

**Summer training**  
**At**  
**Medanta Hospital, Ranchi**  
**May to July 2021**

**A Report**  
**By**  
**Zovaria Rahman**  
**Roll number 1237**

**MBA Hospital & Healthcare Management**  
**2020-22**



**Jaipur**

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TO WHOM IT MAY CONCERN

This is to certify that **Ms. Zovaria Rahman** has completed her internship at "Medanta Abdur Razzaque Ansari Memorial Weavers' Hospital" Irba, Ranchi.

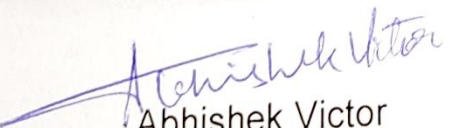
Ms. Zovaria has successfully completed her internship in our Patient Services department under the guidance of Ms. Richa Prasad.

She has completed & submitted a copy of her project report. Titled "Ascertaining the TAT in the pathology lab of Medanta hospital, Ranchi and to suggest measures to improve it".

The tenure of her internship was from 10.05.2021 to 02.07.2021. Her performance during the training period was found to be good.

We wish her success for her future endeavors.



  
Abhishek Victor

Head - Human Resources

## **Acknowledgements**

This report titled “Ascertaining the TAT in the pathology lab of Medanta hospital, Ranchi and to suggest measures to improve it” is a product of hard work and determination for two months in the face of a global pandemic. Needless to say, the challenges to work in this volatile situation were many, but the experience was definitely worth the risk. From May to July 2020, Medanta hospital Ranchi was my second home and not just in terms of the amount of time I spent there. Just like a family, I was welcomed, treated with respect and affection and help was ready whenever I needed it. Being my first ever experience in a hospital setting, Medanta taught me well.

I am grateful for the constant support and encouragement of the entire team of Medanta, Ranchi. Even when they had work pressures of their own, they took time to teach me the workings of a private hospital of such a large scale. Special thanks are in order for Ms Richa Prasad (senior manager- operations and my project guide), Mr Gulzar (senior manager- pathology lab), Mr Adrito Basu (manager- quality), Sister Saloni (infection control nurse), Dr Naseem (anaesthesiologist), Sister Suchita (OT nurse), Mr Dhananjay Raj (executive- operations), Mrs Reshma Sanga (lab technician, OPD), front desk team, pathology lab team, ward team, OT team and the housekeepers.

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*2020-22*

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### **Acronyms/ abbreviations**

- AB- Ayushman Bharat
- ACLS- advanced cardiac life support
- ARAMWH- Abdur Razzaque Ansari memorial weavers' hospital
- CAPA- corrective actions, preventive actions
- ER- emergency
- IPD- in patient department
- KPI- key performance indicators
- MRD- medical records department
- NABH- national accreditation board for hospitals and healthcare providers
- OPD- out patient department
- OT- operation theatre
- RCA- root cause analysis
- TAT- turnaround time

As part of the MBA Hospital & Healthcare management at IIHMR University, Jaipur , students are required to undergo summer training at health sector organization at the end of their first year. The duration of this summer training is of eight weeks during which the trainee is required to work in an organizational setting and learn their day-to-day activities, apart from helping them out in the tasks assigned to the trainee. The trainee is required to submit a project report at the end of their training and present it to the organization as well as the panel at IIHMR in order to get the training certificate.

The objectives for this summer training are:

1. To understand and learn day to day micro-level operations management of a hospital/healthcare/pharma/rural organisation
2. To identify issues/problems associated with some specific operational area/programs
3. To provide some solution to the identified problems.

During the eight weeks summer training at Medanta hospital Ranchi, the trainee was assigned to the operations department and was guided by the senior manager- operations Ms Richa Prasad who also happened to be the project guide. The trainee was assigned to visit different departments and observe things from a managerial perspective. Some departments were observed for long durations while others were observed for just one day. There were some departments like Finance, IT and COVID-19 wards which were restricted and thus could not be visited in person by the trainee. The project guide assigned the trainee to work on a project in the pathology laboratory since at the time of joining, the burden of COVID-19 was overwhelming at the hospital and the trainee was not vaccinated since slots for the age group of 18-45 had still not been opened in the state of Jharkhand by that time. The building housing the pathology laboratory was separate from the main building and COVID-19 testing was being outsourced to Dr Lal Path Lab, making it safer to work there.

A snapshot of the work done during the summer training

| <b>Week</b>               | <b>Activity done</b>               | <b>Key objectives</b>                         | <b>Learning</b>                                            |
|---------------------------|------------------------------------|-----------------------------------------------|------------------------------------------------------------|
| Week 1<br>May 10-15       | Quality, HR, and infection control | Induction, departmental overview              | Overview of the hospital, process flow and safety measures |
| Week 2<br>May 17-22       | Pathology lab                      | Departmental overview, project                | Process flow of lab, observation of departmental sections, |
| Week 3<br>May 24-29       | Pathology lab                      | Project                                       | Primary focus on data collection, other department visit   |
| Week 4<br>May 31- June 5  | Pathology lab                      | Project                                       | Primary focus on data collection, , other department visit |
| Week 5<br>June 7-12       | Pathology lab                      | Project                                       | Primary focus on data collection, , other department visit |
| Week 6<br>June 14-19      | Pathology lab                      | Project                                       | Primary focus on data collection, , other department visit |
| Week 7<br>June 21-26      | Pathology lab, emergency, dispatch | Project, departmental overview                | Data analysis, process flow of dispatch counter            |
| Week 8<br>June 28- July 2 | OT, IPD, Front office, HR          | Departmental overview, conclusion of training | Process flow and patient management, maintenance of files  |

*Table 2 A snapshot of the work done during the summer training*



## **PART 1: ORGANIZATIONAL LEARNING**

### **About the organization: Medanta Hospital, Ranchi**

Medanta Abdur Razzaque Ansari memorial weavers' hospital (ARAMWH) is located in the outskirts of Ranchi, the capital of Jharkhand in a locality named Irba. It is enroute to the NH-31 and can be reached via roadways, railways and by air from Birsa Munda airport.

The hospital was established in 1996 and was previously under the Apollo group. Medanta group took over ARAMWH in 2015, and it has since been called Medanta Abdur Razzaque Ansari memorial weavers' hospital. Mr Abdur Razzaque Ansari was a nationalist and freedom fighter who also led the weavers' revolution. The ARAMWH was established in his honour by Chotanagpur Regional Handloom Weavers Co-operative Union Ltd and his family members.

Medanta has teamed up with Abdur Razzaque Ansari Memorial Weavers' Hospital in Ranchi to offer the only super specialty hospital in this part of the country. The hospital offers state-of-the-art medical facilities to Ranchi and in the surrounding areas of Jharkhand. It serves both inpatients and outpatients including emergency cases, and also works for the betterment of the local weavers' community here at Irba. The hospital offers consultation with highly qualified doctors with an impressive work experience and educational background with devoted nursing and paramedical staff who have become the backbone of the hospital.

There are 43+ Experienced Doctors in this 200 Beds Facility with 12 Super Specialties. Medanta Ranchi has been active in fighting the battle against Covid-19 in Jharkhand and has helped the community in a grave time. Apart from Covid-19 treatment, vaccination drive is also taking place here with the option to get Sputnik V which is not available anywhere else in the city. Apart from this, Medanta Ranchi is an NABH accredited hospital which is in accordance with the standards of NABH 4<sup>th</sup> edition and is currently being prepared for reassessment according to NABH 5<sup>th</sup> edition.

The mission statement of Medanta Hospitals is “Medanta is established with the sole mission to deliver world-class, holistic and affordable healthcare and to build a dynamic institution that focuses on the development of people and new knowledge.” [1]

The super specialities that make Medanta Ranchi the hospital of choice for many people in Jharkhand & nearby states are:

- Cardiac sciences: a centre of excellence for all kinds of cardiac surgeries and interventional, non-invasive, and paediatric cardiology.
- Neurosciences: delivering comprehensive multi-disciplinary care for disorders of the brain and spine.
- Orthopaedics: advanced diagnostic and rehabilitation services for a range of orthopaedic ailments such as arthritis, osteoporosis and injuries to muscles, bones, or joints.
- Gynaecology: world-class evidence-based treatment with cutting-edge technology for a range of gynaecological diseases including breasts.
- Gastroenterology: provides state-of-the-art gastroenterology and hepatology services including OPD consultation, special clinics, endoscopy, and interventional procedures related to liver, biliary and pancreatic diseases.
- Kidney and nephrology: excellence in kidney transplantations, donor nephrectomy, open operative procedures for kidney, creation of A-V fistula, CAPD catheter and permacath insertion, A-V graft fistulas and operations for complications of fistula like pseudoaneurysm, blockage, and strenuous of AV fistulas.
- Urology: comprehensive endoscopic and laser surgeries of kidney stones, endoscopic prostate surgery, plasma kinetic resection of prostate and laparoscopic urology, facilities for haemodialysis, treatment of urethral structure, urological problems in females and paediatric age group.
- Pulmonology: providing quality healthcare in the management of pulmonary diseases, critical care, and sleep medicine. They manage a wide spectrum of chest diseases like asthma, COPD, pneumonia, tuberculosis, pleural diseases, lung cancer, pulmonary hypertension, pulmonary embolism and pulmonary vasculitis, sleep disorders, occupational lung diseases, interstitial lung diseases and patients with respiratory failure requiring invasive and con-invasive ventilator support.

