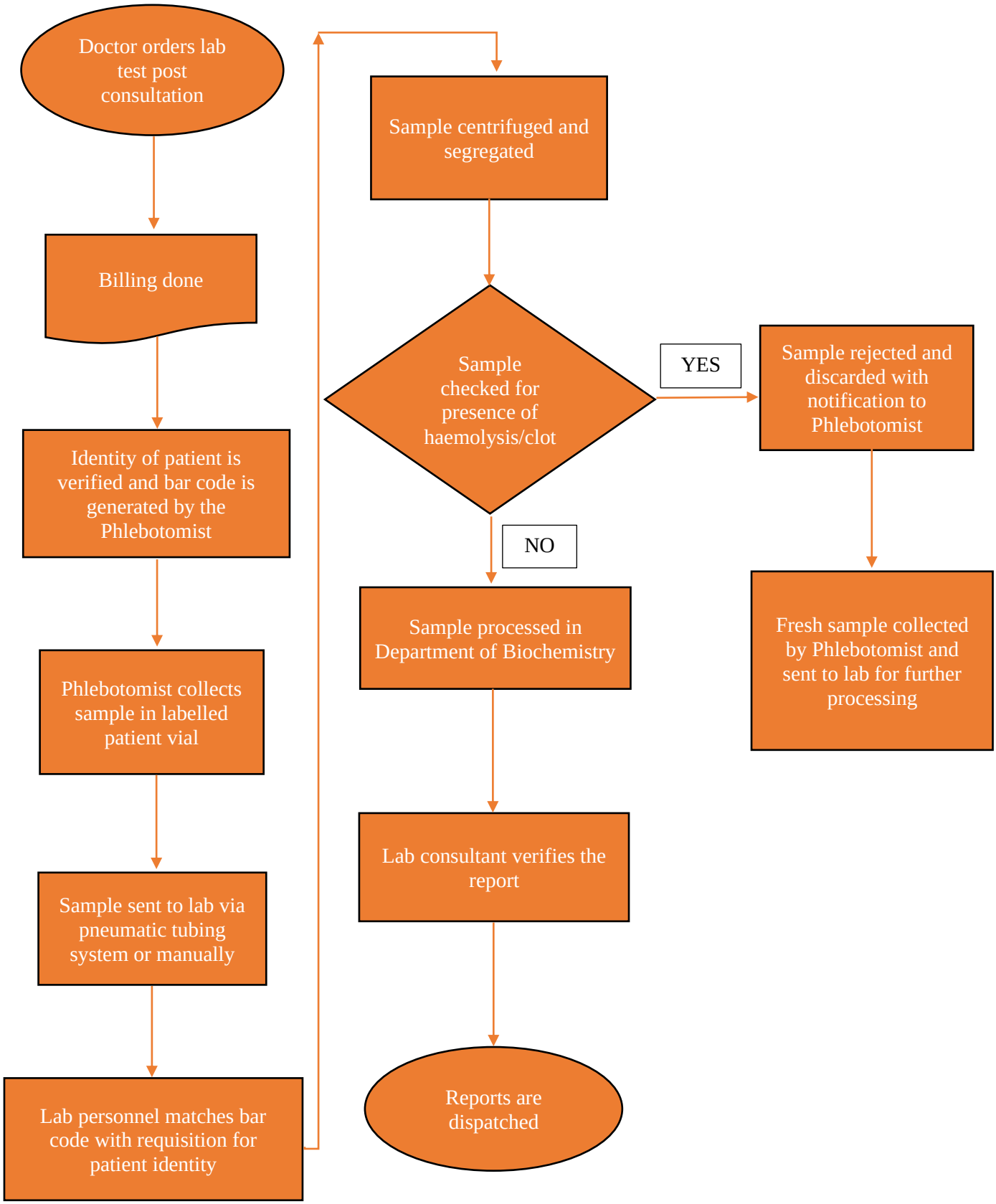
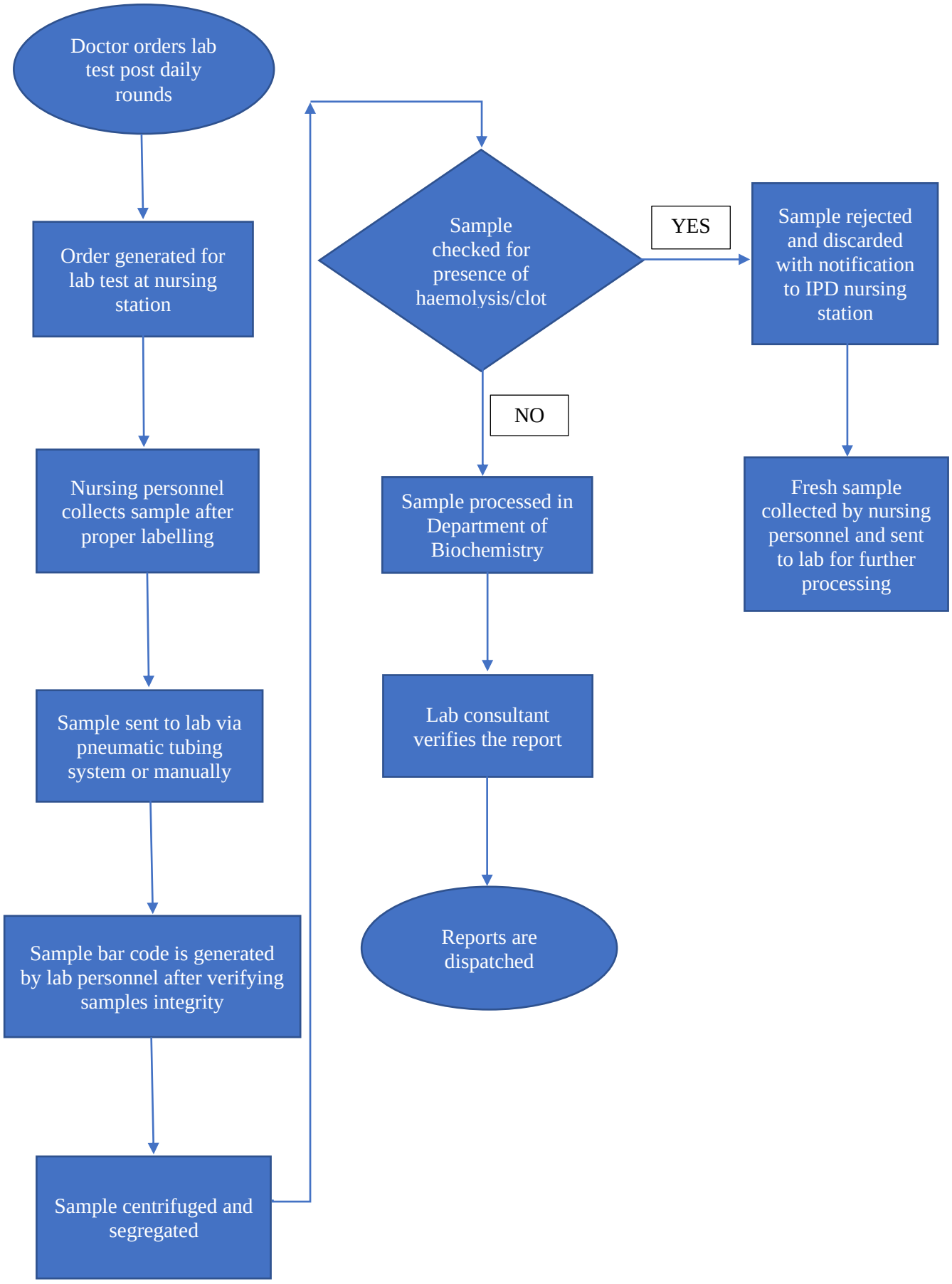


