

**Summer Training at
Zydus Hospital, Ahmedabad**

**Study on Turn-Around-Time (Tat) For Laboratory Services in In-Patient
Wards at Zydus Hospital, Ahmedabad**

**By
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**Under the guidance of
Mr. S.P. Chattopadhyay**

**MBA Hospital & Health Management
2017-2019**


Institute of Health Management Research
The IIHMR University, Jaipur
2018

CERTIFICATE

This is to certify that **Ms. Jilu Kallada** has undergone summer training in **Zydus Hospitals, Ahmedabad** from 2nd April to 1st June 2018.

The candidate herself completed the project assigned to her during summer training. Her approach to the project was sincere and proactive. This summer training is in partial fulfillment of the course requirement recommended for the award of MBA in Hospital and Health management.

I wish her success in all her future endeavors.

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25/5/2018

Mr. S.P. Chattopadhyay

Asst. Professor

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ZHHPRL/HR/PATHOLOGY/1

Date: 1st June 2018

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Jilu Kallada** a student of IIHMR University, Jaipur has completed Training from our Hospital under the guidance of **Dr. Medhavini Ayachit– Lead Medical Services.**

The topic of Training was “TAT for Laboratory Services in inpatient wards” and the duration of training was effective from 2nd April 2018 to 1st June 2018.

During above period we found her very sincere and hardworking.

We wish her all the best for her future endeavor.

For, Zydus Hospitals and Healthcare Research Pvt. Ltd.

Rajiv Ranjan
Lead – Human Resources

HUMAN RESOURCES

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ACKNOWLEDGEMENT

Nothing really can be accomplished alone. It's the direction, guidance, involvement, and support of more than few that results into realization.

I sincerely thank **Mr. Rajiv Ranjan, Head Human Resource Department** at Zydus Hospitals, Ahmedabad for giving me the opportunity to be a part of this prestigious institution for my Summer Internship Training for a period of two months i.e. April 2nd – June 1st, 2018.

I consider it is a matter of pleasure and privilege to work under the guidance of **Dr. Medhavini Ayachit, Lead Medical Services** and thankful for providing me the opportunity to work on my projects. I am grateful for her encouragement, support, guidance and help which has resulted in completion of my projects.

I am grateful to my college mentor, **Mr. S.P. Chattopadhyay, Faculty - IIHMR university Jaipur**, for his commendable support, motivation, continuous guidance and help throughout the project.

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I am grateful to all the hospital staff for devoting their time and attention despite a busy schedule & permitting me to ask my queries & without whose encouragement, faithful suggestions & full co-operation, this report would have been hardly possible.

Ms. Jilu Kallada

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ACRONYMS / ABBREVIATIONS

1. TAT – Turn Around Time
2. MO – Medical Officer
3. NABL – National Accreditation Board for Testing & Calibration Laboratories
4. NABH - National Accreditation Board for Hospitals & Healthcare Providers

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PART - A

1. ZYDUS Hospital, Ahmedabad

ZyduS Hospitals is a 550 bed Super speciality medical institution spanning 15 floors and 2 basement floors. This world class & highly sophisticated medical establishment offers all major medical specialties, sub-specialties, investigation & diagnostics facility, rehabilitation & physical therapy care under one roof. Hospital's architecture design ensures higher energy efficiency by allowing greater permeation of sun light throughout the day and harnessing solar energy for hot water provisioning throughout the hospital complex.

The hospital complex is in the posh western suburb of Ahmedabad on SG Highway, just 20 minutes from the airport and in close vicinity of most hotels and shopping malls. With vast open spaces around the hospital it's positioned & designed to ensure that patients and caregivers get a feel of the skyline of Ahmedabad city from their rooms and never feel claustrophobic. It's an attempt to give a feel of home @ hospital.

Hridayam 360 feature of ZyduS hospitals uses the latest technology of IVUS (Intravascular Ultrasound) & FFR (Fractional Flow Reserve).

ZyduS Hospital received NABH Accreditation in 2016. Other certifications are as follows -

- NABH Emergency Services
- NABH Nursing Services
- NABH Blood Bank/ Blood Centre
- NABL
- Green OT (Certified Green Operation Theatre)

1.1 Vision Statement

To be a leading provider in healthcare service delivery to the community. We shall achieve 1500 beds under our management by year 2020 and become a most preferred destination for comprehensive medical care and treatment.

1.2 Mission Statement

To provide world standard healthcare solutions to the community by leveraging advances in medical research science and technology and adoption of best management practices.

1.3 Core Values

- Patient Centric
- Adaptable to Change
- People-Driven
- Committed to Deliver
- Innovative in What We Do
- Humble
- Value-Driven

1.4 Salient Features of the Hospital

- 160 ICU Beds equipped with facility for bed side dialysisGE 256 Slice Dual Energy CT Scan (first in Asia) with Gemstone Spectral Imaging Technology- capable of performing Cardiac CT Angio at any heart rate and lowered radiation dosage for an array of CT Procedures
- 3.0 Tesla, GE 32 Channel Silent MRI - offers 30% reduction in scanning time and capable of detecting Micro Bleeds
- Philips Allura Clarity Fully Flat Panel Cath Labs with IVUS technology (first in Asia) - 2 side by side cathlab units catering to Cardiac & Neuro Interventions with Zero Delay
- 3D & 4 D Capable Echo & Sonography Systems
- Tuttnauer Isreal's Central Sterile Supply Services Units for fail safe sterility of surgical equipments, one of its kind system housing separate unmanned lifts for transfer of dirty & clean linen
- X-Ray with Flouroscopy with Real Time Imaging (Casetteless / Plateless - console based system)
- C-Arm with Flouroscopy with Real Time Imaging
- 45 Bed Dialysis Unit with advanced Fresenius Machines and an Isolation Dialysis Chamber
- 21 State of the Art Class 100 Operating Suits equipped with digitally controlled Mac Operating Led Lights with Color Deferential Mode & Schaerer Operating Tables from Switzerland and touch free entry & exit doors
- Choice of 5 accommodation classes - Standard, Executive, Deluxe, Premium & Suite
- Dedicated Wellness & Preventive Health check department
- Emergency Room with Triage & Isolation Provisioning
- Single Floor Diagnostics for all Emergency needs (total Diagnostics at ground level)
- 12 High speed Elevators with enhanced ride quality comfort - all lifts capable of transporting Patient Beds
- Sleep Disorder Centre
- True Align Technique in Total Knee Replacement Surgery

1.5 Services Available

1.5.1 Clinical

- | | |
|-----------------------------------|---------------------------|
| • Arthroscopy and Sports Medicine | • Emergency medicine |
| • Breast Reconstruction | • ENT Surgery |
| • Cardiology & Cardiac Surgery | • Genetic Sciences |
| • Critical & Intensive care | • Gynecology & Obstetrics |
| • Dentistry | • Health Check-up |
| • Dermatology | • HIPEC – PIPAC (Cancer) |

- Investigation Services
- Joint Replacement (Knee/ Hip)
- Medical Gastroenterology
- Nephrology
- Neurology & Neurosurgery
- Oncology
- Ophthalmology
- Orthopedics & Trauma
- Pediatrics
- Pain Clinic
- Pulmonology
- Spine & Scoliosis Surgery
- Surgical Gastroenterology
- Urology
- Transplant Medicine (Kidney, Liver)

1.5.2 Auxiliary

- Radiology
- Laboratory and Blood bank
- Physiotherapy
- Pharmacy
- Biomedical Engineering
- Medical gases (Cylinders and piped medical gases)
- Medical records Department
- Mortuary Services
- Emergency Services
- Admission and Billing
- Central sterile supplies department
- Ambulance services
- Administrative office
- Hospital Management Information System
- Quality Assurance Department
- Infection Control Department
- Dietary

1.5.3 Non-Clinical

- Library
- HR Department
- Operations Department
- Finance Department
- Marketing Department
- House-keeping Department

1.6 Services Not Available

1. Nuclear Medicine
2. Radiotherapy
3. PET Scan

1.1 Hospital Layout

FLOOR	DEPARTMENTS
Ground Floor	A-ZYDUS HEALTH CHECK UP B-RADIO DIAGNOSTICS & IMAGING C-EMERGENCY & ER OT D-ADMISSION & BILLING, PHARMACY
01	REGISTRATION DESK A-OPD, EEG & EMG B-OPD, ECHO, TMT, & ECG C-PHYSIOTHERAPY & REHABILITATION, DENTAL OPD D-OPD
02	A-ENDOSCOPY, LITHOTRIPSY & URODYNAMICS B-MOTHER & CHILD CARE C- KITCHEN D-FOOD COURT
03	A-SURGICAL ICU-3A B-OPERATION THEATER COMPLEX C-OPERATION THEATER COMPLEX D-TRANSPLANT ICU & SURGICAL ICU-3D
04	A-IVF B-CENTRAL STERILE SUPPLY DEPARTMENT C-MEDICAL RECORD DEPARTMENT D-DEPARTMENT OF LABORATORY AND TRANSFUSION MEDICINE
05	A-OPERATION THEATER COMPLEX B- OPERATION THEATER COMPLEX C- OPERATION THEATER COMPLEX D-CVTS ICU-5D
06	A-CATH LAB & CARDIAC ICU-6A B-CARDIAC ICU-6B C-CVTS ICU-6C D-CVTS ICU-6D
07	A-CRITICAL CARE UNIT-7A B-PEDIATRIC ICU & NEONATAL ICU C-LABOUR DELIVERY COMPLEX & OT, PREMIUM ROOMS D-NEURO ICU-7D
08	A-EXECUTIVE (TWIN SHARING)801-820 B-EXECUTIVE (TRIPLE SHARING)821-844 C- EXECUTIVE (TRIPLE SHARING)845-868 D- EXECUTIVE (TWIN SHARING)869-888
09	AB-DIALYSIS C-AUDITORIUM D-ADMINISTRATION
10	PREMIUM ROOMS
11	PREMIUM ROOMS
12	PREMIUM ROOMS
13	PREMIUM ROOMS
14	SUITS
15	A-PRESIDENTIAL SUITE B-PREMIUM SUITS 1501-1502 C-PREMIUM SUITS 1503-1504 D-PREMIUM SUITS 1505-1506

