

**Summer Training
at
MAX SUPER SPECIALITY HOSPITAL,
MOHALI**

MAY 10th to JULY 2nd, 2021

**A STUDY OF TO ANALYSE THE DETERMINANTS INFLUENCING CRITICAL
VALUE ALERT TIME AND INTERVENTION STRATEGIES TO AMEND IT**

by

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MBA Hospital and Health Management

2020-2022



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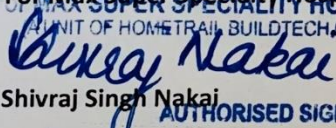
TO WHOM SO EVER IT MAY CONCERN

This is to certify that Dr. Malvika Shekhri D/O Dr. Anil Shekhri Student of IIHMR University, Jaipur, has completed her internship in the department of Hospital Operations and Cardiac Sciences at Max Super Speciality Hospital, Mohali on 02nd July, 2021.

During the training (10th May, 2021 to 02nd July, 2021) she was part of the hospital set up and reporting to Dr. Swati Marwaha and Dr. Deepak Puri.

We wish her all the best in her future endeavors.

For Max Super Speciality Hospital
(A unit of Hometrail Buildtech Pvt. Ltd.)


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ACKNOWLEDGEMENT

This internship opportunity that I had with Max Super speciality Hospital; Mohali was an important opportunity for professional growth. I am pleased for this opportunity as it gave me a great chance to meet so many amazing individuals and executives that directed me during this training time.

I express my sincerest gratitude and special thanks to Mr Abhay Soi, Chairman Max Healthcare. I convey my heartfelt gratitude to my organization mentor Dr Deepak Puri, Director Department of Cardiovascular Thoracic Surgery for his constant guidance and through each stage of the internship.

I sincerely thank Dr Jasbir Kaur, Medical Superintendent, Dr Swati Marwah, Head Quality for guiding me with each step of this project and the entire HR team for this beyond belief opportunity and guiding me at each step.

I would also like to thank my colleagues from the hospital operations department and Cardiac Sciences Department of the hospital for their delightful cooperation and constant will to help me throughout this internship.

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ABBREVIATIONS

- CCU: Critical care unit
- CGHS: Central Government Health Scheme
- CPRS: Computerized Patient Record System
- CTVS ICU: Cardiothoracic and Vascular Surgical Intensive Care Unit
- ECHS: Ex-servicemen Contributory Health Scheme
- GDA: General Duty Assistant
- HIS: Hospital Information System
- HDU-High dependency unit
- ICU: Intensive Care Unit
- IPD: Inpatient Department
- MLC: Medico Legal Case
- MICU- Medical Intensive care unit
- NABH: National Accreditation Board for Hospitals & Healthcare Providers
- NABL: National Accreditation Board for Testing and Calibration Laboratories
- NICU: Neonatal Intensive Care Unit
- OPD: Outpatient Department
- RICU: Renal Intensive Care Unit
- SICU: Surgical Intensive Care Unit

Part-I: Observational Learning

1. Organization Profile

Max Healthcare is one of India's foremost contributors of exhaustive, flawless and consolidated world-class healthcare services. With a chain of hospitals all over India, it offers treatment in almost all specialities. They have outstanding physicians with worldwide experience who are dedicated at a fraction of international prices to provide the highest levels of medical excellence.

Vision

Our enthusiasm is shown in the undeniable actuality that we establish industry excellence when it comes to healing, care, and magnificence. To give cosmopolitan healthcare a clear overall attention on services by building a medical and facility excellence, care of patients, technical know-how and therapeutic education institute.

Mission

To design extraordinary excellence of Medical & Service

To become the TOP-MOST CHOICE of the people

To be the principal choice for physicians

To perform and encourage ethical practices

To create an International Centre of Excellence for super specialities

To provide safety to patients, customers and staff

2. Max Super Speciality Hospital, Mohali

Max Super Specialty Hospital, Mohali is a division of Home Trail Estate Private Limited that provides services in a variety of medical disciplines and specialties such as Cardiac Sciences Neurosciences, Orthopedics Cancer Care and Gynecology, amid others. The hospital has different types of intensive care units like MICU, SICU, CCU, RICU, and Cath Labs. The collaboration of expert doctors acknowledges the health problems of patients and provide personalized care to them.

The hospital is equipped with the advanced therapeutic equipment, including Intensive care unit beds, high dependency unit beds, and top-line Operation Theatres. Guided by of over number of leading doctors and nursing staff, the whole hospital is dedicated to provide the best standard of therapeutic care to every patient that walks inside the doors of the hospital. Max Super Specialty Hospital, Mohali additionally equipped with Labs and blood bank which are NABL accredited and itself it is a hospital which is NABH accredited.

The Hospital not only provides the best clinical specialties, but also the superiority of integrated therapeutic treatment in a disciplinary setting, as offered by the team of trained and highly experienced physicians, nurses, and other frontline workers. Complete specialised services with sophisticated medical machinery is used to make it the centre for difficult operations such as procedures of neurovascular interventional, cancer treatments, cardiac surgeries, surgeries for orthopedics as well, and treatments for fertility. Max Hospital is an entrenched head among other healthcare service providers having industry accreditations to its name for advanced technology, high-class infrastructure, and safety standards.