Figure 3: IPD Workflow



DATA ANALYSIS

The study included a total of 1140 samples that were collected and analysed from the Department of Biochemistry which were received from three sources namely –

1. Emergency Room – 60 test samples
2. Out – patient Department – 180 test samples
3. In – patient Department – 900 test samples

The study was divided into three phases depending on the time frame of the requisition of the test. Phase 1 samples were analysed between 10:00 AM to 12:30 PM, Phase 2 samples were analysed between 12:31 PM to 3:45 PM and Phase 3 samples were analysed between 3:46 PM to 6:00 PM.

The samples received from the respective sources were equally distributed amongst the three phases.

SOURCE	Phase 1 (10:00 – 2:30PM)	Phase 2 (12:36 – 3:45 PM)	Phase 3 (3:46 – 6:00 PM)
Emergency Room	20	20	20
Out – Patient Department	60	60	60
In – Patient Department	300	300	300
Total	380	380	380

Table 2: Phase wise sample distribution

The graph represents the average TAT across the three phases that were recorded in the Emergency Room. It was noted that the highest TAT was recorded during the Phase 1 (10:00 – 12:30 PM) which was 2 hours 22 minutes and 30 seconds and lowest TAT was recorded during Phase 3 (3:46 – 6:00 PM) which was 1 hour 57 minutes and 21 seconds.

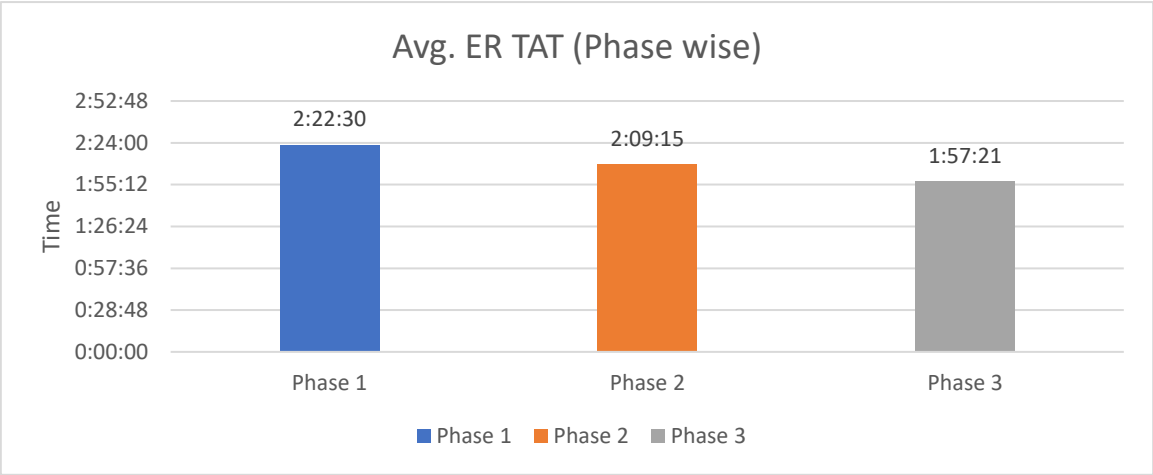


Figure 4: Average ER TAT in each phase

So as to further analyse the various differences in average TAT recorded in the three phases, various TAT's were calculated that included –

1. Pre-Analytical Stage TAT
2. Analytical Stage TAT
3. Post-Analytical TAT

The Pre-Analytical Stage recorded the time taken from when the requisition of the test was made by the consultant until the point to which the sample had arrived at the laboratory for testing.

The Analytical Stage recorded the time taken in the laboratory from the acceptance of the sample to completion of the test that was requested.

The Post-Analytical Stage recorded the time after the completion of the requested test until it was certified by the respective consultant.

The next graph represents the average TAT's recorded across the three stages in each phase that were analysed in the Emergency Room.

It was seen that the Analytical Stage recorded almost similar average turnaround times across the three phases with the highest turnaround time recorded in Phase 1 with an average TAT of 55 minutes and 39 seconds and the least in Phase 3 with an average of 51 minutes and 24 seconds.

The Pre-Analytical Stage recorded the highest average turnaround time in Phase 1 with an average TAT of 42 minutes and 36 seconds and the least in Phase 3 with an average TAT of 33 minutes and 30 seconds.

The Post-Analytical Stage also recorded the highest turnaround time in Phase 1 with an average TAT of 44 minutes and 15 seconds and the least being in Phase 3 with an average TAT of 32 minutes and 27 seconds.