The in-patient wards of Zydus Hospital are located on 8th, 10th, 11th, 12th, 13th, 14th and 15th floors. Each floor is divided into 4 wings namely, A, B, C & D wings. The total number of in-patient beds on these floors is 281. Out of the 281 in-patient beds, presently only 211 beds are available for in-patients, as 12th floor C & D wing (20 beds), 13th floor A, B, C & D wings (40 beds) and 14th floor A & B wing (10 beds) are still not operational. The inpatient beds are classified into twin sharing and triple sharing executive rooms, premium rooms, suits, and presidential suites.

A Medical Officer is assigned to each wing on 8th floor and on other floors one for each 2 wings. The Medical officer to in-patient bed ratio is 1:20 to 1:25 on all in-patient floors except 14th and 15th floors, where it is 1:10 and 1:3 to 1:4 respectively. Similarly, a Nursing In-charge is assigned to each wing on 8th floor and on other floors one for each 2 wings.

Patients with stable vital parameters are admitted to these inpatient areas. Cases ranging from fever, general surgery to isolation patients are admitted to these areas.

RADIOLOGY DEPARTMENT IN ZYDUS HOSPITAL

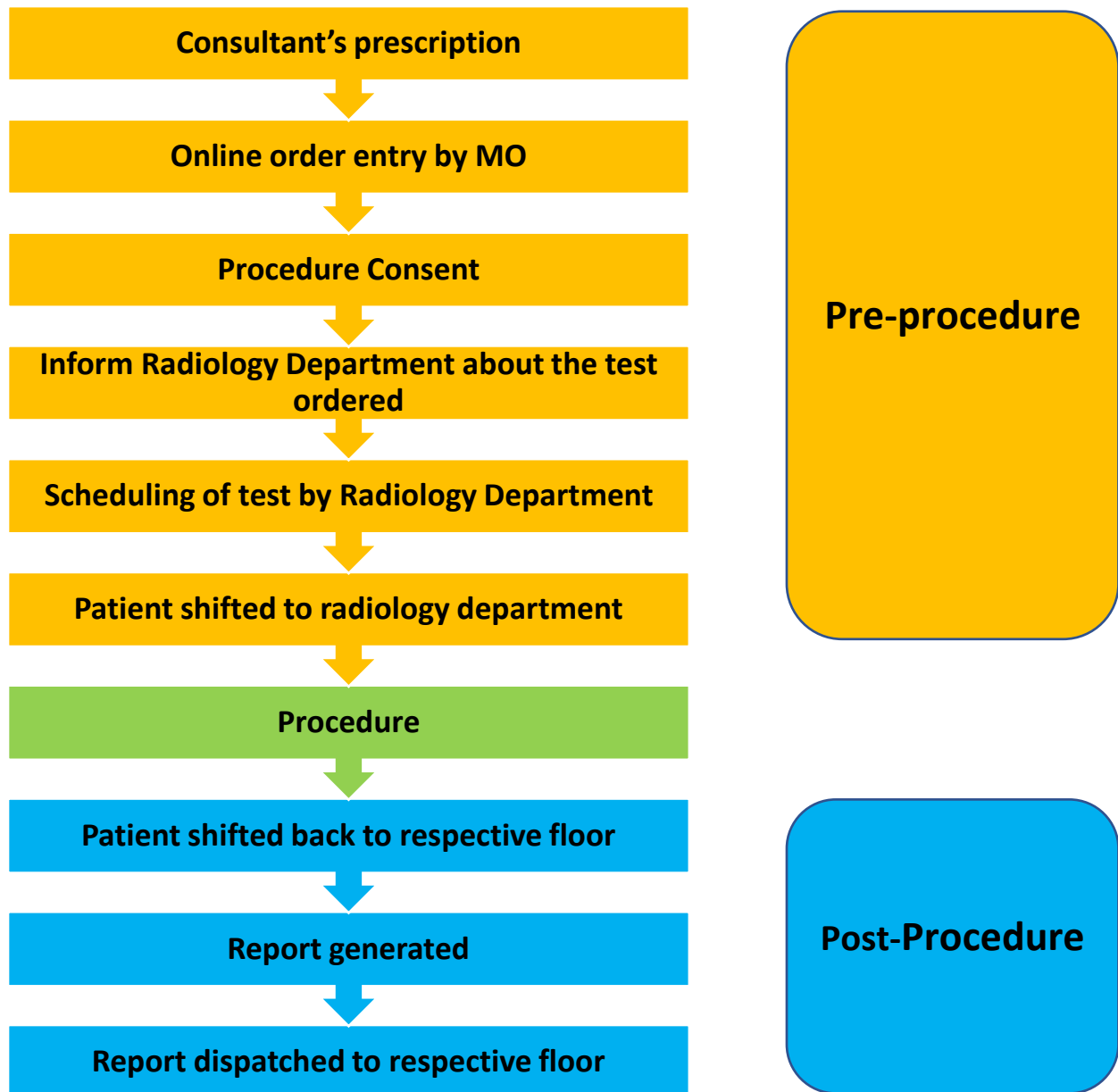
Consists of the following

- X-ray
- CT Scan
- MRI
- Ultrasound

SALIENT FEATURES:

- GE 256 Slice Dual Energy CT Scan (first in Asia) with Gemstone Spectral Imaging Technology- capable of performing Cardiac CT Angio at any heart rate and lowered radiation dosage for an array of CT Procedures
- 3.0 Tesla, GE 32 Channel Silent MRI - offers 30% reduction in scanning time and capable of detecting Micro Bleeds
- X-Ray with Fluoroscopy with Real Time Imaging (Casetteless / Plateless - console based system)
- C-Arm with Fluoroscopy with Real Time Imaging

PROCESS MAPPING FOR RADIOLOGY SERVICES IN WARDS



SOFTWARES USED IN RADIOLOGY DEPARTMENT

The radiology department uses the following software

1. An integrated Electronic Medical Record (EMR) system – HINAI
2. Radiology Information System (RIS)
3. Picture Archiving and Communication System (PACS)

Turnaround time for radiology tests is a complex process comprising of multiple steps from consultant's prescription to report dispatch to the respective department.

“In radiology TAT is King” – Whitney I. Jackson, Nov 12, 2015. In today's healthcare environment, radiology is being asked to be the medical six-million-dollar man – the specialty is expected to be better, stronger, and faster than before and, integral to that achievement is the quickest radiology report TAT possible. The quest for the most rapid TAT isn't new – in many ways, it's been the holy grail of radiology for nearly a decade. but, there is a growing number of tools now available that are designed to shave away the amount of time it takes a radiologist to read a study and return his/her diagnosis to a referring physician.

Turnaround times are variable. Some tests require 15 minutes to read, such as chest X-rays for pneumonia or CT scans for brain bleeds, and others require longer.

“Practice policy and quality initiatives: Decreasing variability in turnaround time for radiographic studies from the emergency department” – Alexander J. Towbin, MD, Srikant B. Iyer, MD, MPH, James Brown, Ms, Kartik Varadarajan, PHD, Laurie A.Perry, RN, and David B. Larson, MD, MBA, Department of Radiology and Division of Emergency Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati.

The final radiology report is the end product of the imaging process and often represents the radiologist's main contribution to the care of the patient. The American College of Radiology's guidelines for communication of diagnostic imaging findings suggest that radiologists can provide quality patient care only if their reports are available to the healthcare team in a timely fashion.