1. The Max Group may be a group of hospitals throughout the country with thirty different specialities.
2. The hospital has a record of treating a million patients that belong to different nationalities.
3. It is known for regularly holding events and conferences all over the country for medical awareness.
4. The doctors are globally trained with the greatest level of proficiency and are dedicated to performing flawless service.
5. The hospital provides services such as regional interpreters, travel information, nearby accommodations, and guesthouses.

2.1 SPECIALITIES:

- Bariatric Surgery / Metabolic
- Transplant of bone marrow
- Oncology
- Cardiac Sciences

- Endocrinology & Diabetes
- Gastroenterology, Hepatology & Endoscopy
- Kidney Transplant
- Laparoscopic or surgeries with Minimal Access
- Transplant of liver and Biliary Sciences
- Neurosciences
- Orthopedics & Joint Replacement
- Urology

Other Specialties

- Surgery of aesthetics and reconstruction
- Therapy for audiology and speech
- Dental Care
- Dermatological care
- ENT
- Emergency & Trauma
- Eye Care
- Health and Wellness
- Infertility & IVF
- Internal Medicine
- Radiology
- Anesthetics
- Mental Health plus science of behavior
- Nephrological care
- Nutrition

- Obstetrics and Gynecology
- Pediatric
- Pain Management
- Physiotherapy & Rehabilitation Medicine
- Sleep Medicine
- Pulmonology
- Radiology

2.2 Top Procedures done at the Max Super Speciality Hospital, Mohali:

- Valvular Heart Surgery
- Surgery for Replacement of knee
- The surgery called as Leonardo Xi Robotic for Bone Marrow Transplant (BMT)
- Lung Transplant Thoracic Surgery
- LVAD Implantation Meniscus Repair Surgery
- CT Coronary Angiogram Extra Corporeal Membrane Therapy (ECMO)
- Hand Surgery Heart Blockage Treatment
- Hip Resurfacing Surgery Interventional Cardiology, Angioplasty
- Cochlear Implant Pacemaker Implantation
- Percutaneous Needle Biopsies Robotic Heart Surgery
- Transcatheter Aortic Valve Implantation Coronary Heart Disease Treatment
- Coronary Artery Bypass Grafting Coronary Angioplasty
- Bariatric Surgery Cardiac Valve Replacement Surgery
- Chemotherapy Breast Reduction Surgery
- Ankle Replacement Surgery Acoustic Neuroma
- Acne Treatment ACL Injury
- Prostate Laser Surgery Kidney Transplant
- HIPEC Treatment

2.3 Technological Advancements

- **TrueBeam Linac with Exactrac**

Radiotherapy traditionally aims at extending the cure rate to a low level of toxicity. Various methods, such as 3 DCRT, IMRT, and IGRT, have recently been developed to attain this goal. A new approach for delivering therapy with little damage to normal tissues has just been discovered. Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT) are terms for this method. The major difference lies between the two methods is that complete dosage in Stereotactic Radiosurgery is administered in one fraction, whereas total dose in Stereotactic Radiotherapy is provided in 5-10 fractions. The advantage of it is that the entire treatment time is reduced from 1-2 days or 1-2 weeks from 7-8 weeks thereby leading to a considerable increase in patient comfort and compliance.

- **Bi-Plane Digital Cathlab**

Within the diagnosis, technology of Bi-plane also assists in the treatment of brain spinal cord, neck, and face-related diseases. A neurologist may use minimally invasive methods to treat conditions like aneurysm, arterio-venous malformations (AVM) and stroke carefully and remove the need for open heart surgery. The system produces 3-dimensional good-quality images of the brain blood arteries. Two image sources, each spinning independently and recording the picture at a rate of 30 frames per second and from 2 areas of the patients' head, are used for this system.

- **Brachytherapy**

The equipment has shown as an effective therapy for treating malignancies of the prostate, cervix area, endometrial, female breast, skin, bronchus, esophagus, and head and neck region, as well as abnormalities in the soft tissues such as sarcomas and another forms of cancers as well.

- **Digital Orthopedic Knee Joint Surgery and Hip surgery:**

This technology is an all image-guided surgery for knee and hip. It guides the entire surgery and hence enabling the surgeon to plan the entire process. The chief benefits are:

- Planning of digital surgery for patients.
- Joint implants are designed prior operation for positioning and size customization according to the anatomy of the patient

- It allows minimum invasive surgeries with very less pain, loss of blood and adaptability is sort of a natural organ.
- It protects against failure of implants and dislocation.

• **Mammography**

It is a machine that utilises less energy X-rays to check the human breast and is used as a tool for diagnosis and screening. The purpose is to find out the carcinoma early, by the detection of masses within the mammary glands. Like other X-rays, it uses radiation doses to make images. These images are studied to detect abnormal findings.

• **Fluoroscopy**

This device, modelled like an X-Ray generator, captures the patient's live motions, which aids not only in diagnosis but also in treatment planning.