- General surgery and laparoscopic surgery: provides all advanced hepatobiliary surgeries, specialised pancreatic surgeries, oesophageal surgeries, thoracic surgeries, and minimal invasive surgeries.
- Critical care: a combination of many specialities and technologies, offering the possibility of survival to patients who are acutely and critically ill. Their 24 hours critical care units are a combination of multidisciplinary ICUs as well as ICUs dedicated to post cardiac surgery patients, stroke patients and post-transplant patients.
- Nuclear medicine: housing state-of-the-art gamma camera system, the provide facility for whole-body scans and single photon emission CT.
- Internal medicine: the focus of this specialty is on a meticulous and exhaustive consultation and workup with timely and appropriate cross-referrals which are then followed up by the primary doctors to ensure that patients get continued care and comfort.
- Radiology: expertise in whole body scan, MR dynamic liver and prostate studies, cardiac MR, MR angiography and advanced musculoskeletal imaging, dynamic multiphase imaging for liver pathologies and CT angiographies, ultrasounds of foetuses, soft tissues and joints, advanced foetal echocardiography, transrectal and transvaginal scans, prostate and breasts biopsies, breast imaging and digital mammography. They provide high quality image resolution with low radiation dose.
- ENT: expertise in all ENT surgeries such as sinus surgeries, tonsil, and adenoid surgeries, CSOL, thyroid surgeries, salivary gland, and skull-based surgeries. Provision of highly trained doctors in Coblation surgeries for tonsils. They also treat oral cancer, larynx, and neck tumours.
- Pathology and diagnostic services: provide laboratory tests, audiometric tests, cardiology tests, and emergency services.
- Emergency and trauma care: they have round-the-clock emergency response team trained in advanced cardiac life support (ACLS) with trauma care ambulances on standby.
- Anaesthesia: they have expertise in safe anaesthesia in various extensive surgeries and fine operative procedures in the state-of-the-art operation theatres, including renal transplant, uro-endoscopic surgery, ERCP, GI & pancreatic surgery, thoracotomy,

bronchoscopy, advance laparoscopic surgery, joint replacement surgery, cosmetic and reconstructive surgery, and high-risk obstetric surgery with critical care.

## **The departments at Medanta hospital Ranchi**

**Front office:** the front office/reception is the first place a patient goes to during a hospital visit. It is located near the entrance, making it very accessible. There are four counters, one of which is reserved for Ayushman Bharat beneficiaries. Behind the counter is a huge board which has the names of all the departments and the doctors available for consultation. The average processing time is five minutes per patient. Financial counselling is also done at the front office. Discharge is done after approval and payment of due amount at the front office, too.

For Ayushman Bharat beneficiaries, the process entails a patient requesting treatment under the scheme at the said counter, after which he needs to take an appointment with a doctor for consultation, who will then recommend him to undergo certain procedures which fall under the purview of Ayushman Bharat in the hospital. The request form is then filled by the person responsible for handling Ayushman Bharat cases and is then forwarded for approval to the local Ayushman Bharat office, after which his request for undergoing the procedure gets the approval from the hospital's end.

There is also a section for patient feedback/complaint forms at the front desk. Apart from these, emergency code activation also takes place at the front desk.

### *Process flow:*

1. Patient arrives at the reception area/front office.
2. The receptionist asks the person the problem they are experiencing and their choice of doctor.
3. If the person does not know which doctor he should consult, the receptionist helps them out.
4. For first time visitors, registration form is filled, and hospital card is created for which their personal details are entered into the HIMS including their UHID, address, etc. The fees for hospital card is ₹100.
5. For repeat visitors, the hospital card charge is not added and only the doctors' consultation fees is charged at the beginning.

6. In case of unavailability of doctor or daily quota filled, the next best option is given to the patient if they want. Otherwise, advance booking is done for the doctor of choice for the next available date.
7. After the paperwork is ready, the patient is redirected to the OPD area from where they will consult with the doctor.

**Call center:** the call center is located in the front hall in the staircase room. The call center receives calls from potential and existing patient parties, along with general information seekers and provides information and counselling. It is the first point of contact for queries and has recently started booking appointments online and other telemedicine services. After picking a call, the receiver greets them according to the time of the day and introduces themselves, and then ask them about the reason for the call. If it is something they have knowledge about, they answer it promptly and if not, they redirect the call to the concerned person. At the end of the call, they ask if there is something else that requires their help and thank the caller before hanging up.

*Process flow:*

1. The staff picks up the phone and wishes the caller, introduces themselves and asks how to be of assistance.
2. After listening to the query, they answer it or redirect it to the person of concern.
3. At the end of the call, they ask if there is anything else they need help with. If not, they thank them for calling Medanta and hang up.
4. In case of booking appointments, patient details are taken, and number is given. The payment will be made when the patient arrives at the hospital.

**Emergency:** this is the place to go if time is extra crucial and patient needs immediate medical attention. It has its separate entrance for better accessibility. Patient parties visit the emergency area for admission, first aid and queries. The attendant goes up to the desk and describes the situation, after which patient vitals are checked and necessary medication is started. The doctor on duty examines the patient and decides whether the patient needs admission or not, after which transfer to IPD area or discharge is done. The billing is done at the front office at the time of discharge. The emergency area has all necessary facilities like oxygen and ventilator beds, etc.

*Process flow:*

1. The *patient* is brought in, and the attender explains the problem to the staff at the emergency desk, along with providing the patient's details.
2. The vitals are checked, and necessary medication are started in the emergency area itself.
3. The doctors at the emergency area take care of the patient and then decide if they need admission.
4. In either case, the attendant then goes to the front office for necessary payments and takes his patient home or admits him.

**Dispatch counter:** this is located at the conjecture of the main building and the building hosting the lab, medical records department, blood bank and housekeeping. The dispatch desk serves reports of pathology and radiology, and the left side of the counter has IPD reports while the right side has OPD reports. The wall behind the counter has the reporting time for various radiology test printed on it for the patient party's reference. The person at the disk receives the bill and looks for the report. After matching the details, the report is enveloped and handed over to the patient party. Dialysis reports are received by the patient attendants while the IPD reports are received by nurses or housekeepers. The person at the dispatch counter also hands out the forms for MRI/USG/Echo etc. and fills it if patient party is unable to do so.

*Process flow:*

1. The reports from radiology and pathology are received at the dispatch counter.
2. The reports are put in separate columns for pathology, culture, x-ray, MRI, ECHO, CT scan, USG, etc. for easier location.
3. The patient comes with his bill and is given the report if it is ready to be dispatched after his personal details are matched to satisfaction.
4. For in patients, nurses or housekeepers come to collect reports with a slip of paper and are given the report after proper verification.
5. For people needing to undergo radiology tests, the consent form is given at the dispatch counter and is also forwarded to the radiology area from the dispatch counter.

**Pathology lab:** the pathology lab is situated in a separate building which also houses other departments like MRD, Housekeeping, blood bank etc. it is a huge lab with many departments like haematology, serology, biochemistry, microbiology, histopathology, etc. they take in blood, urine, stool, body fluids, tissue and more for conducting these tests. The samples are predominantly collected at the sample collection area and brought to the lab via housekeepers.

*Process flow:*

1. The sample collected from sample collection area is brought in the lab.
2. It is then distributed to the various departments to do the testing.
3. Every department has a register which records the sample and the test that is to be done.
4. Prepping of the sample is done like putting in water bath or centrifuge for tests that require serum separation.



5. After ensuring that the sample is ready to be tested, it is fed into the respective machines in batches, which have a certain testing time and keep giving the test values as soon as the test for a sample is completed.
6. Some machines like the biochemistry ones are connected to the LIS and thus does not require a typist to type in the values.
7. For the machines which are not connected to the LIS, the values are printed and then forwarded to the doctor in the lab who cross checks the values and advises repeat testing in case of abnormal values.
8. The values are then forwarded to the typists who then generate the final report which is saved on the HIMS as well as printed.
9. The printed reports are sent to the dispatch counter from where the report is distributed.

**Radiology lab:** the radiology lab is situated in area 38 and provides a range of services like MRI, CT scan, USG, X-ray, echo, etc. the report of radiology is provided just outside the radiology area, in the dispatch counter along with pathology reports. It is a large room with different areas for different tests. The number for taking radiology tests is given at the dispatch counter along with the form for such tests.

*Process flow:*

1. Patient fills the form at dispatch counter and his name is called for the tests.
2. The patient goes inside the radiology area and undergoes the particular test.
3. He comes out and awaits his report at the dispatch counter and takes it after it has been prepared.

**Sample collection room (OPD):** after the patient has undergone the billing and consultation with the doctor processes, they will go to the various testing sites like the sample collection

room, radiology department etc. for blood tests, x-ray, CT scan, ultrasound, MRI, and many other. The sample collection room is situated in the OPD area and collects blood, urine, stool and other body fluids from both inpatients and outpatients.

*Process flow:*

1. Patient comes in with bill and the collector takes a look at the tests prescribed.
2. Register entry is done, barcode is generated and required vials and boxes are barcoded.
3. The sample is taken, in case of blood it is taken immediately and in case of urine/stool/body fluid it is taken after the time necessary for such collections.
4. The patient is returned the bill and reporting time is mentioned to him, along with directions for the remaining tests and report collection.
5. For inpatients, the housekeeper or nurse bring the sample from the respective ward or care unit. It is sometimes barcoded and sometimes just a slip of paper is given.
6. The collector acknowledges receiving the sample and signs the inpatient register, and also records it in their register.

**Quality department:** the quality department is a one-man department. It is located in a separate building beside the infection control department, the conference hall, and the building housing the HR, marketing, maintenance, bio medical departments.

*Process flow:*

1. the quality manager starts his day with doing rounds of the hospital and taking notes or audits.
2. He visits all the places including the IPD and OPD areas and takes a look at the files in every department.
3. In case of any mistakes, he talks to the concerned person and notes in his diary.
4. He also keeps a track of maintenance of the hospital infrastructure.