EMERGENCY DEPARTMENT

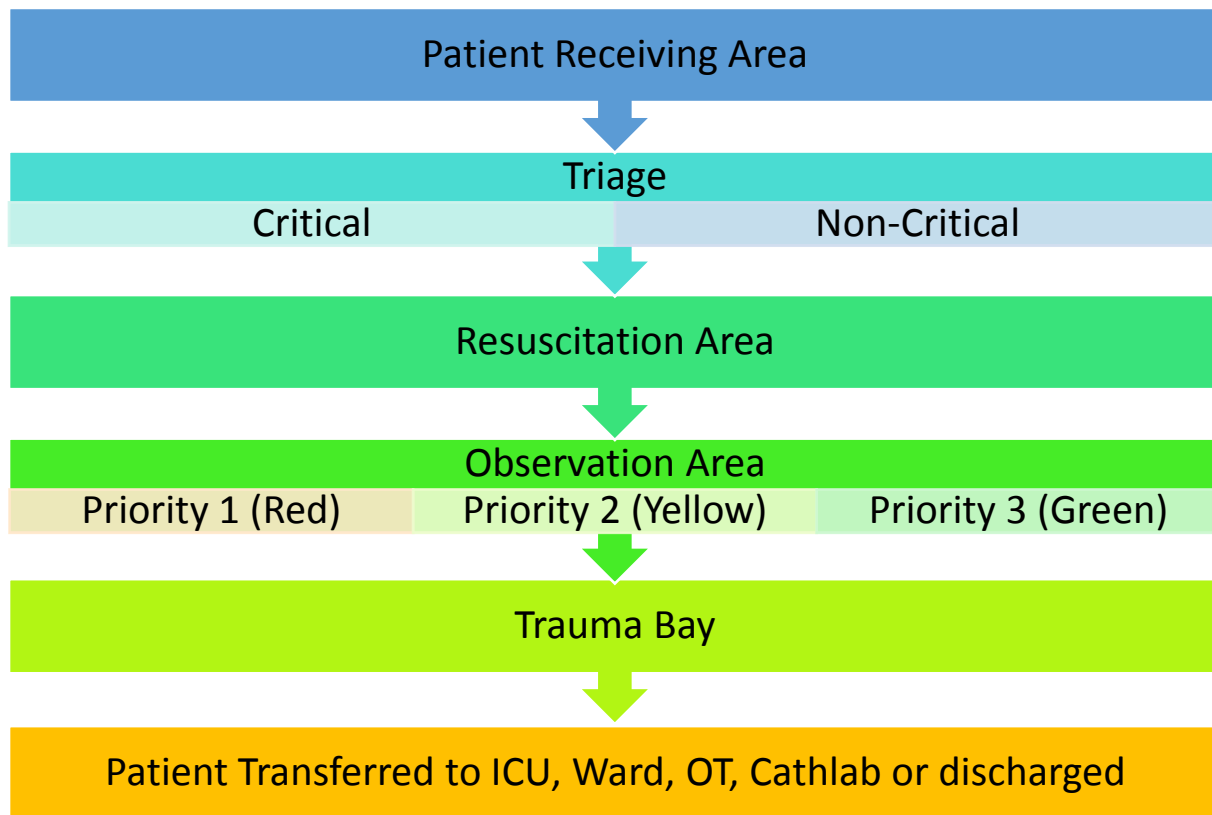
The emergency department of Zydus Hospitals is 16 bedded well equipped unit. The department is divided into various zones as per NABH guidelines. These zones are colour coded according to the criticality of patient's condition. The zones are as follows

- Triage Area
- Resuscitation Area
- Priority 1 Area
- Priority 2 Area
- Priority 3 Area
- Priority 4 Area
- Isolation Room
- Trauma Bay

- Emergency department reception and billing
- Waiting area for relatives

Emergency department consists of the Emergency Physician, MO, Sister-in-charge, Senior Nurses and Junior Nurses, Attendants, Transport team, House-keeping personnel.

FLOW OF PATIENTS IN EMERGENCY DEPARTMENT



PART - B

2. TAT for Laboratory Services

Turn-around-time (TAT) is defined as the time from when a test is ordered until the result is reported. Each team member involved in laboratory process defines TAT in a different way.

Table 2.1 Different Definitions of TAT According to the Healthcare Team Members

Team Member	Start Process	End of Process
Consultant	Prescription	Report Informed
Ward Medical officer	Online entry	Report generated
Ward Nurse	Sample Collection	Report generated
Laboratory	Sample received in laboratory	Report generated

TAT is an important aspect to measure the quality of service provided by the laboratory. It has also been shown that outcomes of certain situations such as operation theatres and in emergency departments have been affected by timely reporting of lab test results. Rapid laboratory TAT is important both from a medical and commercial point of view.

Laboratory TAT involves a complex process involving multiple steps, participants and stakeholders. Delay in a single step might affect the entire laboratory process and delay the TAT.

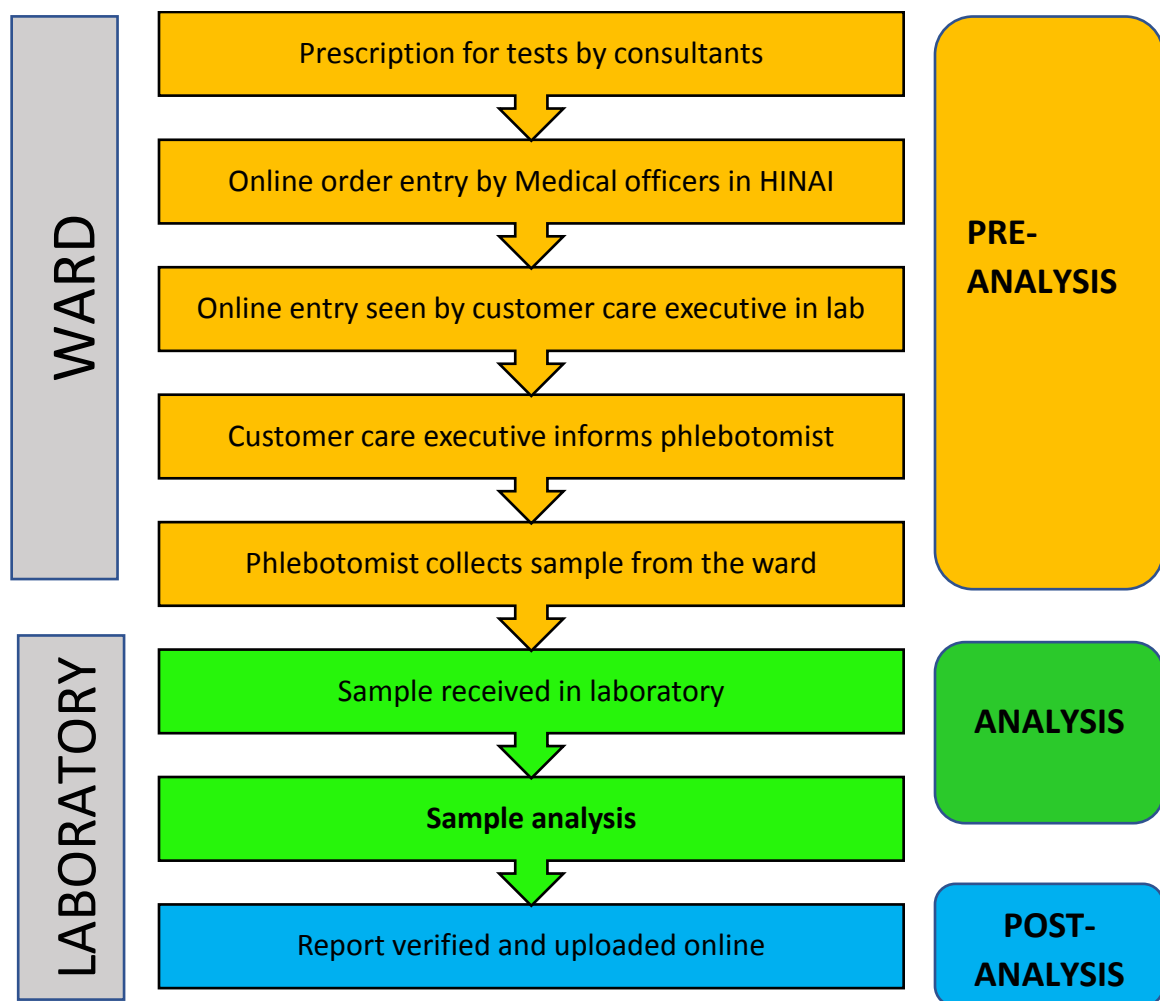
The reduction in TAT will lead to increased patient satisfaction, quality of care, employee satisfaction and ultimately the hospital's revenue.

Zyodus Hospitals were facing problem in initiating treatment for patients on floors as there were delay in reporting of laboratory investigations. The consultants were dissatisfied with this delay from laboratory department. Discharges of patients were delayed because of the delay in laboratory reports. The hospital wanted to assess their current scenario in relation to the overall TAT of laboratory services in inpatient wards. They wanted to identify the problem areas where the delay is prominent. They wanted to calculate the time taken by phlebotomist to reach the floors for sample collection after online entry of investigation orders. Also they wanted recommendations for decreasing the time taken for pre-analysis phase of laboratory services.

The study was conducted from 9th April 2018 to 28th April 2018 (3 weeks). Out of 291 samples, 160 samples were taken for analysis and 131 samples were outliers. Out of the 160 samples, 78 samples were within TAT time. Out of the total 82 samples which were delayed, 27 samples had TAT between 76-90 min, 16 samples had TAT between 91-120 min, 26 samples had TAT between 121-180 min and 13 samples had TAT over 180 mins. Average time between consultant's

prescription and online entry of test my MO was observed to be 27 mins. The average time between online entries of test my MO and sample collection is observed to be 28 mins.