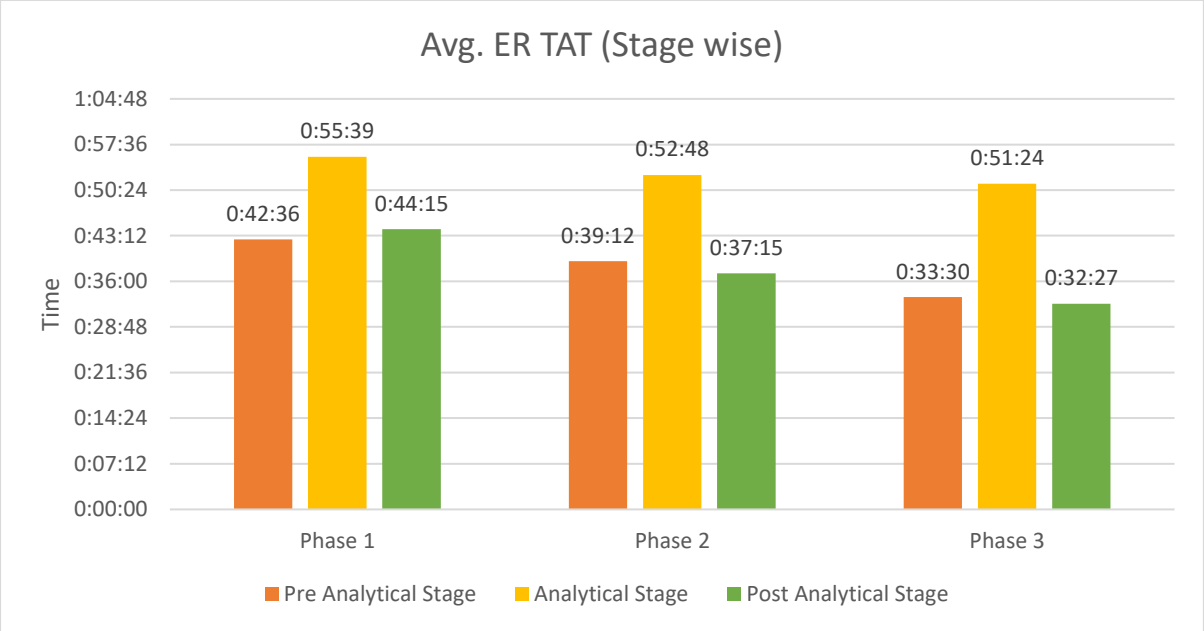


Figure 5: Average ER TAT in each stage

A trend across each stage with time was observed which was believed to be a decrease in average turnaround times across the three stages.

The average decreases in turnaround time for the Analytical Stage was 2 minutes and 7 seconds where Pre and Post-Analytical stages recorded 4 minutes and 33 seconds; 5 minutes and 54 seconds respectively.

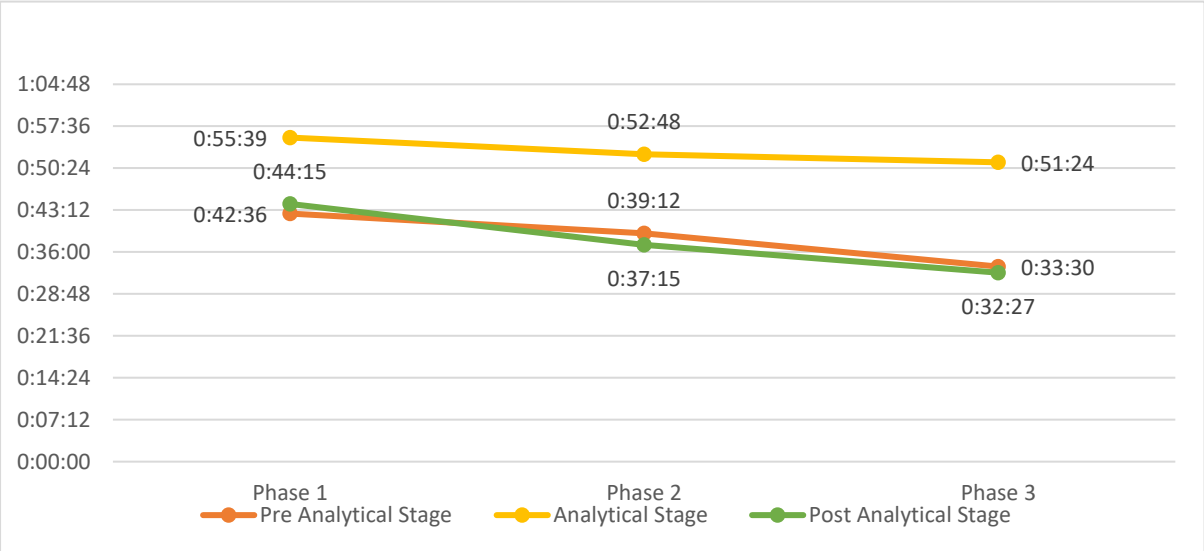


Figure 6: ER trend line

The pie chart represents the percentage (%) that accounted for the overall average TAT generated for the Emergency Room.

The Analytical Stage contributed 41.08 %, where the Pre and Post-Analytical Stages were 29.29 % and 29.63 % respectively giving them a total contribution of 58.92 %.