5. After his daily rounds are over, he goes back to his department and updates the daily report on his spreadsheet.
6. He also has the duty of informing the management about any major issues that he might observe.
7. He is also responsible for providing quality training and preparing the hospital for NABH assessment and goes to train different departments.

**IPD:** the IPD consists of three floors and many areas. The first floor has the A, B, C, D, E, F, female general ward, male general ward, neuro ward etc. with nursing stations in both wings.

- a) CCU- it is the cardiac care unit and is divided into CCU-1 & CCU-2. CCU-1 has 8 beds and one isolation bed while CCU-2 has 7 beds. Ideally, one bed is left vacant for in-house transfers or emergency situations. Beside the CCU is the Cath lab and the counselling area for patients/attendants undergoing any cardiac intervention. The Cath lab provides services like angiography, angioplasty, PPI, TPI, BMB etc. There is a cardiac OT too.
- b) HDU- it is the high dependency unit where patients who are highly dependent on medical services for their survival are put and monitored. Some patients from CCU are sent here over time. It has 8 beds.
- c) Isolation ICU- it is a 6 bedded unit where patients who need intensive care as well as isolation are kept. This is used in case of infectious diseases like Covid-19 in today's date.
- d) Apart from these, there are OTs and post-operative areas too.
- e) NICU- the NICU or neuro ICU has 9 beds in total.
- f) MICU- the MICU or medical ICU has – beds in total. Due to renovation work, the patients have been shifted to CCU-1 & CCU-2 from other ICUs.
- g) ITU- ITU or intensive treatment unit has 12 beds, 2 isolation areas, post-operative area, and the cardiac OT outside it.

The attendants can visit their patients from 9:00am to 9:30am in the morning and 4:00pm to 4:30pm in the afternoon and also meet the doctors.

The ward secretary looks after all the wards, the individual and double occupancy rooms as well as the deluxe rooms. She visits each patient, asks about their well-being, checks their files, checks activity card for rough estimate of bill in case attendants ask. For TPA patients, when their approved amount gets exceeded, intimation is done to the patient party. The discharge summary is prepared, and the ward secretary takes a look at it for any mistakes. Then, the return card is produced and sent to the pharmacy where unused medicines are returned, and amount is adjusted. Next, the supplies are returned to the store and after the clearance is given from the pharmacy and store, the activity card goes to the front office for final bill amount. For TPA patients, the bill is sent to the company via email from the corporate desk.

- h) The wards: there are A, B, C, D, E, F, male general ward, female general ward, neuro ward and covid ward present in the hospital on the first floor. The structure of the wards is the same and patient file format is same. Wards A, B, C, D, E, F have 5 beds each. The female general ward has 10 beds and has been shifted to the site of old covid ward. The neuro ward has 9 beds. A call response file is maintained in which details of all calls to the respective ward is documented including in-house calls, calls from attendants, calls from doctors etc.

*Process flow of IPD:*

1. The patient gets admitted after advice from doctor and consent of attendants.
2. The patient is placed in the respective ward or care unit, where his treatment takes place.
3. His patient file is maintained which has a record of everything done to him for final billing.
4. The doctor visits daily and check the patient's condition and write down tests.
5. The dietician visits for checking the dietary requirement of each patient according to his condition.
6. The attendant is informed about any expensive tests r medications and approval is taken.

7. Activity card is updated throughout the day and reports, patient charts, prescriptions, consent forms, risk assessment form, nurse record sheet, doctors record sheet, vitals like blood pressure/sugar levels/temperature sheet, discharge summary are attached in the patient file.
8. The attendants are regularly informed about their patients' updates.
9. The doctors as well as management are kept in loop for important decisions.
10. Surgeries and medical interventions are scheduled and take place after consent.
11. In case of discharge, the discharge summary is prepared, and activity card is checked for mistakes.
12. Return cards for pharmacy and store are prepared, the unused items are returned, and clearance is taken.
13. The billing amount is updated at the front office and the due amount is deposited, after which the patient is handed over to the attendant.
14. In case of TPA patients, the final bill is shared with the company via email from the corporate desk and the patient is discharged after the amount has been deposited by the company to the hospital.

**Finance:** this is one of the most essential departments in any hospital. It is what keeps the pumps going and some of its most important functions is calculating expenses, preparing budgets, allocating monetary resources for various departments and processes, etc.

**Information Technology:** the information technology or IT department is the backbone of the modern-day hospital. The increasing dependency on information technology is a key feature of hospitals as processes can be easily streamlined and dependency on humans is reduced by increasing the dependency on technology, thus reducing chances of human errors and making processes faster. The hospital runs on an HIMS software which is accessible from every department to people who are eligible for such privileges. Every step in a patient's journey right from the registration to discharge is recorded on the HIMS at various points like reception area, OPD area, sample collection area, investigations like laboratory and radiology area, IPD area, etc. Apart from the purpose of maintaining a

patient database, the software also has sections for employees like checking attendance, applying for leaves, checking work schedules and accessing their employee details like incentives, etc.

**Biomedical department:** The biomedical department provides the technical expertise & support to the hospital administration, engineering department, medical and paramedical staff, laboratory, as well as all other departments in the hospital. It is located in the building which houses the HR, marketing, and maintenance departments.

**Store:** the store is the area where supplies are kept before being sent to the various departments. Logs are maintained and inventory is done, along with recording how much consumables have been given to which department in what quantities and which date.

**Mortuary:** the mortuary is the place where dead bodies are stored before being released to the concerned parties. Post-mortem and autopsies are also carried out here. It is located behind the building housing the HR, maintenance and biomedical departments.

**Maintenance department:** The maintenance department is responsible for the way equipment runs and looks and for the costs to achieve the required level of performance. Splitting responsibility between maintenance or any other department where overlapping responsibility occurs is ensure that a single department is not the only one held responsible. The maintenance department is responsible for the frequency and level of maintenance. They are also responsible for the costs to maintain, which requires development of detailed budgets. The maintenance department needs to report to the top management. The maintenance department is situated in the building with HR, marketing, and biomedical departments.

**Infection control department:** the infection control department is beside the quality control department. It is made up of a doctor and an infection control nurse. the infection control nurse is a busy person as she has to oversee infection control practices hospital wide as well as provide training to all departments periodically. She also has to train every new employee of the hospital and is thus, one of the most crucial people. Apart from these, she has to maintain monthly checklists of various parameters like hand hygiene etc.

Process flow:

1. The infection control nurse starts her day with daily rounds of the hospital.
2. She observes hygiene behaviour of staff and checks if they are following protocol.
3. She also checks whether waste is being disposed in the correct colored bins.
4. Another important thing that needs to be checked is the box in which needles, wires and other sharp medical equipment are disposed and if the lid is properly closed.
5. The infection control nurse notes down incorrect practices in her checklists along with the incident report.
6. Another important task of the infection control nurse is managing needle stick injuries and other injuries caused by improper handling of medical equipment like syringes etc.

**CSSD:** the CSSD or central sterile supply department is located in the corridor after the deluxe rooms. This is the area in which sterilization and disinfection of reusable items takes place. As the name suggests, it is centrally located and accessible from different parts of the hospital.

*Process flow:*

1. The items to be sterilized are brought in by housekeepers.
2. They are treated with various chemicals to disinfect them and prep them for reuse.
3. They are ready for reuse and are sent out to various departments for use.

**MRD:** the MRD or medical records department is situated on the first floor of a separate building housing the pathology lab, blood bank, housekeeping department along with MRD. All files and documents related to patients, surgeries and other medical interventions are stored here. It is a huge room filled with a lot of shelves containing thousands of records. The staff have special training in coding medical records which is not something everyone can do.

*Process flow:*

1. The patient file is maintained at the OPD/casualty/labor room/admission office/wards/ etc.
2. The files are properly assembled in the correct sequence.
3. The files are checked for errors and incomplete records are taken care of.
4. Coding and indexing of the files takes place.
5. Filing is done for record keeping at the MRD department.
6. The files can be retrieved for future reference or reporting to the management anytime from the MRD.

**Housekeeping/laundry:** the housekeeping department is situated on the first floor of a separate building housing the pathology lab, blood bank, MRD along with housekeeping. Housekeeping can be considered the backbone of a hospital as it functions in the whole hospital and has a huge number of staff. The housekeeping staff are responsible for cleaning and transporting of reports, samples, information etc.

*Process flow:*

1. The staff are assigned places to work.
2. They do the dusting, mopping and other cleanliness related activities.
3. Apart from daily dusting and mopping, they are required to do multiple cleanings in case of dirt being accumulated.
4. They also clean washrooms in all areas.



5. Apart from the usual cleaning, staff are also required to assist the various departments they are posted at with minor tasks like transporting items, taking samples, transporting reports, files, etc.

**Blood bank:** the blood bank is situated on the ground floor at one corner of the building housing pathology lab, MRD and housekeeping departments. It collects and stores blood for use in the hospital and for outside cases as well. People come to the blood bank to donate blood voluntarily, in exchange for blood for their patient, or during blood donation camps.

**OT:** the OT or operation theatre is the area where surgeries and other procedures take place in a controlled, safe environment. The OT area at Medanta hospital, Ranchi is located on the first floor beside the elevator shaft. There are three types of OT; general OT, cardiac OT and neuro OT. The general OT has 5 OTs, 3 major and 2 minor. OT-3 is prepared to take in cases of patients with infectious diseases and is maintained according to the infection protection and control safety protocols. The time for surgery/procedure is from 8am to 8pm. Apart from the operation theatres, there are other areas like two 5-bedded recovery rooms, pre- and post-operative areas, waste disposal room, sterile zone, protective zone, cleaning zone, scrubbing zone, storeroom, male and female changing rooms. There are three types of events that can take place i.e., pre-planned surgery, emergency surgery and day care surgery.