2.1 Process Mapping of Laboratory Services for In-Patient Wards



2.2 Laboratory Department

The in-patient wards of Zydus Hospital are located on 8th, 10th, 11th, 12th, 13th, 14th and 15th floors. Each floor is divided into 4 wings namely, A, B, C & D wings. The total number of in-patient beds on these floors is 281. Out of the 281 in-patient beds, presently only 211 beds are available for in-patients, as 12th floor C & D wing (20 beds), 13th floor A, B, C & D wings (40 beds) and 14th floor

A & B wing (10 beds) are still not operational. The inpatient beds are classified into twin sharing and triple sharing executive rooms, premium rooms, suits, and presidential suites.

Table 2.2 Classification of Inpatient Areas and Distribution of Healthcare Providers

Floor	Wing	Bed Category	Medical Officer Patient Ratio	Nurse Patient Ratio
8 TH	A & D	Twin Sharing Rooms	1:20	1:5
	B & C	Triple Sharing Rooms	1:25	1:6
10 th	A & B	Premium and Twin Sharing Rooms	1:25	1:5
10 th	C & D	Premium Rooms	1:20	1:5
11 th	A, B, C & D	Premium Rooms	1:20	1:5
12 th	A & B	Isolation Rooms	1:20	1:2
14 th	C & D	Suits	1:10	1:2
15 th	A	Presidential Suite	1:3	1:1 to 2:1
15 th	B, C & D	Premium Suits	1:4	1:1

A Medical Officer is assigned to each wing on 8th floor and on other floors one for each 2 wings. The Medical officer to in-patient bed ratio is 1:20 to 1:25 on all in-patient floors except 14th and 15th floors, where it is 1:10 and 1:3 to 1:4 respectively. Similarly, a Nursing In-charge is assigned to each wing on 8th floor and on other floors one for each 2 wings.

Laboratory department in Zydus Hospital is equipped with high-end laboratory equipment's that ensure quick turn-around times. It is located on 4th floor D-wing. The services provided by the laboratory in Zydus are Clinical Biochemistry, hematology, Clinical Pathology, Histopathology, Cytology, microbiology and Serology. The laboratory is equipped with fully automated machineries for biochemistry tests and semi-automated machineries for hematology and other laboratory tests. The laboratory has 20 phlebotomists working round the clock. The laboratory receives samples from critical areas like Intensive care unit, Operation theatre, Emergency Services and non-critical areas like inpatient wards, outpatient department and day care. The

received samples are processed in laboratory as per the urgency of reports. The samples from critical areas and stat tests are processed on priority basis followed by samples from non-critical areas.

2.2.1 Features of laboratory services:

- 24 x 7 service availability
- HL-7 compliant pathology services
- Most modern equipment like Vitros Dry Bio Chemistry Analyzer
- Laboratory environment & planning matches international standards
- NABL accredited

Total number of phlebotomists in laboratory is 20.

Table 2.3 Shift Timings of Phlebotomist in Laboratory Department

S.N.	Timings	NO. of Phlebotomist
1	6:00 – 14:30	2
2	7:00 – 15:30	4
3	8:00 – 16:30	1 – OPD
4	10:00 – 18:30	1 - BLOOD BANK
5	12:00 – 20:30	2
6	14:00 – 22:30	3
7	22:30 – 7:00	2
8	OFF/LEAVE	5
	TOTAL	20

Table 2.4 Expected TAT of Laboratory Tests

TEST	Lab TAT (Analytic + Post-analytic)	Total TAT (pre-analytic + analytic + post-analytic)
Hematology	60 mins	75 mins
Biochemistry	60 mins	75 mins
CRP	60 mins	75 mins
Serology	60 mins	75 mins
Antibody Screening	120 mins	135 mins
RBS	120 mins	135 mins
Hb1AC	60 mins	75 mins
Coagulation Profile	60 mins	75 mins

Ideal time taken by phlebotomist is 10 – 15 mins to reach floors as per Laboratory Protocol.

2.3 Objectives

The study was conducted from 11th April 2018 to 20th May 2018 (3 weeks). Data were collected by direct observation, from consultant's notes, Hospital information System (HINAI) and test reports. Data is collected through a structured data sheet.

The major objectives of the study were:

- 1.To understand the process map of laboratory services in inpatient wards of Zydus hospitals
2. To calculate the TAT for laboratory tests in inpatient wards
- 3.To identify the factors causing delay in TAT for laboratory tests
4. To develop suggestions to minimize delay in TAT for laboratory tests

2.4 Material and Methods

Study Design: Observational cross-sectional study

Setting: Inpatient Wards (8th, 10th, 11th, 12th, 14th and 15th floors) Zydus Hospitals, Ahmedabad

Duration of Study: April 11, 2018 – May 20, 2018

Sample Size: 160 orders

Sampling Technique: Non-probability Sampling (Convenient Sampling)

Sample Selection:

Inclusion criteria:

In-patients from wards undergoing laboratory tests

Exclusion criteria:

- Outsourced Laboratory tests
- Histopathology Tests
- Microbiology Tests
- Critical-care area inpatients

Data Collection: Data was collected using the following methods

Primary Data:

1. Direct observation
2. Information from employees
3. Information from patients

Secondary Data:

1. Referring to patient's files
2. Referring to online records (HINAI)
3. Referring to departmental registers

The data were collected using a data collection tool - Data sheet

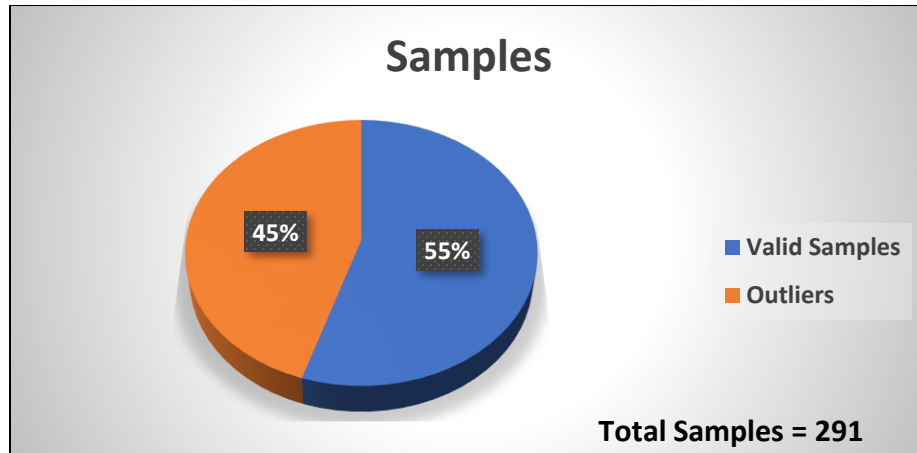
Data Analysis

Data analyzed using MS Excel and Pivot Table

2.5 Analysis & Interpretation

Out of 291 samples, 160 samples were taken for analysis and 131 samples were outliers. The outliers were decided as per the exclusion criteria and the limitations of study in selection of samples. Graph 2.1 shows the distribution of valid samples and outlier samples.

Graph 2.1 Samples and Outliers in Study



Different TATs calculated in the study

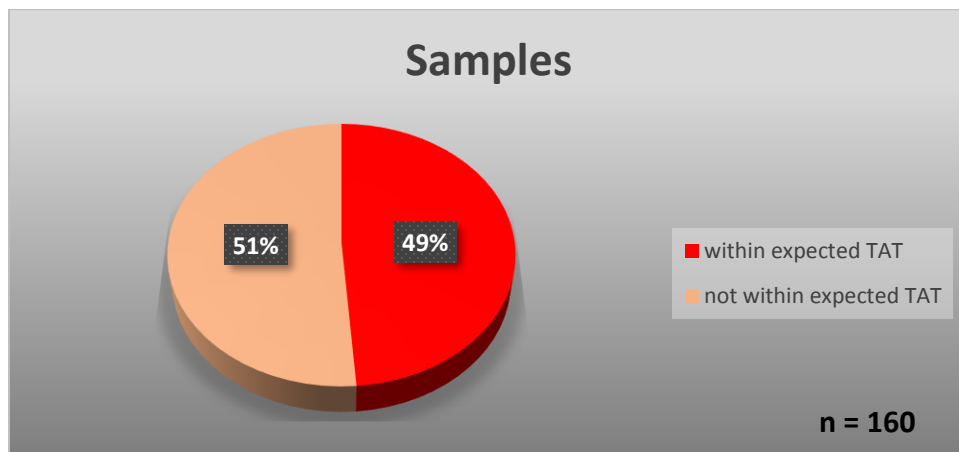
1. Consultant order to report generation time = consultant order to online entry + online entry to sample collection + sample collection to report generation
This TAT cannot be used for comparison as there is no defined time range for online entry by MO after consultant's order.
2. Online order entry to report generation = online entry to sample collection + sample collection to report generation
This TAT is used to compare the expected TAT and actual TAT for the investigations included in this study.
3. Sample collection to report generation (Laboratory TAT)

Table 2.5 Distribution of Investigations in the Study and their Different TATs

Investigations	Number of Investigation	Average Consultant Order - Report Time	Average Online Order – Report Time	Average Sample Collection – Report Time
COAGULATION PROFILE	23	1:44	1:18	0:49
CRP	9	2:02	1:20	1:00
DIABETIC PROFILE	14	1:41	1:19	0:49
HEMATOLOGY	22	1:46	1:26	1:03
IMMUNOLOGY	3	2:55	2:44	0:53
LFT	27	2:13	1:30	0:59
RFT	42	1:54	1:32	1:03
SEROLOGY	8	2:45	2:19	1:57
BLOOD GROUPING	8	2:31	2:08	1:43
OTHERS	4	2:16	1:09	0:54

Table 2.5 shows the distribution of investigations considered in the study and the three different TATs calculated for these investigations.