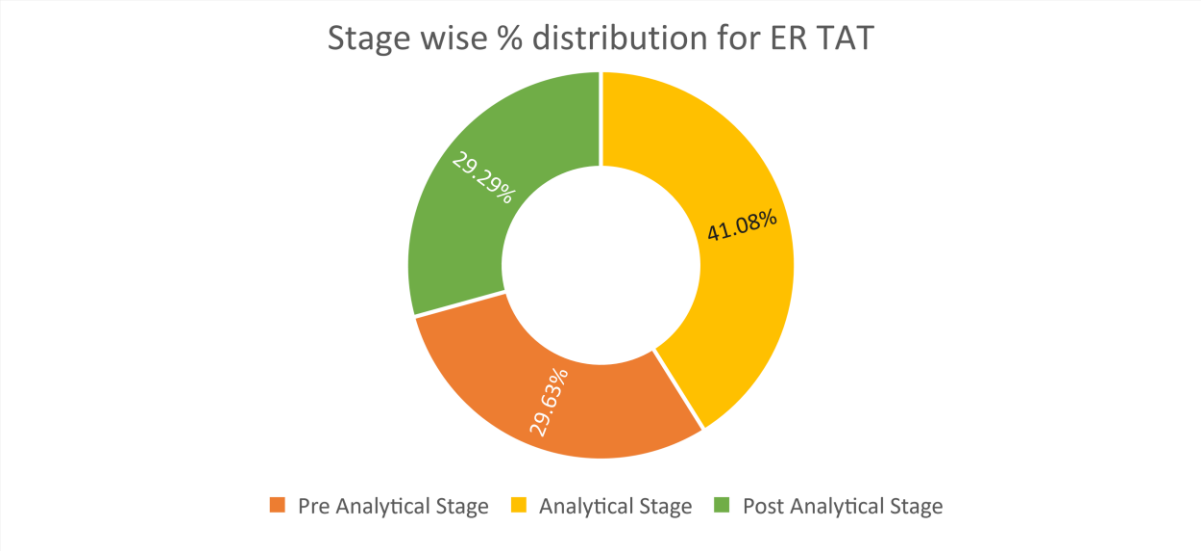


Figure 7: Percentage distribution for ER TAT

The below depicted graph shows the average TAT of the Out-Patient Department across the three phases.

The average OPD TAT was 3 hours 15 minutes and 24 seconds across Phase 1 where as it was 3 hours 12 minutes and 54 seconds and 3 hours 13 minutes and 52 seconds across Phase 2 and Phase 3 respectively.

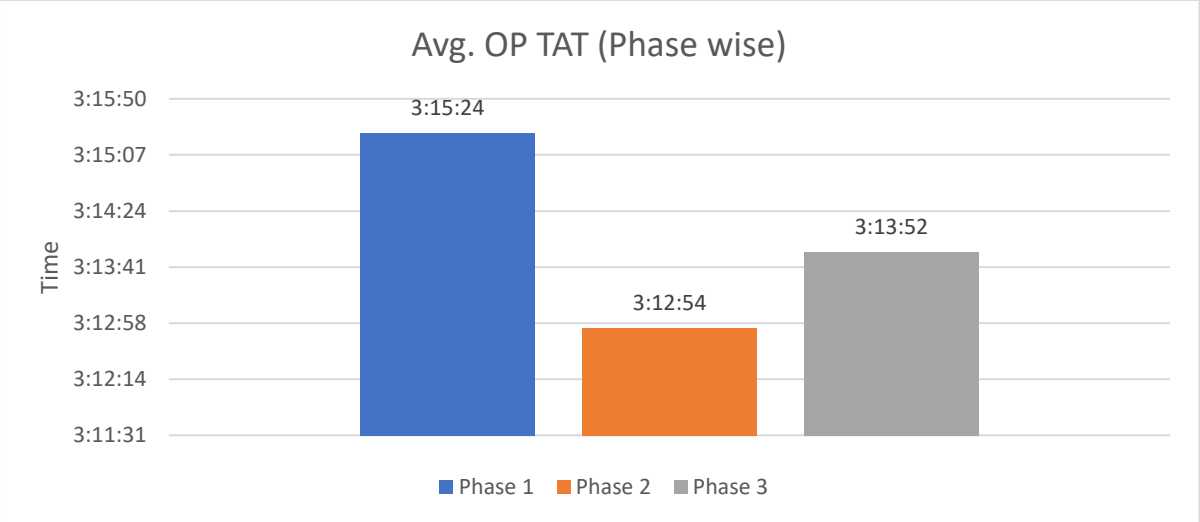


Figure 8: Average OPD TAT in each phase

The graph represents the average TAT recorded across the three stages of the Out-Patient Department stage wise.

The Pre-Analytical Stage recorded the highest average turnaround time of 1 hour 7 minutes and 8 seconds in Phase 3 and the lowest in Phase 1 which was recorded to be 1 hour 5 minutes 22 seconds.

The Analytical Stage recorded an average turnaround time of 1 hour 3 minutes and 46 seconds, 1hour 5 minutes and 11 seconds and 1 hour 3 minutes across Phase 1,2 and 3.

The Post-Analytical Stage recorded the highest average turnaround time in Phase 1 of 1 hour 6 minutes and 16 seconds and the least in Phase 2 of 1 hour and 56 seconds.

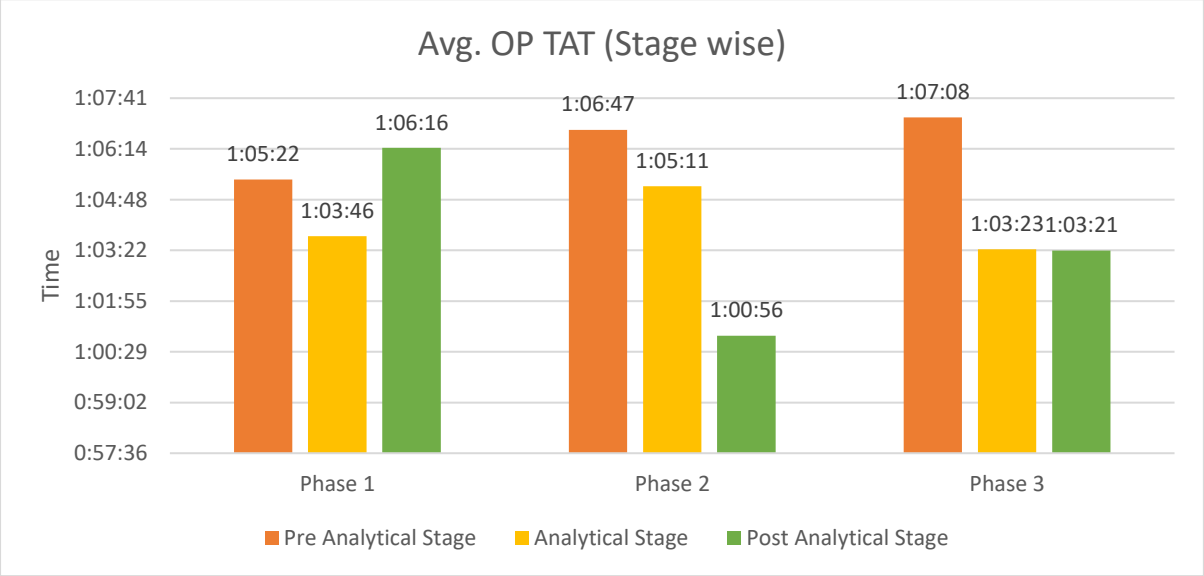


Figure 9: Average OPD TAT in each stage

As noticed in the ER, a trend line was observed relating to the increase in the average turnaround time across the Pre-Analytical Stage with an average increase of 53 seconds across the three phases.