The entire OT area is cleaned thrice a day, in the morning, before a surgery and after a surgery. Apart from this, it is cleaned in case of spills. Weekly fumigation also takes place. The OT-3 which handles infectious patient takes in surgery after all other scheduled surgeries are over and is fumigated after the surgery. The cleaning mix includes sodium hypochlorite and bacillocid. For fogging, 10% bacillocid is used. All surgical instruments are autoclaved which is a 45-minutes long process and expires in three days. For plastic and rubber items, ETO (ethylene trioxide) is used which takes 6 hours to finish and lasts up to 6 months before getting expired. Laparoscopy instruments a solution of cydex OPA is used which takes about 15-20 minutes.

The OT is a complex place. It is an 18 by 20 room and has areas for sterilization, storage of medications and equipment, focused lights, ambient temperature (18-20°C), color-coded bins, CO<sub>2</sub> supply cylinder, washing area, linen trolley, suction pipe, IV stands, etc.

There are three types of anesthesia methods used in the OT namely,

- general anesthesia which numbs the whole body and is given by IV line or inhaled via breathing tube and mask,
- local anesthesia which numbs a certain region of the body and is given via injection for absorption by the skin,
- spinal anesthesia which is used to numb the entire body below the site of the injection and is given by injecting directly into the spinal cord.

*Process flow:*

1. Information for surgery comes up or is found out by daily calls to various patient care areas by the OT nurses.
2. The anesthesiologist is informed about the surgery/procedure.
3. Clearance is taken from the bill counsellor.
4. After clearance is done, surgery notice is put up in the board outside OT with details of the patient, doctor's name, name of the procedure/surgery, anesthesiologist and scrub nurse names.
5. After the patient is brought in, his vitals are checked, and pre-operation sheets are filled in by the nurse.
6. The anesthesiologist checks the patient to be satisfied with his condition and the patient is then brought into the OT.
7. The site of the operation is stained with betadine and sterilized.
8. Before the operation starts, all points in the surgical safety checklist are satisfied.

9. There are typically one doctor, two anesthesiologists, three scrub nurses, one circulating nurse and two technicians present in the OT during a surgery/procedure.
10. The patient is connected to an anesthesia tower which has a monitor to display real time vitals, and is also connected to gases like oxygen, nitrogen etc. Specific equipment for the procedures are also brought in and connected.
11. After administration of anesthesia, surgery begins. Vitals are closely monitored, and the procedure is filmed.
12. As the procedure ends, the specimen is sent for biopsy, the incision is sealed and gradually, the patient is stopped giving anesthesia.
13. After the patient has regained consciousness, he is asked to do a series of activities like moving limbs or taking out the tongue to help determine his level of consciousness.
14. The patient is shifted to the post-operative recovery room and is attached to a monitor displaying his vitals, which the nurse records every 15 minutes.
15. The OT is cleaned post-surgery and is prepared for the next surgery.
16. A series of paperwork is filed like the OT note by the consultant, nurses progress sheet, etc. The OT master registered is also updated.
17. After about two hours, if the patient is stable, they can be discharged or shifted to a ward. If the condition is not so good, they are sent into MICU.

There are lots of forms and charts maintained in the OT for each case. Below is a list of them:

- Master OT register: it contains columns for serial number, date, UHID, IP number, OPD, name, age, weight, gender, number of OT, planned/unplanned ventilation, diagnosis, PAC, modification of anaesthesia, adverse events of anaesthesia, death, pre-medications, antibiotics, operation, details of anaesthesia, time in, time out, surgeons, anaesthesiologist, scrub nurse, remarks, blood grip and blood bag number.
- SSI bundle: this sheet has information about cases of surgical site infection.
- Pre- operative checklist: this sheet is to be filled by nurses.

- Monthly quality indicator report: this is filled by nurses and is compounded with the help of the quality indicator checklist and the OT master register.
- Quality indicator checklist: it has 30 indicators which are to be filled by nurses.
- Operation notes: these are notes on the operation and are filled by the consultants.
- Anaesthesia record: this is filled by the anaesthesiologist on duty.
- Post anaesthesia recovery score: it is calculated by the anaesthesiologist on duty.
- Assessment and monitoring in post anaesthetic care unit: filled by nurses.
- Informed consent for surgical operation/procedure: filled by the patient, the family member, and the doctor.
- Informed consent for administration of anaesthesia/sedation: filled by patient, family member and anaesthesiologist on duty.
- Surgical safety checklist: to be filled by doctors, anaesthesiologist, and nurses.

For patients admitted under the Ayushman Bharat scheme, picture is taken with the face of the patient, picture of the procedure and gross specimen removed is also taken. A scar photo is taken without bandage and barcode of implant used (if any) is forwarded.

### **Conclusive learning:**

Apart from the departmental activities, the trainee learned some managerial :

- Work scheduling for small departments like front office, call centre, sample collection at OPD
- Calculate person-hours to decide task duration or number of staff required
- Root cause analysis, fishbone cause and effect diagram, time-motion study, process flow of various departments.
- Dealing with conflicts and resolve problems faced by patient party or staff
- Handling of samples and timely running of tests in the pathology laboratory
- Record keeping like patient files, activity cards, safety checklists, consent forms, infection control bundles that are maintained in the IPD.

## PROJECT REPORT

On

**Ascertaining the TAT in the pathology lab of Medanta hospital, Ranchi  
and to suggest measures to improve it**

## **Introduction**

Turn Around Time (TAT) for laboratory is usually defined as the time from when a test is requested until the result is reported which includes pre-testing, testing and post testing time. TAT is one of the most prominently noticeable signs of a laboratory's service quality as well as being a key performance indicator (KPI). Patient satisfaction and faster diagnosis and treatment is also achieved by timely TAT, thus enabling faster recovery of the patient and discharge.

This project has been done in the pathology laboratory of Medanta hospital, Ranchi by the trainee as part of the summer training program. The trainee has personally recorded all the data used for this project and has not relied on other sources of data like the OPD or IPD register which also mention collection and reporting time. The TAT for 700 samples of IPD and OPD for the duration of eight weeks/two months was recorded in this study from the time of sample collection to report generation of haematology and biochemistry. The contribution of the actual testing time to the total turnaround time was found to be less than that of pre and post testing time in both IPD and OPD patients. In this study, reasons of delay in the turnaround time and suggestions to achieve a faster turnaround time were discussed.

Rationale: Pathology laboratories are some of the most important department in a hospital because patients as well as clinicians depend on it for diagnosis and treatment. Therefore, the service quality of pathology labs is important for giving accurate and timely reports which may affect the patient outcome. This topic was chosen as TAT is an important indicator of a laboratory's performance and gives a clear picture of its service quality.

**Objectives for this project report:**

- 1) To calculate the TAT percentage for the project duration and for a sample size of 700, of which 600 are of biochemistry and 100 of haematology.
- 2) To find out the percentage of inpatients and outpatients as well as percentage each test covered in this study makes of the whole sample size.
- 3) To find out the gaps in processes that each test undergoes and determine the most delaying factor.
- 4) To analyze the data and give suggestions to make service quality of lab even better.

### **Review of literature:**

This study titled “Ascertaining the TAT in the pathology lab of Medanta hospital, Ranchi and to suggest measures to improve it” is understood with the help of reading research papers pertaining to the theme of analysing, calculation, and implications of turnaround time (TAT) of laboratory services in the various areas of study these research have covered.

Turn Around Time is a parameter for measurement of performance of laboratory services. Laboratories often use TAT and other indicators to determine the accuracy and precision of their tests to showcase the service quality. Clinicians seek faster TAT for tests which helps them in diagnosing, treating, and faster discharge. On the other hand, slower TATs can lead to increase in the requests which can cause duplication of tests. This may in turn increase the cost burden of healthcare. Turnaround Time can be described in many ways; for clinicians, TAT is considered as the time the test is ordered till the reports are dispatched, whereas for laboratory professionals, TAT is usually considered from the time the specimen is received at the laboratory to the generation of reports. The total TAT for laboratory includes the complete interval from the time of ordering the test to the results being communicated to the clinician. It consists of the time intervals from the placement of order to sample collection, time taken to transport the sample to the lab, entry in the lab books, centrifugation, transport time within laboratory, testing time, the time after completion of test until the result is published on the HIS or printed. TAT can also be divided into pre-analytical, analytical, post analytical depending on the different phases of sample processing.

Dr Mekala Jaya Krishna. "A Study on Turnaround Time (TAT) As an Indicator to Improve Laboratory Efficiency." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 16.12 (2017): 05-08 <sup>[2]</sup>

“The study area was Osmania General Hospital, and the study was done to ascertain the TAT for Emergency, outpatient department and inpatient department to determine whether the analytical phase is more time-taking than pre and post analytical phases. Number of samples that were reported outside the standard TAT were calculated and steps to reduce the total TAT were suggested. They covered the microbiology, clinical biochemistry and



pathology departments and observed the TAT for three months. A total of 282 samples were traced out of which 32 got excluded while 60 from ER, 90 from IPD, and 100 from OPD got included. Then, average time for pre-analytical, analytical, and post-analytical phases was taken out and it was found that for ER samples, the average time taken was 85 minutes plus sample receiving time. The OPD average time was one day as reports were dispatched the next day and the average IPD TAT was 7 hours as reports are dispatched on the evening of the same day. They also discovered that pre and post analytical phases contribute around 30% of the TAT for ER, 84% for OPD and 71.4% for IPD. Streamlining the pre and post analytical phases can help achieve a faster TAT.”