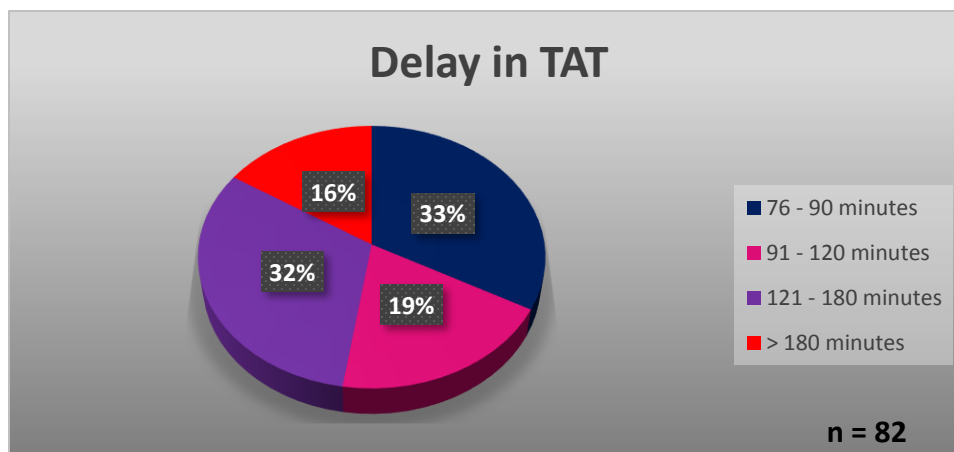
Graph 2.2 Sample Distribution Within and Outside expected TAT for Laboratory Services



Graph 2.2 shows the distribution of total samples that were within and outside the expected TAT as per institutional standards. Out of the 160 samples analyzed, 78 samples were within the expected TAT and 82 samples were not within expected TAT. The TAT used here to compare the actual and expected TAT for laboratory tests is the time from online entry to report generation. The TAT from consultant order to report generation cannot be used for comparison as there is no

defined time target for the MO to do online entry after consultants' order. The MO is expected to enter the orders online as soon as possible. But the expected time limit is not defined.

Graph 2.3 Distribution of Time Delay in TAT of Laboratory Services



Graph 2.3 shows the distribution of time delay in the samples that were not within the expected TAT as per institutional standards. Out of the total 82 samples which were delayed, 27 samples had TAT between 76-90 min, 16 samples had TAT between 91-120 min, 26 samples had TAT between 121-180 min and 13 samples had TAT over 180 mins.

As it is evident from the graphical representation, samples are almost equally delayed in all the four-time brackets. Hence it is necessary to study samples under each time brackets separately and understand the root cause for the same.

The TAT considered here for comparison with the expected TAT is the time from when a test is ordered online by MO until the result is reported. The TAT from consultant's prescription to report generation could not be compared with expected TAT because there is no protocol in place that defines the expected time limit for the MO to make online entries. The MO is expected to enter the orders online as soon as possible. But the expected time limit is not defined.

TAT for laboratory tests include three activities –

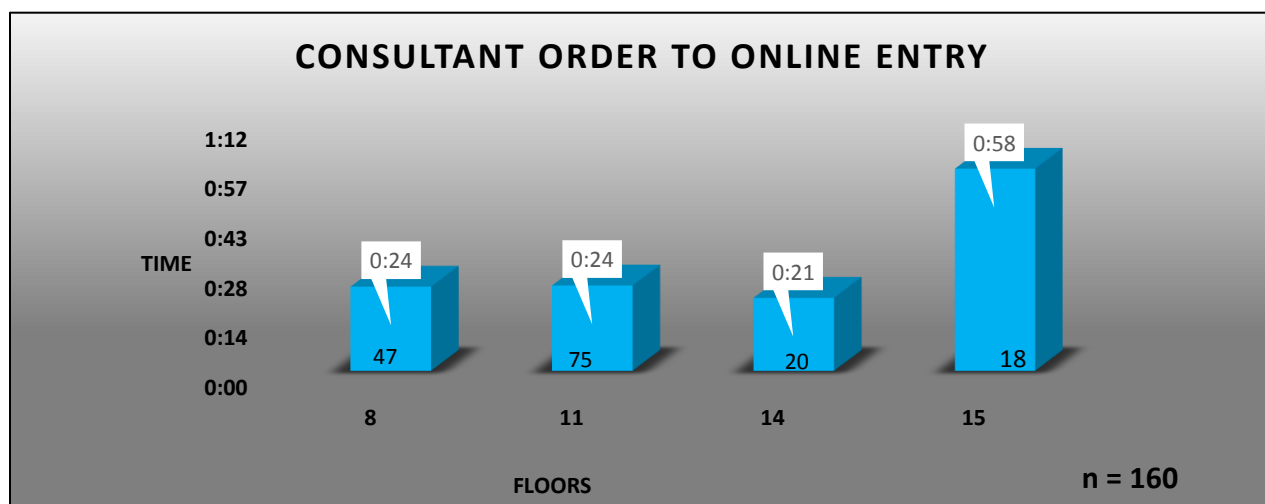
1. Time taken by the MO to make online entries after consultant's prescription
2. Time taken by the phlebotomist to collect sample after the online entry
3. Time taken from sample collection to report generation

In the following sessions, time taken for each of these three activities are calculated and compared with the recommended time as per SOPs of the department.

1. Time taken by the MO to make online entries after consultant's prescription

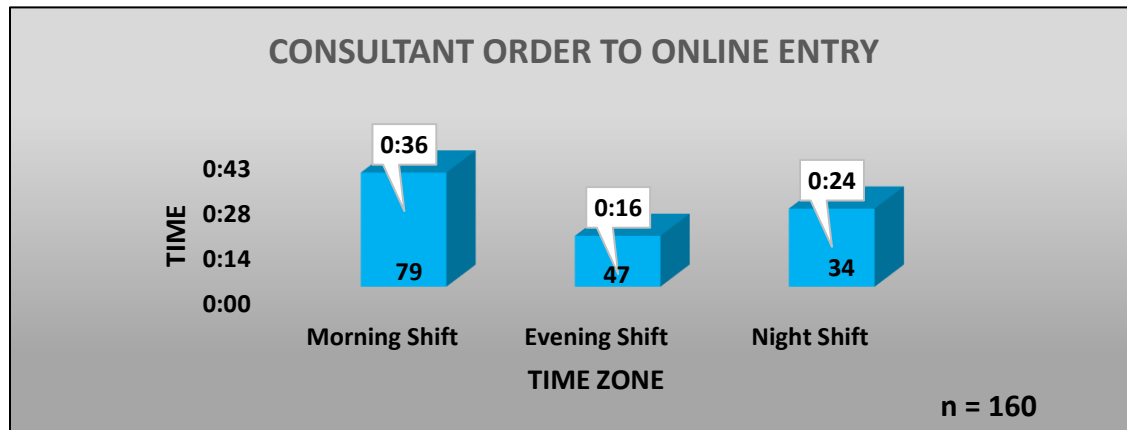
The consultant prescribes for an investigation followed by which the MO logs in Hospital Information system (HINAI) and enters investigation order in HINAI. This time taken for this activity is recorded by calculating the difference between the time of online entry and consultant's prescription. On analysis of 160 samples, the average time taken by the MO to make online entries after consultant's prescription is found to be 27 minutes.