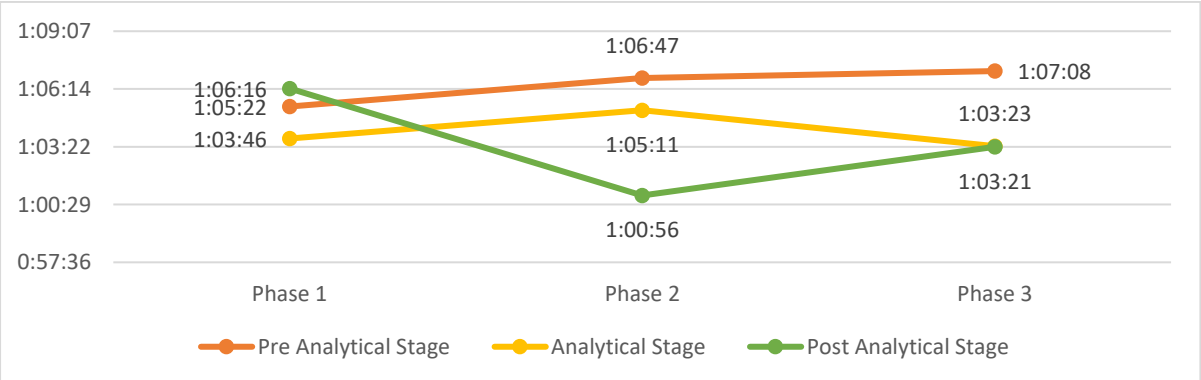


Figure 10: OPD trend line

The below depicted chart shows the contribution of all the Stages to the overall average turnaround time of the Out-Patient Department.

The contribution across all the three stages were significantly similar with a percentage (%) of 34.24%, 32.67% and 33.09 %.

A combined contribution of 67.33 % was noted between Pre and Post-Analytical Stages to the overall average turnaround time.

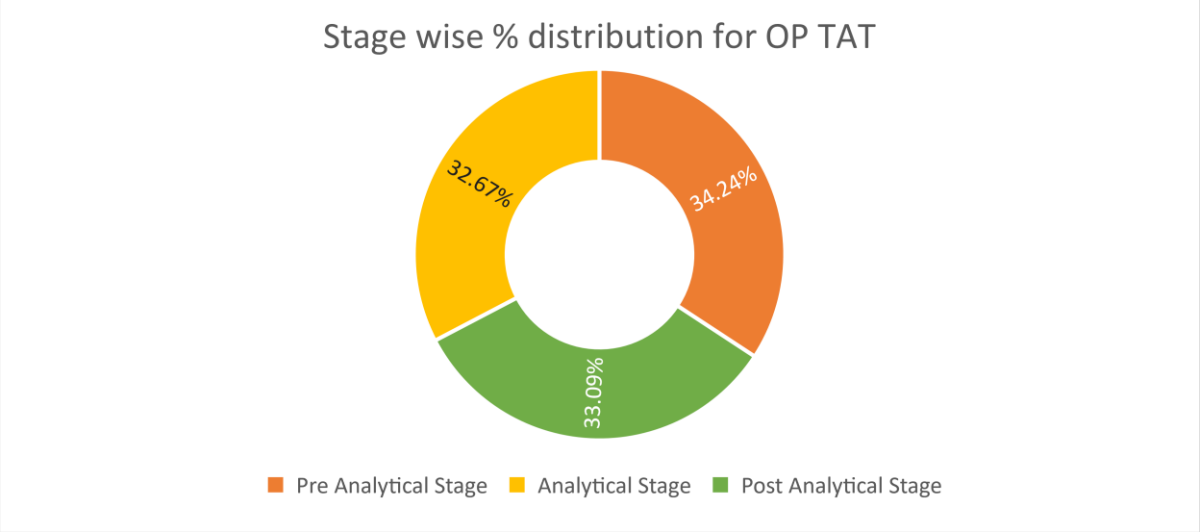


Figure 11: Percentage distribution for OPD TAT

The below depicted graph is used to represent the average TAT recorded in the In-Patient Department across the three phases.

The highest being recorded in Phase 1 with a time of 2 hours 34 minutes and 11 seconds and the least in Phase 3 with a time of 2 hours 23 minutes and 53 seconds.