Breil, B., Fritz, F., Thiemann, V. *et al.* Mapping Turnaround Times (TAT) to a Generic Timeline: A Systematic Review of TAT Definitions in Clinical Domains. *BMC Med Inform Decis Mak* 11, 34 (2011). <sup>[3]</sup>

“The paper focuses on seeking a proper definition of turnaround time or TAT with the help of analysing different published papers containing different definitions of TAT in the field of hospitals. The researchers analysed and tabulated the existing definitions of TAT and summarised them. They studied more than a thousand articles and ended up narrowing down to 162 papers for the study.

They reached a consensus for the following fifteen terms: admission, order, examination, receipt of sample in the laboratory, completion of procedure, interpretation, dictation, transcription, verification, report available, delivery, physician views report, treatment, discharge, and discharge letter being sent. Several standard definitions for TAT were proposed based on these terminologies. The major definitions that were reached are given as follows:

- Turnaround time can be defined as the time taken from receipt of the sample to the time of result availability or laboratory TAT
- The time from the time of doctor’s request till the time the doctor views the report or total TAT.

There are also drug turnaround time and medication TAT which have the same time interval. Different circumstances require a different TAT for proper measurement and the definition of TAT should be precisely defined.”

Zawawi, Rahad & Justinia, Taghreed. (2017). Laboratory Information Systems and Analytical Turnaround Time. Global Journal of Research and Review. 4. 1-12. 10.21767/2393-8854.10005 <sup>[4]</sup>

“The paper seeks to find whether the implementation of the new LIS has made the analytical TAT faster at the haematology section of KAMC lab department. To arrive at a conclusion, data from the old as well as the new LIS has been analysed to determine the analytical TAT.

There were many drawbacks to the old LIS like the interface was not user-friendly, the data was stored for just three months, not all equipment were interfaced to it etc. The new LIS had more advanced features like a graphical UI and most of the equipment could be interfaced with it. It can also store patient data indefinitely.

Data regarding the analytical TATs ( the dependent variable) for Coagulation and CBC and Differential test panels with either STAT or Routine priorities (the independent variable 1) have been gathered from the old Laboratory Information System and the new Laboratory Information System (the independent variable 2). The Analytical Turnaround Time data has been collected from the old LIS for a period of 17 months before the go-live of the new LIS. Also, the analytical Turnaround Time data for the same test panels have been gathered from the database of the new LIS for a period of 17 months after the go-live. There will not be any control group in this study. To analyse the problem, data from 17 months of old and new LIS each have been extracted. Independent T-test was used to compare the analytical TAT. The mean for old LIS was thirty-five minutes with a standard deviation of eight minutes. The mean for new LIS was twenty-six minutes and standard deviation was nine minutes.”

After going through the papers discussed above, some clarity has been obtained and my study has taken its direction. The first paper discussed TAT as a performance indicator and supported the research statement with data. It calculated TAT as the average of all data in the different series i.e., IPD, OPD, ER. The next paper talked about mapping TAT and defining it in various settings apart from laboratory like drug TAT, medication TAT & total TAT. It focused less on calculation of TAT as compared to seeking the perfect definition for it. The last paper was about building a relationship between using a new laboratory information system software and turnaround time. It compared the TAT of samples from the old LIS and the new LIS to determine whether an upgrade in software has an effect on improving TAT.

### **Methodology:**

**Study area:** The study has been conducted in the Haematology and biochemistry section of the Laboratory at Medanta Ranchi. The Laboratory and Pathology Department in Medanta Ranchi is one of the critical departments that provide health care services. Haematology and biochemistry sections are some of the important sections within the department, which perform many tests that significantly aid health care providers in making their diagnoses regarding their patients' health condition. The following tests were covered in the study:

- 1) Haematology
  - CBC
  - Hb
  - Platelet count
- 2) Biochemistry
  - SGPT
  - HS CRP
  - PT/INR
  - PTT
  - Creatinine
  - Urea
  - Uric acid
  - Albumin
  - Na
  - K
  - Ca
  - HbA1C
  - LFT
  - Lipid profile
  - Lipase
  - Cardiac marker
  - Serum calcium
  - Blood sugar
  - Alkaline phosphate
  - Cardiac enzyme

**Study design:** The study design is based on a time-motion study. Time motion studies is a quantitative data collection method where the observer captures detailed data on the movements and durations required to complete a particular task, coupled with an analysis focused on improving efficiency.

**Sampling & Sample size:** A total of 700 samples (100 samples of haematology and 600 samples of biochemistry) were collected from the point of collection to the point of final reporting for the duration of eight hours per day from 9am to 4:30pm. The sample size was determined by the average number of tests that come in daily for these two categories for the duration of the project as all the work is being done manually by one person and is time-taking.

**Type of study:** Descriptive analysis

**Data collection method:** To capture the activities and each minor steps taken by the staff, process mapping has been done and the investigation is broken down into smaller tasks which makes it easier to determine which individual processes took how much time in the total investigation time.

The investigation is divided into three broad categories like pre-testing (sample collection time, sample in-time, register entry time, water bath/centrifugation time), testing and post-testing (verification time, LIS to HIMS time, report generation time).

**Data collection tools:** Observation checklist (attached at the end of the report)

**Data collection process:** The secondary data in the form of literature reviews was done. as well as primary data collected by the trainee. The secondary data has been obtained using researchgate.com to surf for research papers on the topic.

The primary data collection was done in the following steps-

- The samples from OPD patients were collected in the Sample Collection Area by trained lab technicians whereas samples from In-patients and in emergency were drawn by the staff nurses and junior doctors of their respective wards.
- The samples were taken to the lab by the nurses or housekeeping staff from the wards and emergency areas as well as from OPD.
- The samples received in the laboratory were first checked for clots and serum is separated in some cases followed by processing.
- This is preceded by routine maintenance in the morning.

- The samples received in the laboratory were processed in the order in which they were received except for samples received from emergency which were run on stat mode as soon as they were received.
- After the sample was analysed for all requested parameters and the reports were validated in the software which were then dispatched and manually distributed by the lab staff to the patient attendants at the dispatch counter.

The data collected is recorded in a notebook as well as uploaded on a live excel sheet for tabulation.

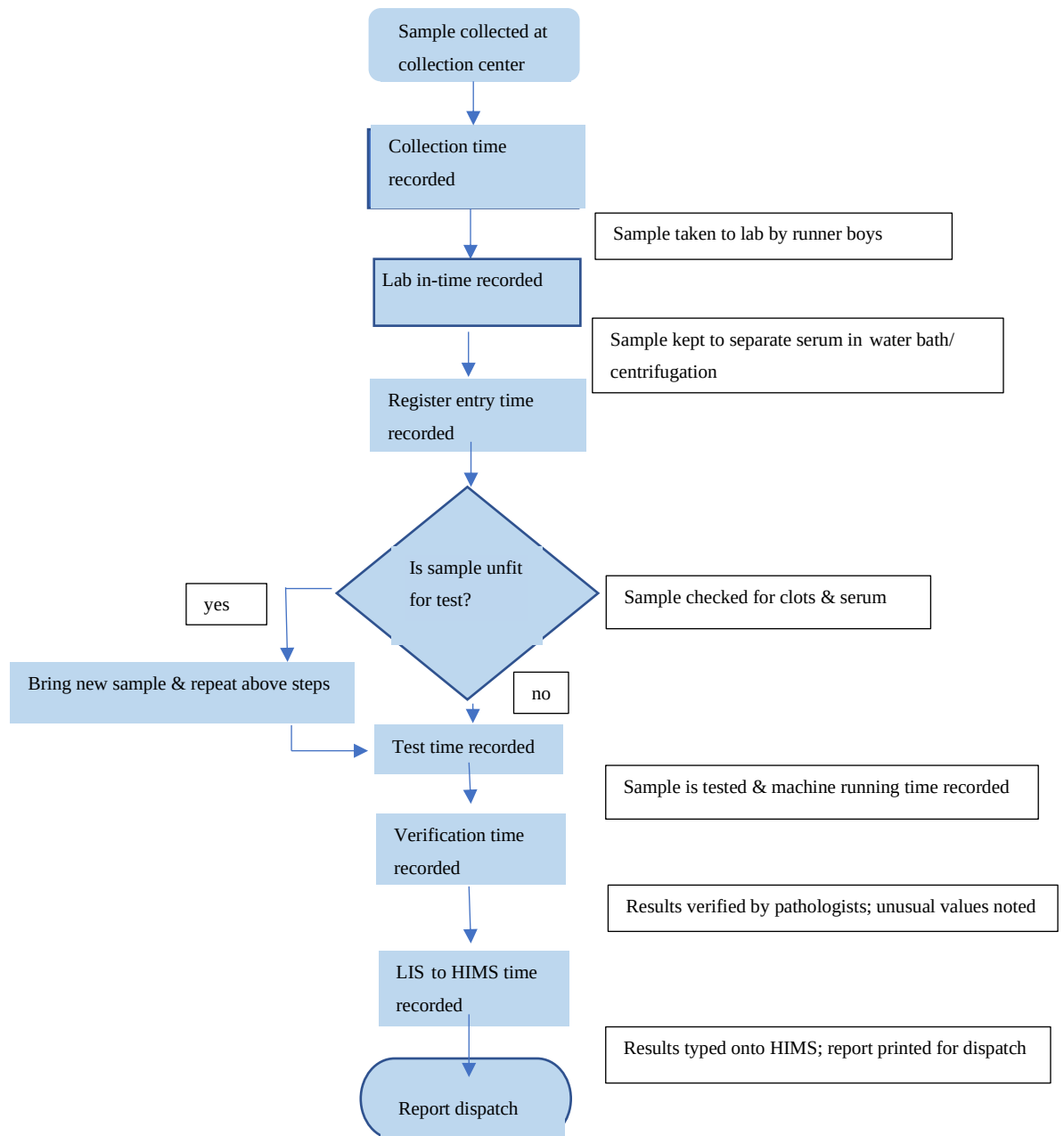
**Data quality measures:** Each entry is cross-checked for errors with the respective registers so that accuracy in names, tests, and UHID are maintained.