Graph 2.4 Floor-Wise Distribution of Average Time Taken by MO to do Online Entries



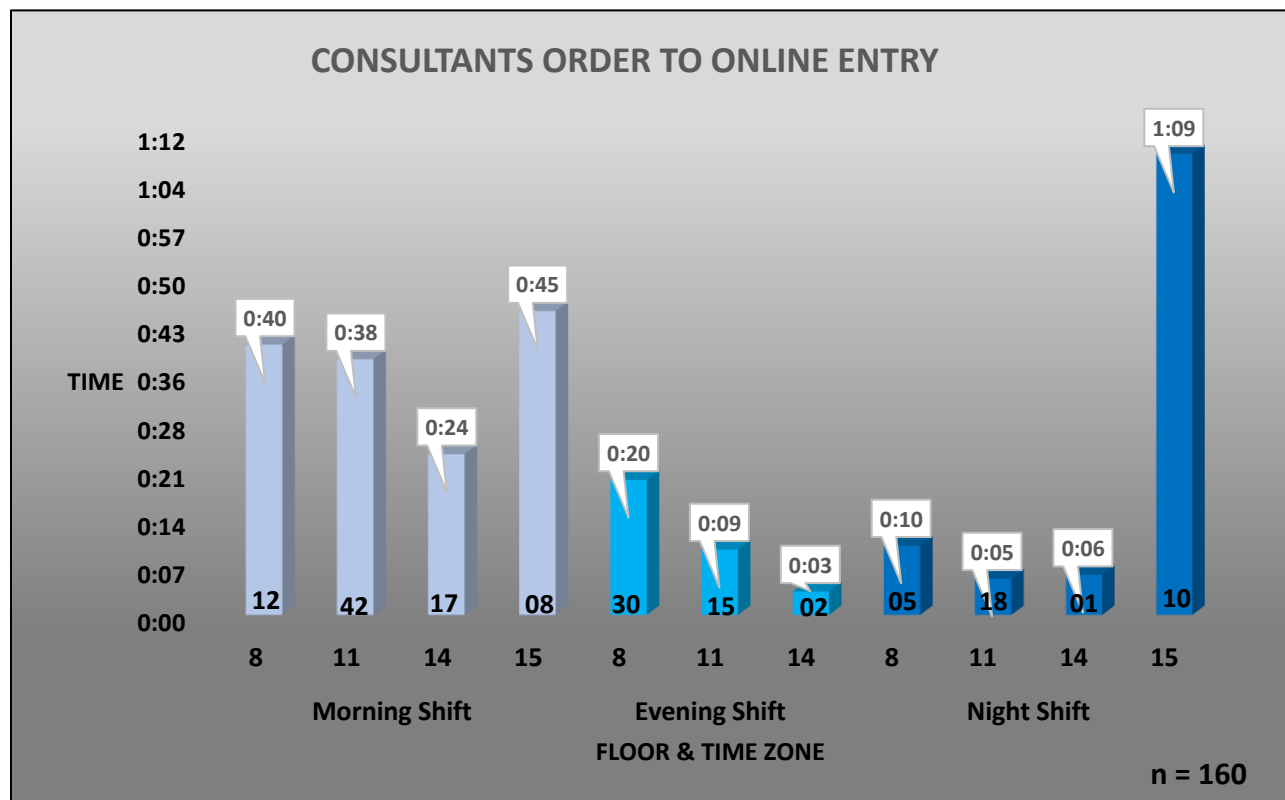
Graph 2.4 shows the floor-wise distribution of average time taken by MO to do online entries of laboratory investigations after consultant's prescription. On an average the MO takes 21 to 24 minutes to do online entry of tests on 8th, 11th and 14th floor inpatient areas, whereas it took 58 minutes on 15th floor. So, there is huge scope of reduction in the process time on 15th floor by more than 50%. If average time taken on 15th floor is reduced to 24 minutes (the highest among the rest three floors) then the overall average process time will reduce from 27 minutes to 24 minutes (14 % reduction).

Graph 2.5 Shift-Wise Distribution of Time taken by MO to do Online Entries of Laboratory tests



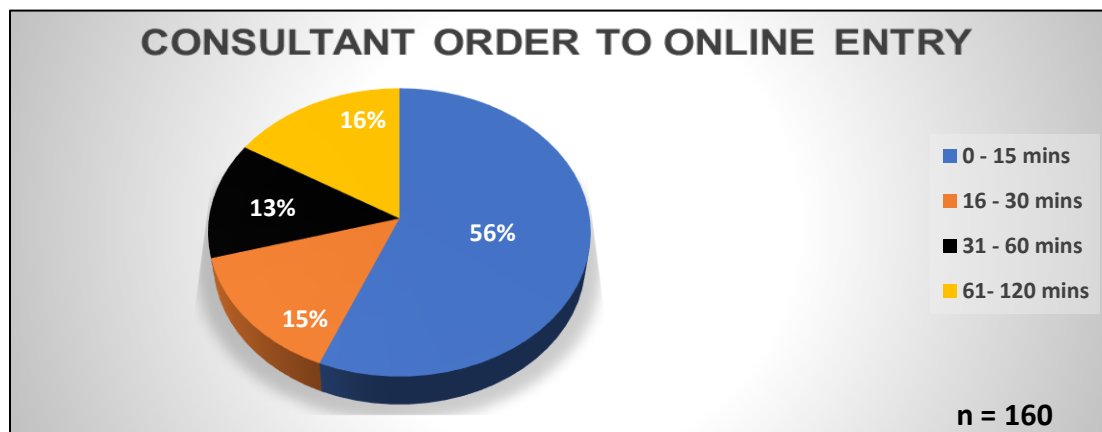
Graph 2.5 shows the shift-wise distribution of time taken by MO to do online entries of laboratory tests after consultant's prescription. The MO takes an average of 36 minutes to do online entry during morning shift whereas the MO takes an average of 16 minutes during evening shift. During night shift, the average time taken by MO for online entry is found to be 24 minutes. There is a need to carry out a detailed time motion study during morning shift to identify key bottleneck/ time taking activities. Post identification of the same we can evaluate process changes to reduce the time taken for these activities. Also, by comparing the processes between evening shift and morning shift, we can identify the opportunities for improvement.

Graph 2.6 Shift-Wise Distribution of Time taken by MO to do Online Entry on each Inpatient Floor



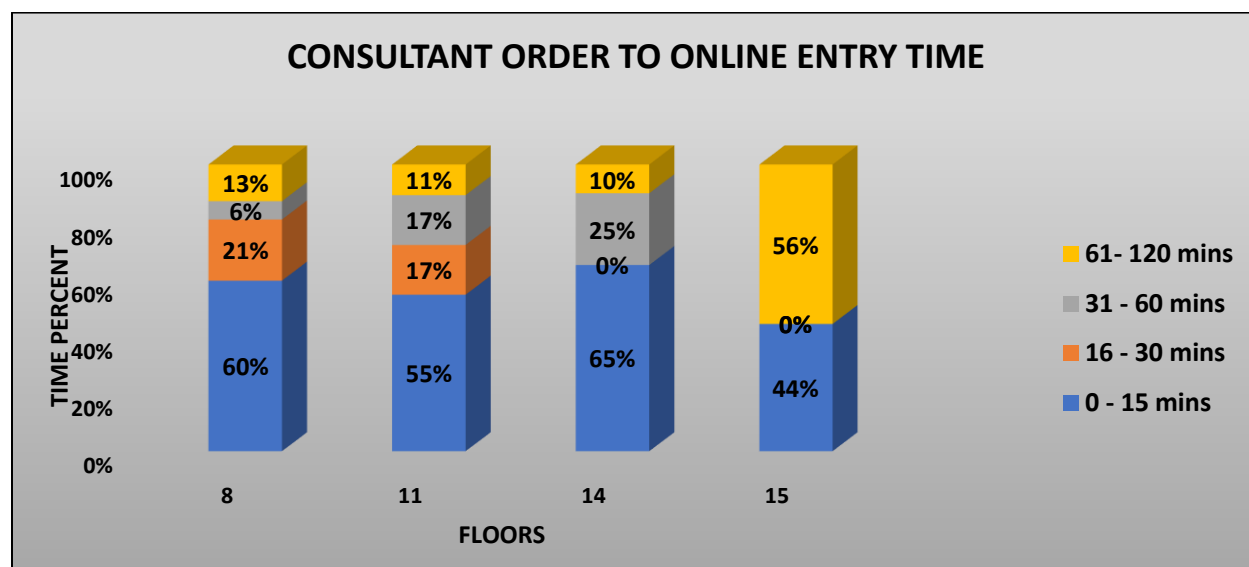
Graph 2.6 shows the shift-wise distribution of time taken by MO to do online entry on each inpatient floor. It is found that there is delay in time taken for online order entry in morning shift on every floor. Hence there is a need to carry out in detail study of processes on every floor during morning shift.

Graph 2.7 Distribution of Time taken by MO to do Online order entry after Consultant's Prescription



Graph 2.7 depicts the distribution of time taken by MO to do online order entry after consultant's prescription. Out of 160 samples, online entry of 90 samples were done within 15 minutes after consultant's prescription. Rest of the samples are more or less equally distributed in the delayed time brackets.