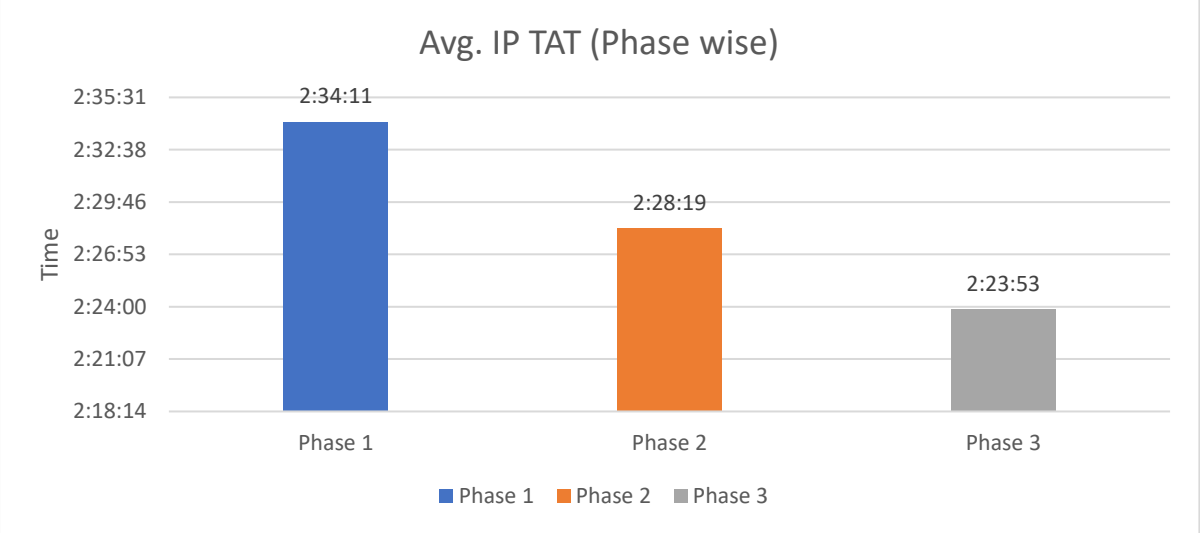


Figure 12: Average IPD TAT in each phase

The below depicted graph represents the stage wise recorded average TAT across the three phases in the In-Patient Department.

The Pre-Analytical Stage recorded the highest average TAT in Phase 1 of 53 minutes and 52 seconds and the lowest in Phase 2 with a time of 49 minutes and 36 seconds.

The Analytical Stage recorded its highest average turnaround time in Phase 2 with a time of 59 minutes and 21 seconds and its lowest in Phase 1 of 58 minutes and 52 seconds.

The Post-Analytical Stage recorded its highest average turnaround time in Phase 1 and lowest in Phase 3 with a time of 41 minutes and 27 second and 33 minutes and 8 seconds respectively.

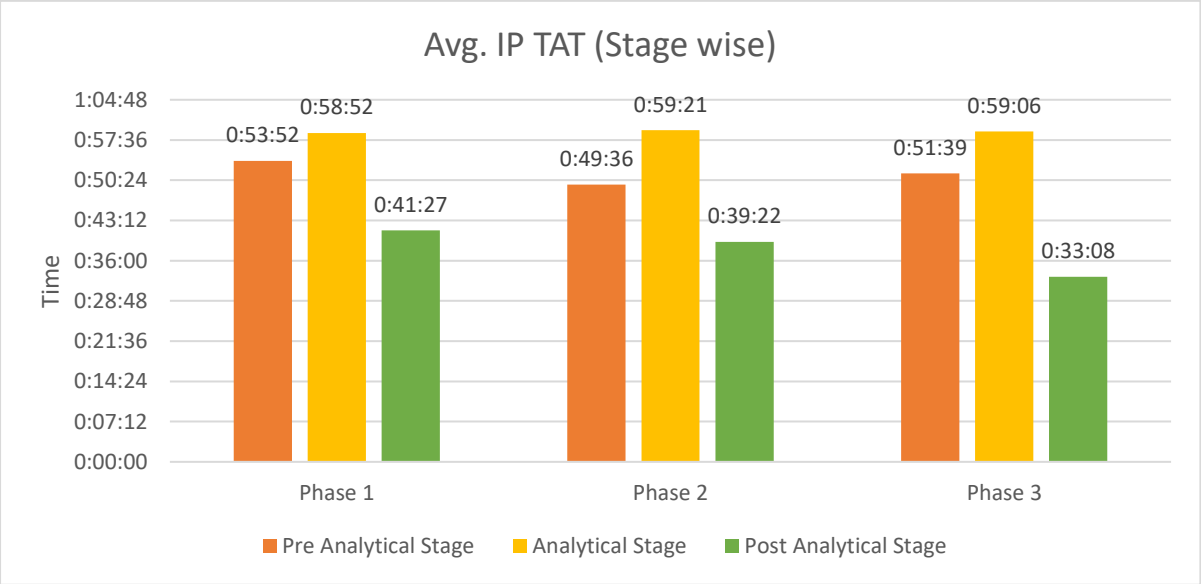


Figure 13: Average IPD TAT in each stage

A trend was seen to be present with a decrease in average turnaround time in the Post-Analytical Stage across the three phases whereas an increasing trend was seen in the Analytical stage although being very minute in number.

The below graph depicts this trend with an average decrease of 4 minutes and 9 seconds recorded for the Post-Analytical Stage.

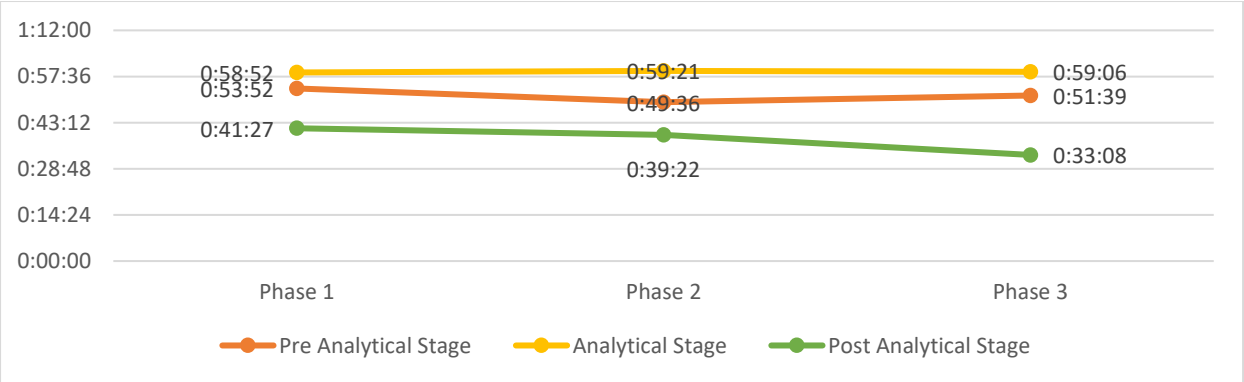


Figure 14: IPD trend line

The below depicted pie chart signifies the overall contribution to the average turnaround time of the In-Patient department, the Analytical Stage contributed 40.73 % whereas the Pre and Post-Analytical Stages contributed 33.10 % and 26.17 % respectively. A combined contribution of 59.27 % was seen between the Pre and Post-Analytical Stage.