**Data Analysis:** The data was compiled on MS Excel spreadsheet and arranged. After the compilation process is over, the TAT derived from the samples has been compared with the standard TAT for a laboratory with the help of the data collected over the period of two months (May-July,2021). The formula for deriving TAT is:

$$\text{TAT} = \text{Exit time} - \text{Entry time}$$

Apart from this, percentages and frequency have been used. The data has been analyzed on various parameters like percentage, frequency of occurrence to get to the bottom of the problem. Root cause analysis was done after analyzing the data and identifying gaps, and suggestions to improve were given.

*Fig 1 Process flow diagram of a pathology test*



### Results:

A total of 23 test types were studied, out of which three were of haematology and 20 of biochemistry. The data of 700 samples was presented.

*table 2 Sample distribution type & number of tests*

| NAME OF TESTS      | NUMBER OF TESTS |
|--------------------|-----------------|
| SGPT               | 18              |
| HSCRp              | 42              |
| PT/INR             | 67              |
| PTT                | 12              |
| Creatinine         | 148             |
| Urea               | 44              |
| Uric acid          | 15              |
| Albumin            | 6               |
| Na                 | 23              |
| K                  | 32              |
| Ca                 | 8               |
| HbA1C              | 20              |
| LFT                | 80              |
| Lipid profile      | 7               |
| Lipase             | 2               |
| Cardiac marker     | 3               |
| Serum calcium      | 9               |
| Blood sugar        | 69              |
| Alkaline phosphate | 1               |
| Cardiac enzyme     | 1               |
| CBC                | 86              |
| Hb                 | 13              |
| Platelet           | 1               |

Table 2 shows a distribution of 700 samples that were traced in the study. The top 20 tests belong to the biochemistry group and the bottom three belong to the haematology group.



Table 3 Standard TAT for tests covered

| Name of test                                      | OP TAT | IP TAT |
|---------------------------------------------------|--------|--------|
| All haematology tests covered except platelet     | 4hours | 3hours |
| Platelet                                          | 2hours | 2hours |
| All biochemistry tests covered except PT/INR, PTT | 4hours | 3hours |
| PT/INR<br>PTT                                     | 3hours | 2hours |

1. Frequency of given tests:

Table 4 Name & number of OP and IP tests with number of delayed TAT

| NAME OF TEST       | OP NUMBER OF SAMPLES | OP cases of bad TAT | IP NUMBER OF SAMPLES | IP cases of delayed TAT |
|--------------------|----------------------|---------------------|----------------------|-------------------------|
| SGPT               | 15                   |                     | 3                    |                         |
| HSCRP              | 35                   |                     | 7                    |                         |
| PT/INR             | 41                   |                     | 26                   |                         |
| PTT                | 3                    |                     | 9                    |                         |
| CREATININE         | 107                  |                     | 41                   |                         |
| UREA               | 27                   |                     | 17                   |                         |
| URIC ACID          | 11                   |                     | 4                    |                         |
| ALBUMIN            | 5                    |                     | 1                    |                         |
| CBC                | 54                   |                     | 32                   | 2                       |
| HB                 | 5                    |                     | 8                    |                         |
| PLT                | 0                    |                     | 1                    |                         |
| NA                 | 11                   |                     | 12                   |                         |
| K                  | 18                   |                     | 14                   |                         |
| CA                 | 4                    |                     | 4                    |                         |
| HB A1C             | 15                   |                     | 5                    |                         |
| LFT                | 66                   |                     | 14                   |                         |
| LIPID PROFILE      | 5                    |                     | 2                    |                         |
| LIPASE             | 1                    |                     | 1                    |                         |
| CARDIAC MARKER     | 1                    |                     | 2                    |                         |
| SERUM CALCIUM      | 7                    |                     | 2                    |                         |
| BLOOD SUGAR        | 55                   |                     | 14                   |                         |
| ALKALINE PHOSPHATE | 1                    |                     | 0                    |                         |
| CARDIAC ENZYME     | 0                    |                     | 1                    |                         |
|                    | 487                  |                     | 220                  |                         |

Table 4 shows how many OPD and IPD samples have been taken for each test and cases of delayed TAT. There were two instances of delayed TAT in the CBC-IP category. Haematology tests have been denoted in yellow while biochemistry tests have been denoted in green.

*Fig. 2 Percentage of tests in haematology out of 100*

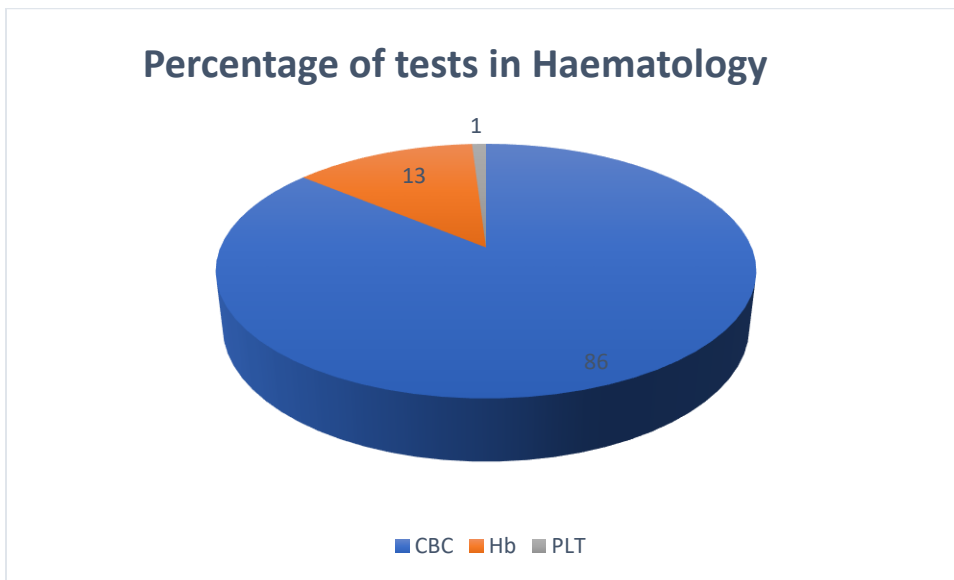


Figure 2 is a diagrammatic representation of the percentage of each haematology test taken in the study period. 86% tests were Complete blood count, 13% were hemoglobin and 1% was platelet. A total 100 tests were taken in haematology.

*Fig. 3 Percentage of tests in biochemistry out of 600*

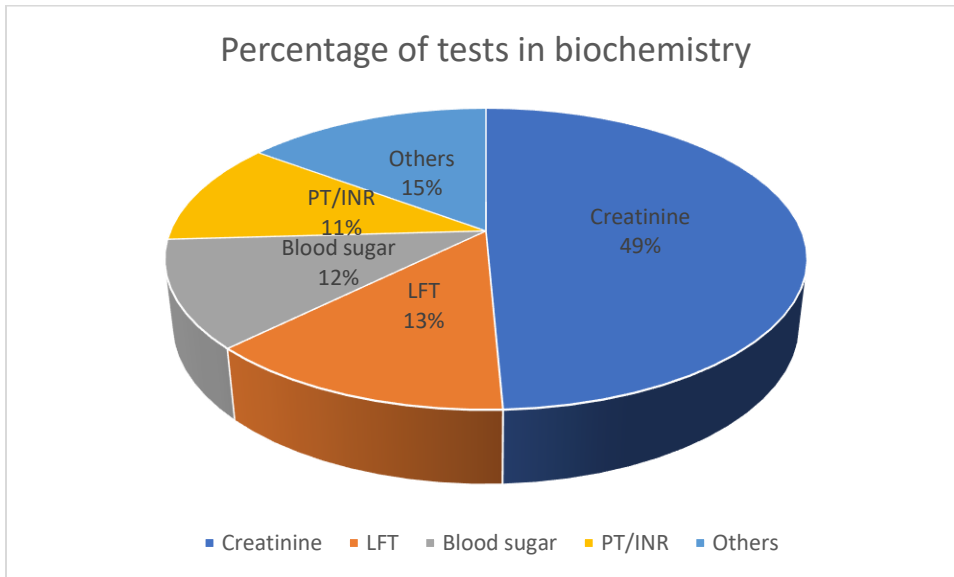


Figure 3 is a diagrammatic representation of the percentage of each biochemistry test taken in the study period. 49.3% of the samples tested were creatinine, 13.3% LFT, 11.5% blood sugar, 11.1% PT/INR, and 14.8% were the remaining investigations. A total of 600 tests were taken in biochemistry.

2. Percentage of IP and OP tests that were investigated

*Fig. 4 Percentage of inpatients and outpatients in haematology*

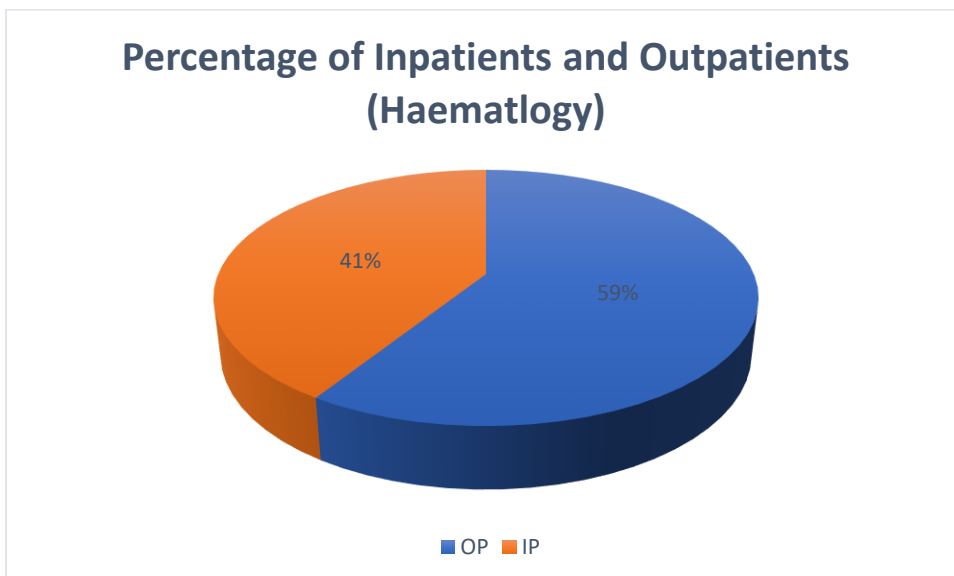


Figure 4 represents the percentage of in-patient versus out-patient tests done in haematology. The majority of tests were requested under the outpatient category, although it is marginal.