Graph 2.8 Floor-wise Distribution of time taken by MO to do Online order entry after Consultant's Prescription

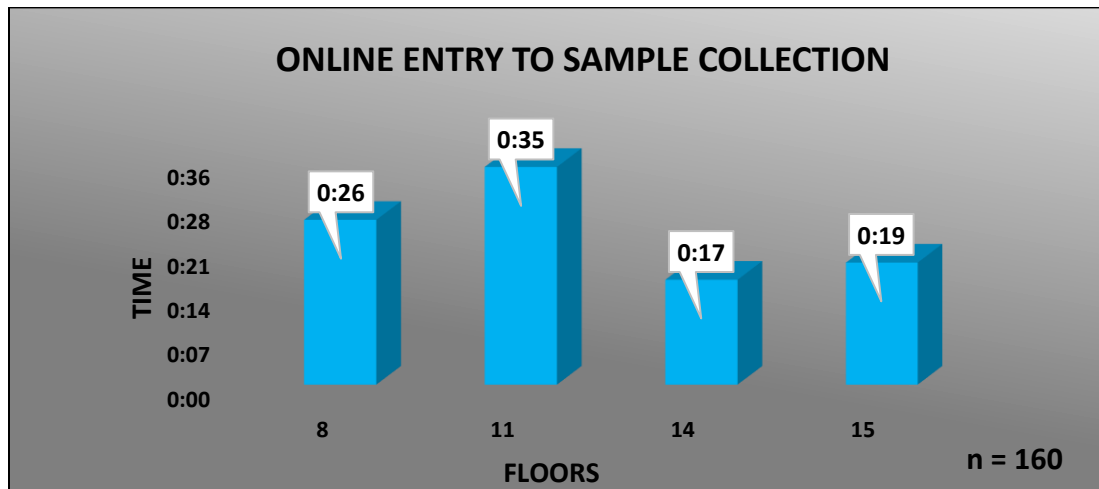


Graph 2.8 depicts the percentage distribution of time taken for online entry on each floor for 160 samples. 65% orders on 14th floor are entered online within 15 minutes, whereas only 44 % orders are entered online on 15th floor. On 8th and 11th floor it is 60% and 55% respectively. Investigation order entered online over a period of one hour after consultant,s prescription is highest (56%) among samples from 15th floor

2. Time taken for Sample Collection after Online order Entry for Tests

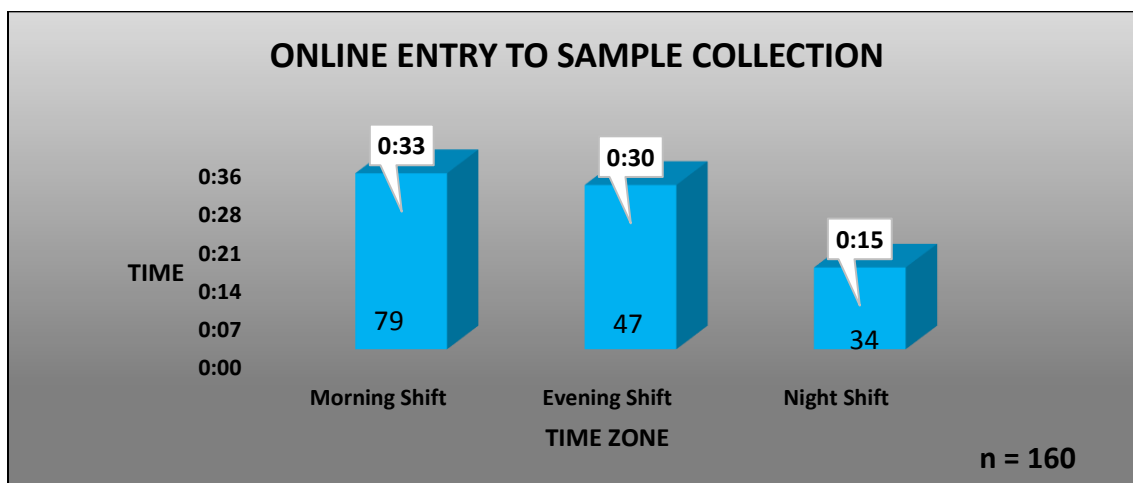
This is the second activity in calculating the TAT for Laboratory services. Once the online entry of orders are done by the MO on floors, the order is seen by the customer executive in the laboratory. The customer executive informs the phlebotomist about the order and the phlebotomist goes to the floor and collects sample. The time taken for this activity is captured by calculating the difference between the time of sample collection and the time of online entry. On analysis of 160 samples, the average time taken for sample collection after online entries is found to be 28 minutes.

Graph 2.9 Floor wise Distribution of Time taken for Sample Collection after Online entries of Laboratory Tests



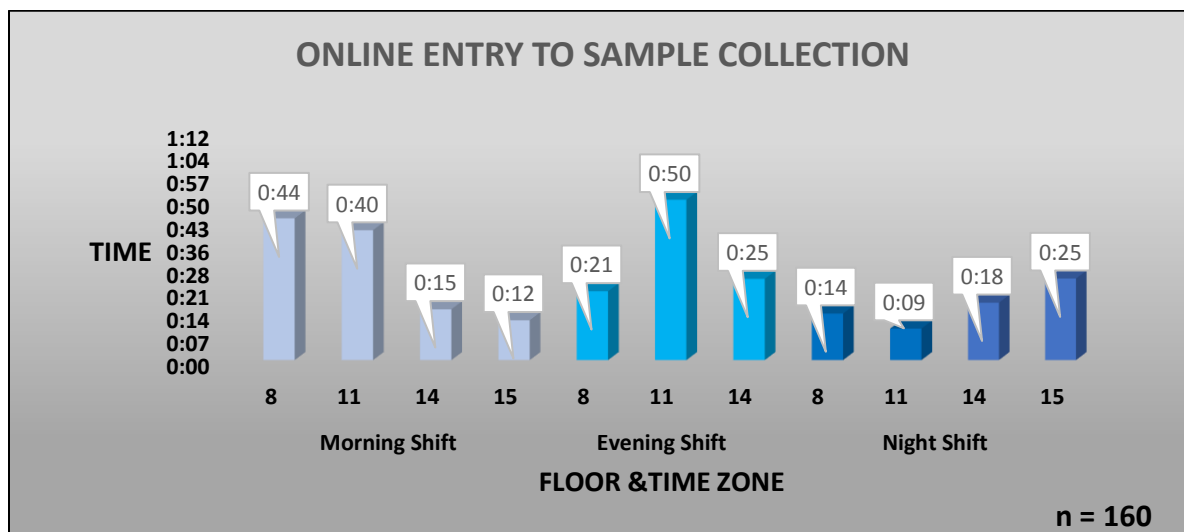
Graph 2.9 shows the floor-wise distribution of average time taken for sample collection after online entry by MO. The average time taken for sample collection is longest on 11th floor whereas it is shortest on 14th and 15th floors.

Graph 2.10 Shift-wise Distribution of Time taken for Sample Collection after Online Entries of Laboratory Tests



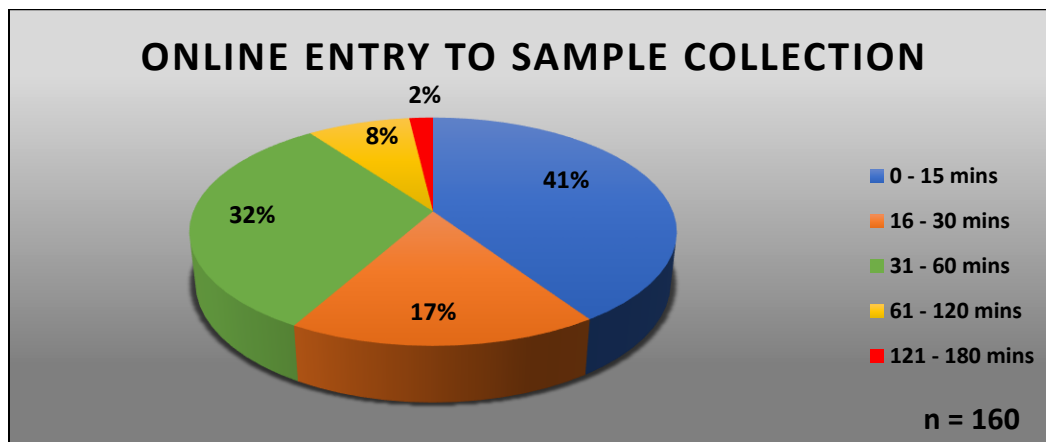
Graph 2.10 shows the shift-wise distribution of time taken for sample collection after online entry of orders. It is found that the time taken for sample collection is more or less the same in morning and evening shift but it's the least in night shift.

Graph 2.11 Shift-wise Distribution of Average time taken for Sample Collection after Online Order entry on Each Floor



Graph 2.11 shows shift-wise distribution of average time taken for sample collection after online order entry on each floor. There is no specific pattern been followed in time taken for sample collection after online order entry.