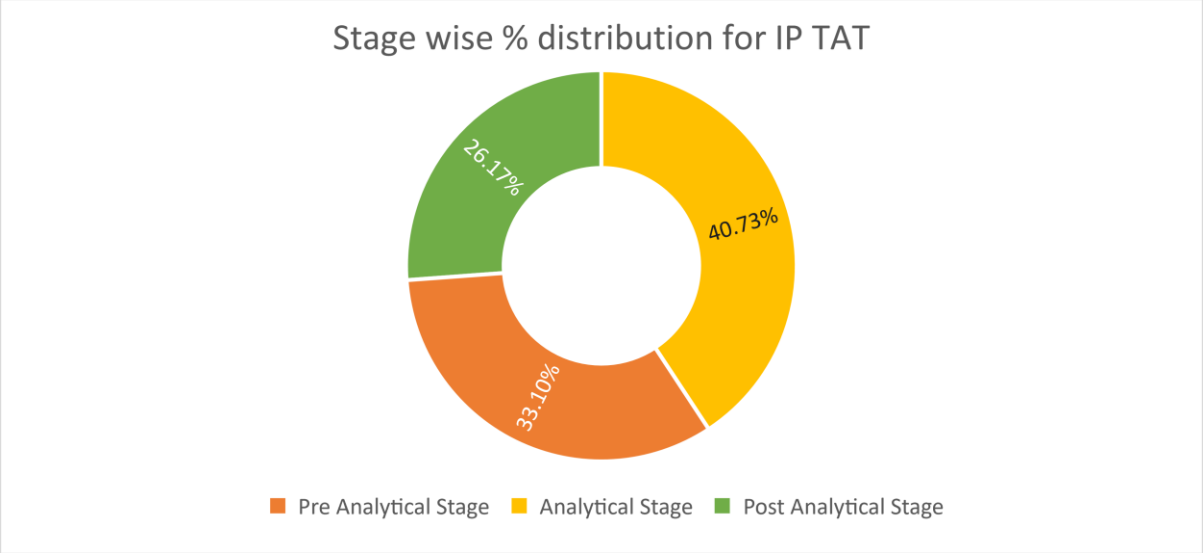


Figure 15: Percentage distribution of IPD TAT

The average turnaround times in the Department of Biochemistry recorded across all the three department's namely, Emergency Room, Out-Patient Department and In-Patient Department. The highest was recorded in the Out-Patient Department with an average turnaround time of 3 hours 14 minutes and 23 seconds and the lowest in the Emergency Room with a time of 2 hours 9 minutes and 42 seconds.