*Fig. 5 Percentage of outpatients and inpatients in biochemistry*

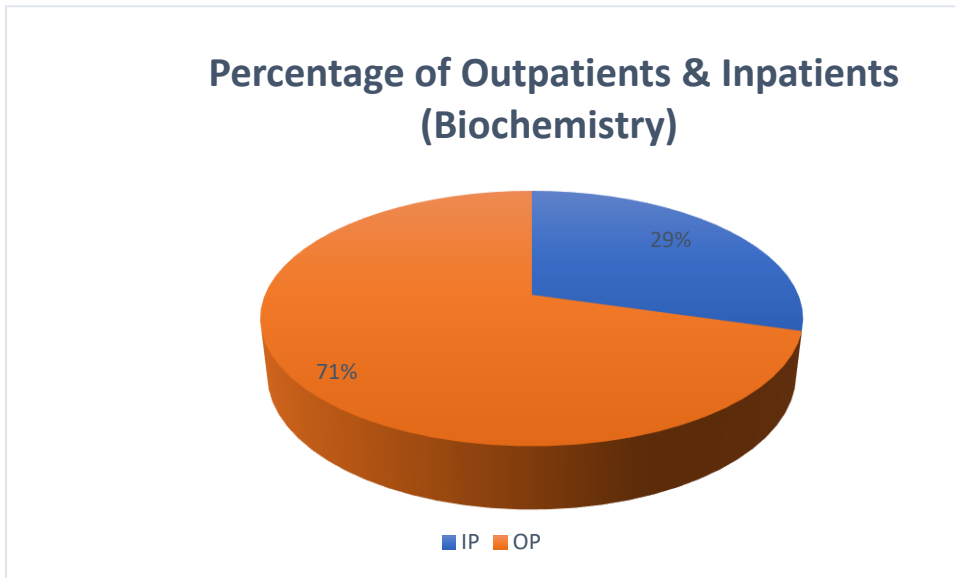


Figure 5 represents the percentage of in-patient versus out-patient tests done in biochemistry. There is a clear majority (71%) that the greatest number of tests were requested under the outpatient category.

3. percentage of delayed TATs

**Formula used: Turnaround time = Exit time - Arrival time**

*Fig. 6 Percentage of timely and delayed TATs in haematology*

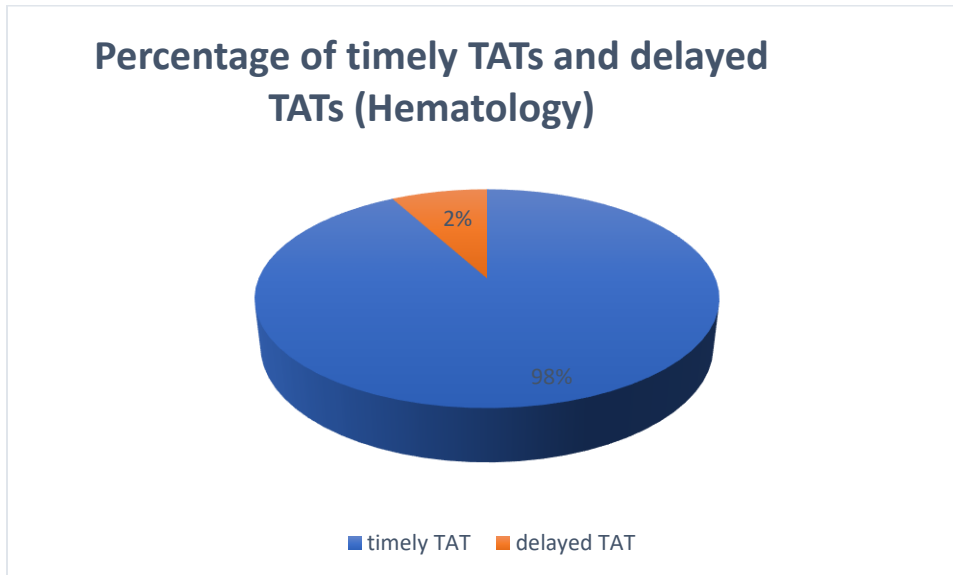


Figure 6 above represents the percentage of timely versus delayed TAT in haematology. 98% of samples traced were finished within the time frame while 2% were delayed. The cause for delay will be investigated further.

There is no figure for biochemistry as 100% of samples traced were able to be finished in time.

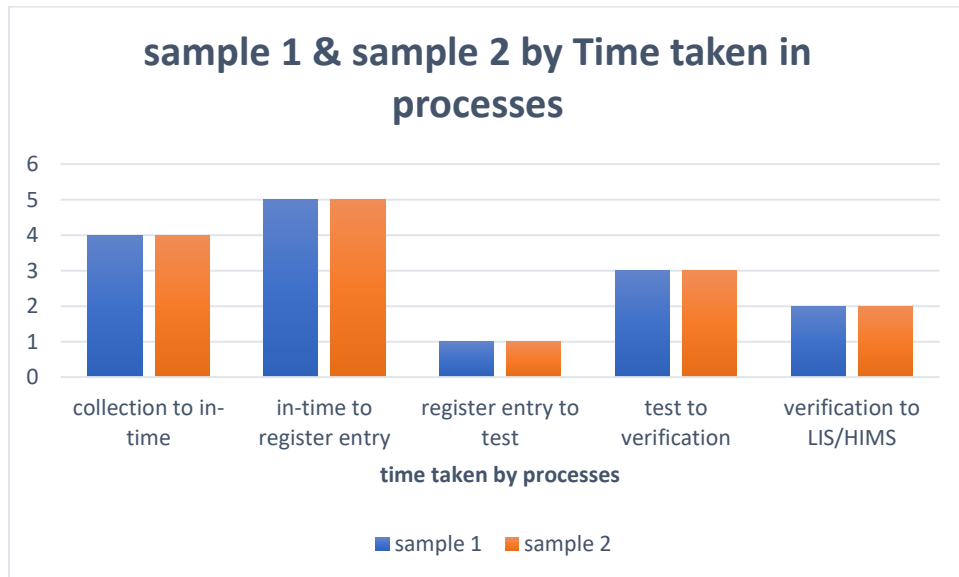
Haematology versus biochemistry TAT percentages:

*Table 5 Haematology versus biochemistry TAT percentage matrix*

|              | OP     |          |    |  | IP     |          |       |
|--------------|--------|----------|----|--|--------|----------|-------|
|              | <      | standard | >  |  | <      | standard | >     |
| Haematology  | 96.61% | 3.39%    | -- |  | 90.24% | 4.88%    | 4.88% |
| Biochemistry | 100%   | --       | -- |  | 99.44% | 0.56%    | --    |

Table 5 highlights the comparison between IP and OP samples and which ones led to a delayed TAT by what percentage. Out of 41 IP tests in haematology, 2 had a delayed TAT and thus there is a 95.12% TAT score of IP samples of haematology. 4 samples of haematology in OP (2) and IP (2) and 1 sample in biochemistry in IP were completed just in standard time (1-10 minutes before) while the rest were completed well before time in all categories.

4.factor/process that led to a delayed TAT in percentage:



*Fig. 7 Sample 1 & sample2 by time taken in processes*

The chart above showcases the two samples with a delayed TAT and which processes contributed the maximum in causing the delay. The most delay was recorded between the

sample in-time and register entry time (pre-test time) and the least between register entry to test (test time). The entries pertaining to the delayed TAT has been tabulated as following:

*Table 6 process map of delayed sample 1 & 2*

| Nam<br>e     | DAT<br>E    | UHID<br>NO. | SL.<br>NO. | TE<br>ST | IP/<br>OP | Collectio<br>n time | In-<br>time | Register<br>entry time | Testing<br>time | Verificatio<br>n time | LIS to<br>HIMS | TAT       | DEVI<br>ATION |
|--------------|-------------|-------------|------------|----------|-----------|---------------------|-------------|------------------------|-----------------|-----------------------|----------------|-----------|---------------|
| Samp<br>le 1 | 18.5<br>.21 | -----       | 41         | CB<br>C  | IP        | 10:39               | 11:3<br>6   | 02:17                  | 2:27-<br>2:35   | 2:35-3:30             | 3:30-<br>3:31  | 4h4<br>2m | +1h42<br>m    |
| Samp<br>le 2 | 18.5<br>.21 | -----       | 40         | CB<br>C  | IP        | 10:38               | 11:3<br>6   | 02:18                  | 2:27-<br>2:35   | 2:35-3:28             | 3:28-<br>3:29  | 4h5<br>1m | +1h51<br>m    |