Graph 2.12 Distribution of Time Taken for Sample Collection after Online Entry

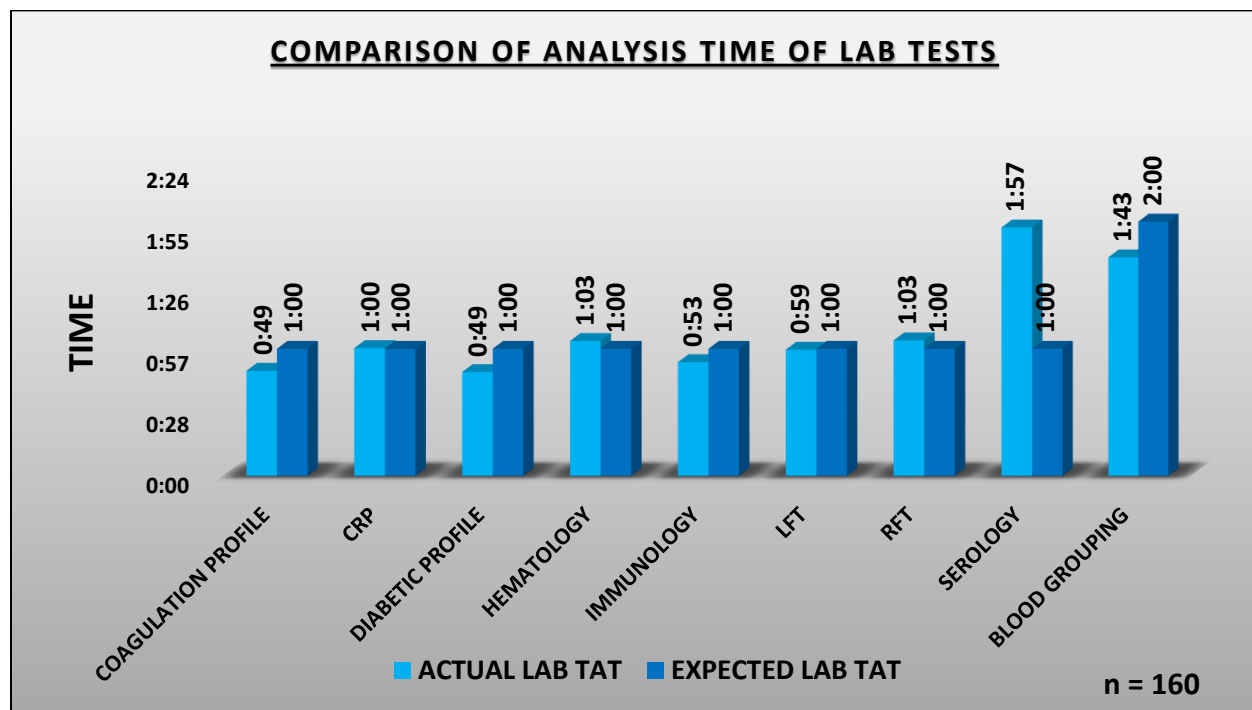


Graph 2.12 shows the distribution of time taken for sample collection after online order entry. Out of 160 samples, about 65 samples were collected within the institutional standard time of 15 minutes and 95 samples were collected after 15 minutes of online order entry. Out of 95 samples collected after the standard time, 51 samples were collected between half an hour to one hour period.

3. Sample Collection to Report Generation Time

The laboratory TAT time i.e. the analysis and report generation time for the listed tests mostly falls within the expected TAT. The actual TAT is higher in Hematology test and RFT by 3 minutes than the expected TAT of 60 minutes. Serology test shows a greater TAT of 117 minutes as compared to the expected TAT of 60 minutes. There could be false positive reports in serology tests which is then reconfirmed using confirmatory tests like ELISA. This results in delay in the TAT for Serology tests. Thus, the laboratory TAT falls within the expected TAT range.

Graph 2.12 Comparison of Actual and Expected TAT for Analysis Process



Graph 2.12 shows the comparison of analysis time between expected and actual TAT. All the samples except serology samples falls in the expected TAT for respective investigations. The delay in serology tests is because of the serology samples undergoing confirmatory tests in case of false positive test results. The laboratory maintains their institutional standard time for analysis of investigations.

2.6 Findings

A total of 291 samples were considered for the study according to the inclusion and exclusion criteria. Out of which 160 samples were taken for analysis and 131 samples were outliers. Out of the 160 samples analyzed, 49% samples were within expected Total TAT. Out of the total 82 samples which were delayed, 33% samples had TAT between 76-90 min, 19% samples had TAT between 91-120 min, 31% samples had TAT between 121-180 min and 17% samples had TAT

over 180 mins. Average time between consultant's prescription and online entry of test my MO was observed to be 27 mins. The average time between online entry of test my MO and sample collection is observed to be 28 mins.

On an average the MO takes 21 to 24 minutes to do online entry of tests on 8th, 11th and 14th floor inpatient areas, whereas it took 58 minutes on 15th floor. So, there is huge scope of reduction in the process time on 15th floor by more than 50%. If average time taken on 15th floor is reduced to 24 minutes (the highest among the rest three floors) then the overall average process time will reduce from 27 minutes to 24 minutes (14 % reduction).

Out of 160 samples analyzed, 56% had online order entries done within 15 minutes of consultant's prescription whereas 44% took more than 15 minutes to do the same. 16% samples had online entries done after 60 minutes of consultant's prescription. The MO takes an average of 36 minutes to do online entry during morning shift whereas the MO takes an average of 16 minutes during evening shift. During night shift, the average time taken by MO for online entry is found to be 24 minutes. There is a need to carry out a detailed time motion study during morning shift to identify key bottleneck/ time taking activities. Post identification of the same we can evaluate process changes to reduce the time taken for these activities. Also, by comparing the processes between evening shift and morning shift, we can identify the opportunities for improvement.

There is no specific pattern being followed while considering the delay in sample collection after online order entry. Out of 160 samples analyzed, 41% samples were collected within target time after online entry whereas 59% had samples collected after the expected time. There is huge scope of improvement in reduction of delay in sample collection.

The laboratory TAT time i.e. the analysis and report generation time for the listed tests mostly falls within the expected TAT as per institutional standards.

2.7 Discussion

On an average the MO takes 21 to 24 minutes to do online entry of tests on 8th, 11th and 14th floor inpatient areas, whereas it took 58 minutes on 15th floor. So, there is huge scope of reduction in the process time on 15th floor by more than 50%. If average time taken on 15th floor is reduced to 24 minutes (the highest among the rest three floors) then the overall average process time will reduce from 27 minutes to 24 minutes (14 % reduction). There is delay in time taken for online order entry in morning shift as the load of orders is high and the MO is involved in multiple activities at a time. There are consultant's visits and new orders being written in the morning hours.

There is a need to carry out a detailed time motion study during morning shift to identify key bottleneck/ time taking activities. Post identification of the same we can evaluate process changes to reduce the time taken for these activities. Also, by comparing the processes between evening shift and morning shift, we can identify the opportunities for improvement.

Number of lifts available for phlebotomist to reach inpatient areas is limited and phlebotomists spend a lot of time waiting for the lift to reach the inpatient wards. Also, the phlebotomist takes the sample with them back to the laboratory for analysis. The optimum use of pneumatic tubes for sending samples to the laboratory reception area will help to reduce the delay. Pneumatic tubes need to be reliable to depend on them for sample dispatch from inpatient areas to laboratory reception

The laboratory is meeting the institutional standard TATs for analysis and report generation of tests. There is no delay apart from tests like serology where confirmatory tests are done for samples with false positive reports. The systems for laboratory services in the hospital are in place. The delay is in the process of laboratory services. The pre-analysis phase is the most affected one whereas the analysis phase is within the standard target.

2.7.1 Limitations of the Study

1. TAT for the following investigations were not calculated –
 - TAT for planned investigations could not be calculated due to the following
 - The consultant would prescribe, in advance, the investigations to be done a day later. The online entries for the planned tests are done around midnight by MOs (according to hospital protocol). This delays the time between the consultant's order and online entry by MO.
 - The samples for planned laboratory investigations are collected in the morning around 7.00 hours. This delays the time between online entry by MO and sample collection by phlebotomist.
 - The online entries were done by MO after sample collection of the investigation
 - Investigations with missing documentation of time for consultant's order.
2. The actual time and expected time taken by MO to do online entry of tests cannot be compared as there is no existing protocol on it.
3. The brain to brain TAT (consultant's prescription to report informed) could not be calculated as there is no record of time of informing the reports to the consultant.

2.8 Recommendations

1. **To reduce the average time taken by MO to do online entry of lab tests after consultant's prescription-**
 - Provide the rights of online order entry in HINAI to sister in-charges as they are seniors in the department and areas available during morning hours when the MO is overloaded with work.
2. **To reduce the time taken for sample collection after online entry of test –**
 - Allow phlebotomists to access to all the lifts to reach patient areas

- Make optimal use of pneumatic tubes to send samples to laboratory Allocation of floors to phlebotomists
- Arrange duty to make more number of phlebotomist available in morning shift when the sample collection load is more
- Assignment of floors to Phlebotomists
- Monthly recognition for the phlebotomist who collects sample within institutional standard time

3. To reduce the time taken for analysis and post analysis in laboratory –

The laboratory maintains the institutional standard TAT for tests. There is no delay and so no recommendations for this process.

2.9 Conclusion

Delay in TAT of laboratory services is caused mainly due to delay in time taken by two activities, namely

1. Time taken by MO for online order entry
2. Time taken for sample collection after online order entry.

Based on the analysis there is a need of further in-depth study to be done in these two steps. Also, it is found that the delay is predominantly present during the morning shift compared to other two shifts. There is a need to carry out a detailed time motion study during morning shift to identify key bottleneck/ time taking activities. Post identification of the same we can evaluate process changes to reduce the time taken for these activities. Also, by comparing the processes between evening shift and morning shift, we can identify the opportunities for improvement.

The analysis and post analysis activities in this process are within the target time as per institutional standards.

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2.11 Annexures

1. Data collection Tool