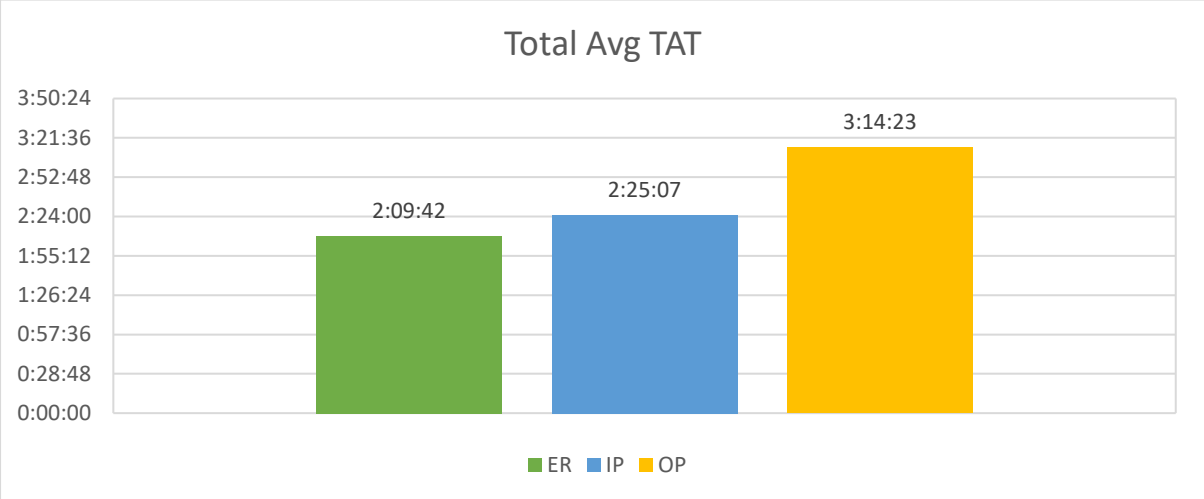


Figure 16: Overall average TAT in ER, IPD and OPD

ROOT CAUSE ANALYSIS

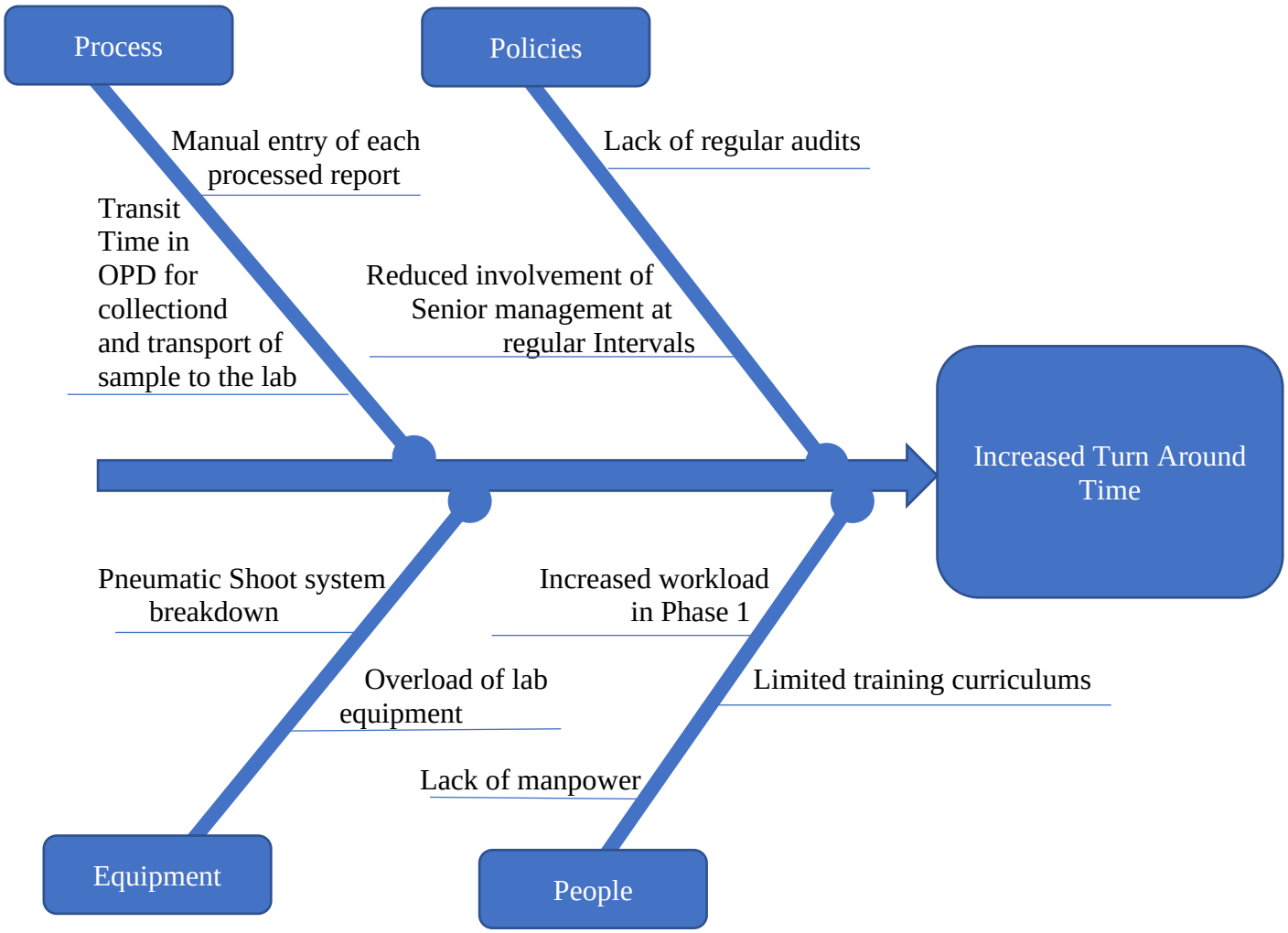


Figure 17: Root cause analysis for increased TAT

SUGGESTIONS

- A comprehensive rooster to be developed where there is an increased presence of workforce available at our disposal for the peak hours witnessed by the hospital. This is primarily aimed to cater to the morning hours due to the increased workload witnessed by the unit.

- Placement of a satellite Phlebotomist bay for the OPD and providing directions to the same on OPD ticket hence making it more accessible to the patients in provisions of samples that need to be collected.

- Monthly maintenance schedule for the pneumatic system would ensure greater efficiency and would also lead to fewer breakdowns in the system.

- Adoption of efficient quality control procedures by maintaining a checklist for the process in the laboratory.

- Training of technical staff for equipment management as well as for nursing staff by implementing single prick policy.

- Generating a monthly feedback mechanism to cater to the technical issues, if any.

- With the recent adoption of the LIS, provision of keywords along with pre designed templates for routine investigations would greatly help in reducing the turnaround time by making the process a system driven modality.

- Creating of dashboards for consultants so as to make the reports more accessible as well as receive TAT alerts upon nearing a deadline.

- Developing an overall benchmarking system for laboratory turnaround time.

- Implementation of a quarterly audit schedule across the three phases to check and monitor the results achieved are as per set benchmarks.

CONCLUSION

This study was carried out with the aim to analyse the turnaround time recorded in the Department of Biochemistry of CARE Hospitals, Banjara Hills. It was performed across three stages that contribute to the overall turnaround time of a laboratory test namely the Pre-Analytical Stage, Analytical Stage and the Post-Analytical Stage.

Samples were received from three departments; Emergency Room, In-Patient Department and the Out-Patient Department. The data was broken down into three phases which represented the time frame to which the tests were ordered by the clinicians. Phase 1 was between 10:00 AM to 12:45 PM, Phase 2 between 12:46 PM to 3:00 PM and Phase 3 between 3:46 PM and 6:00 PM.

The average turnaround time across the three departments; ER, IPD and OPD were recorded to be 2 hours 9 minutes and 42 seconds, 2 hours 25 minutes and 7 seconds, and 3 hours 14 minutes and 23 seconds.

It was found that due to limitation across all the three stages; Pre-Analytical, Analytical and Post-Analytical Stages there was an overall increase in average TAT in the test results. Hence, only upon working on all the three stages would the overall turnaround time would lead to significant improvements.

When analysed across three different time frames, an increase in the overall TAT across the three departments was seen majorly in Phase 1 (10:00-12:30 PM) which was mainly attributed to the increase workload experienced during those hours.

A comprehensive rooster would optimise the utilisation of workforce needed to provide effective and efficient service to the end user while helping in reducing the overall turnaround time. Along with which the installation of a satellite phlebotomists bay during the morning hours for the OPD would also contribute immensely in reducing the turnaround time.

Another major finding was the breakdown of the pneumatic system as well as the overload of equipment in the laboratory. A monthly maintenance schedule along with training of technical staff of the laboratory could be an effective measure to counteract these findings.

Optimum utilisation of the LIS in the Post-Analytical Stage for certification of reports with keywords and pre designed templates as well as making them more accessible for the consultants was another suggestion made for decrease in the overall turnaround time.

Policies need to formed and implemented with regular audits to be conducted in improving the overall turnaround time. This would play not only a major factor in improving the patient satisfaction but also would decrease the length of stay of patients thereby decreasing the financial burden on them.

The results of our present study show that a lot can be done to improve the turnaround time of our laboratory. Although there is difference of opinions relating to the clinical outcomes of an improved TAT, the causes of delayed TAT should be identified. Improving TAT is a continuous process and we need to have a wholesome approach for reducing the obstacles for optimum TAT.

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