*Legend: Pre-test in Orange*

*Test in green*

*Post-test in yellow*

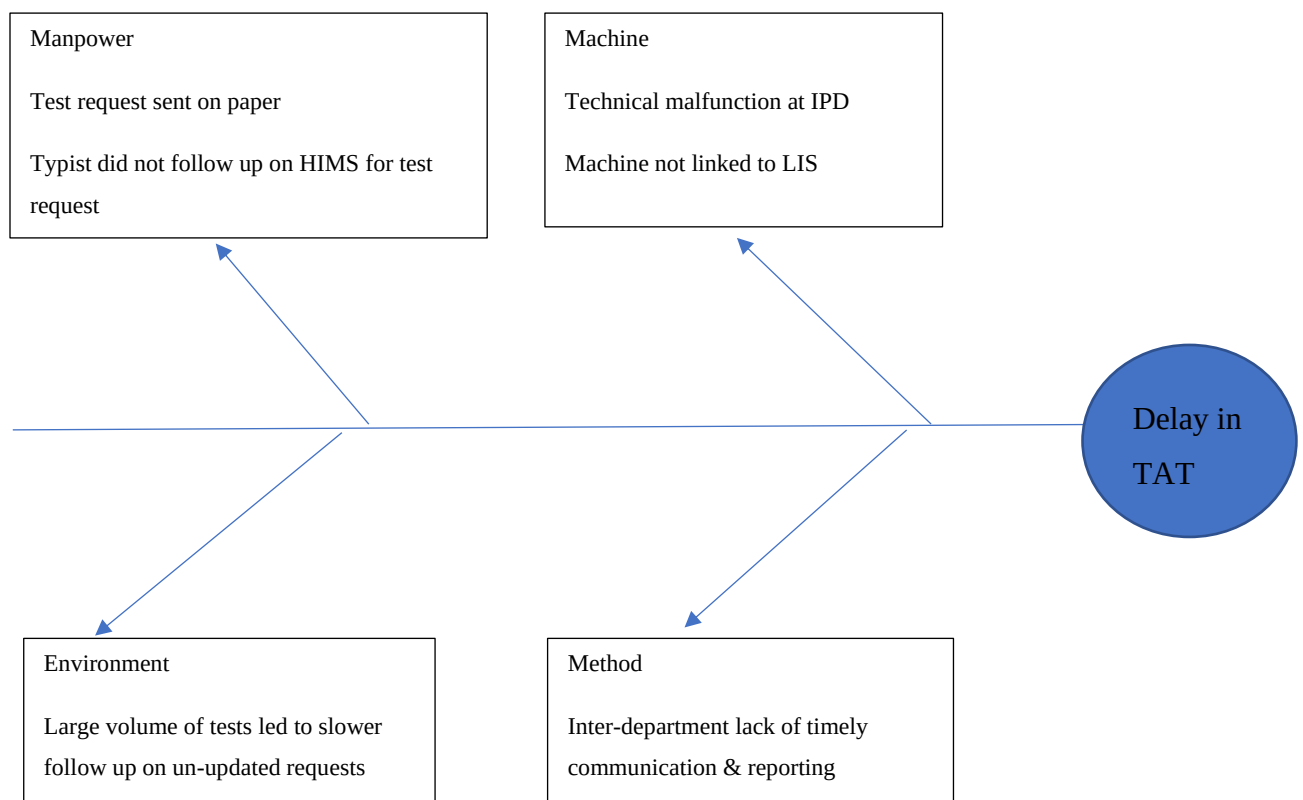
Delays in processes can be caused by a lot of factors, some of which may be incidental and some a gap in practice. To determine those factors and to find the root cause, we do an RCA or Root cause analysis which can be used to determine CAPA or corrective actions & preventive actions so that any existing gaps may be addressed, and incidences of delay be eliminated.

#### Root Cause Analysis:

After investigating the case of delayed TAT on 18<sup>th</sup> May 2021 it was discovered that the nursing staff had sent in the sample on a manual request receipt before 8AM and it was duly tested. However, due to some technical problem at the nursing end, an electronic request was only put on the system at 10:38AM. The lab staff had called in the test reports and treatment was provided accordingly to the patient on time. At the end of the day, the lab staff checked the pending IPD request section in the HIMS and found the request for the two samples from the morning has been left as pending on the system and typed in the result, which led to a time difference from 10:38AM to 3:30PM. Unlike the biochemistry test machines, the

machine that runs CBC tests is not connected to the LIS which implies that all CBC tests need to be manually entered into the database as compared to the Biochemistry tests which automatically feed data into the database as soon as the test is run. Since this was an IPD request, no damage had been done as the patient did not need the hard copy of the report to consult with the doctor or to take back home till the time he was duly discharged from the hospital, nor was his treatment affected in any way.

*Figure 8 Fishbone diagram of cause & effect*





### **Conclusion:**

The results of our present study show that a few things can be done to improve the Turn Around Time of our Laboratory. Improving Turn Around Time is a continuous process and we need to have a wholesome approach for reducing the obstacles for optimum Turn Around Time.

- The TAT percent for the project duration as a whole for the sample size of 700 was 99.71%. TAT for OPD (haematology and biochemistry) was found to be 100%, while the TAT for IPD (haematology and biochemistry) was found to be 95.21% with two cases of delayed TAT contributing to it.
- The total percentage of OPD patients was 69.57% while the total percentage of IPD patients was 31.43% and the tests with the highest frequency of request were CBC (86%) & Hb (13%) in Haematology and Creatinine (49.3%) & LFT (13.3%) in Biochemistry.
- Root cause analysis showed that the two samples which exceeded the optimum turnaround time were indeed within the time frame but due to miscommunication between the IPD and laboratory staff and technical difficulties, the report was updated on the server at a later time which reflected a delayed TAT on the systems.
- To avoid any similar situations in the future, clear communication between different departments must be encouraged. Any technical difficulties must be immediately reported to the concerned departments so that the other department could be alerted and act accordingly.

### **Limitations and scope for future study:**

No study is perfect or remains relevant forever. Changes in factors affecting the study like environmental, human resource, legal policies or technology can affect the relevance of this study at a later date. I took 700 samples in the duration of two months, out of which 100 were of haematology and 600 of biochemistry, and 481 were outpatients while 219 were inpatients. Due to time and manpower constraints, I could not cover more departments or take a bigger sample size. Also, these were recorded between 9am and 4:30pm except on Sundays and holidays. Apart from the data collection, I also had to devote time to learn the processes of all the departments in the hospital for my training. There is scope for future studies on this theme as I was unable to cover aspects like the relationship between employee satisfaction and productivity in a laboratory setting, measures to control absenteeism and tardiness in a laboratory, identifying major gaps in service delivery to reduce TAT, relationship between patient satisfaction and TAT, etc.

## References:

[1] From [www.medanta.org](http://www.medanta.org), accessed on 5<sup>th</sup> July 2021 at IST 3:47PM.

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Accessed on 20<sup>th</sup> June,2021 at IST 4:22PM.

<http://www.iosrjournals.org/iosr-jdms/papers/Vol16-issue12/Version-10/B1612100508.pdf>

[3] Breil, B., Fritz, F., Thiemann, V. *et al.* Mapping Turnaround Times (TAT) to a Generic Timeline: A Systematic Review of TAT Definitions in Clinical Domains. *BMC Med Inform Decis Mak* 11, 34 (2011).

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[4] Zawawi, Rahad & Justinia, Taghreed. (2017). Laboratory Information Systems and Analytical Turnaround Time. *Global Journal of Research and Review*. 4. 1-12. 10.21767/2393-8854.10005.

Accessed on 21<sup>st</sup> June,2021 at IST 11:42AM.

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**Annexure:**

| TAT VALUES OF SOME COMMON TESTS |           |           |
|---------------------------------|-----------|-----------|
|                                 | OP        | IP        |
| CBC                             | 4         | 3         |
| Hb                              |           |           |
| PLATELET                        | 2         | 2         |
| PBS                             | 4         | 3         |
| RETICULOCYTE                    | 3         | 2         |
| BONE MARROW                     | 5         | 4         |
| PT,PTT                          | 3         | 2         |
| BIOCHEMISTRY                    | 4         | 3         |
| BODY FLUID EXAMINATION          | 4         | 3         |
| FNAC/PAP                        | 4         | 3         |
| HISTOPATHOLOGY                  | 5-10 DAYS | 5-10 DAYS |

Time schedule during training

| Serial no. | Name of department                    | Dates of visit   | % Time spent                              | Interacted with                                 |
|------------|---------------------------------------|------------------|-------------------------------------------|-------------------------------------------------|
| 1          | Quality                               | 10.5.21- 12.5.21 | Whole days                                | Mr. Adrito Basu                                 |
| 2          | Infection control                     | 13.5.21-15.5.21  | Whole days                                | Sister Saloni                                   |
| 3          | Front office (reception, call centre) | 1.7.21-2.7.21    | Whole days                                | Mr. Dhananjay Raj, Ms Shilpi, Ms Anshu          |
| 4          | IPD                                   | 29.6.21-30.6.21  | Whole days                                | Ms iris Raina, Dr Kashif, Ms Upyukta            |
| 5          | OT                                    | 27.6.21-28.6.21  | Whole days                                | Sister Suchita, Dr Naseem                       |
| 6          | Pathology Laboratory                  | 16.5.21-26.6.21  | Whole days, two half-days                 | Mr. Gulzar, Mrs Reshma Sanga, Mr Mutassam Ahmed |
| 7          | HR                                    | 10.5.21          | Whole day                                 | Mr. Abhishek Victor, Mr. Kishore Kunal          |
| 8          | Operations                            | 10.5.21-2.7.21   | Daily work/department allotment by mentor | Ms Richa Prasad                                 |
| 9          | Emergency                             | 25.6.21          | Half day                                  | Mr Shoaib                                       |
| 10         | Dispatch counter                      | 26.6.21          | Half day                                  | Mr Altaf, Ms Shashi                             |

MS Excel sheet with data used for the project attached at the end.