3. DEPARTMENTS:

3.1 CLINICAL DEPARTEMENTS

Cardiac Sciences	Pulmonology
Gastroenterology	Dermatology & Cosmetics
Neurology & Neurosurgery	ENT
Orthopedics	Endocrinology
Emergency Medicine	Dietetics
Oncology	Physiotherapy & Rehabilitation
Transplant Unit	Preventive Medicine
Nephrology & Urology	Radiology
Pediatrics	Bariatrics
Anesthesiology	Endocrinology
Psychiatry	Gynecology & Obstetrics

Day Care Facility	Internal Medicine
Dental	Nuclear Medicine
Blood Bank	General Surgery

3.2 NON-CLINICAL DEPARTEMENTS

Human resource	Quality
Medical records	Marketing
IT	Biomedical Engineering
Central sterile services	Finance & Accounts
Security	Blood Bank
Laundry and Linen	Maintenance
Food and Beverage	Materials
Laboratories	ECHS
Pharmacy	Immigration
Engineering	Gas manifold
Fire safety	PHP

Outpatient Department (OPD)

The OPD represents the patient's first contact point with the hospital. Diagnosis and care of those who do not need to remain overnight is made in the ambulatory department. The ambulatory service is an important element of the hospital's overall operation. It relates to the hospital and is manned by doctors.

The ambulance department is situated in the ground level of the Max Super Speciality hospital nearby. For non-ambulatory patients at the reception, stretchers and wheelchairs are offered. Patients will register and sit down while waiting for their appointment. Each doctor has a consulting room and there are waiting areas near these. Close at hand are the radiology department and pharmacy.

OPD timings: 8 AM - 7 PM

3 Shifts:

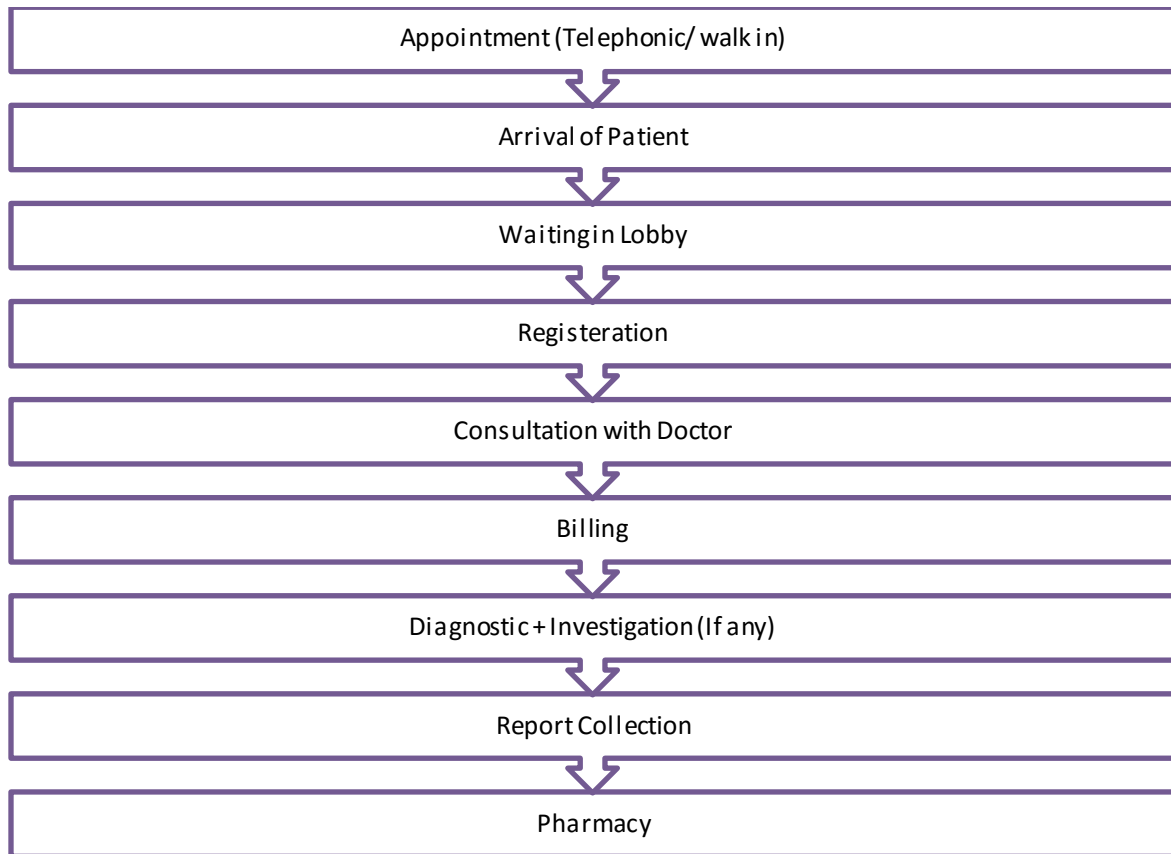
General shift - 9:00 AM to 5:PM

Morning - 8:00 -4:30 in the evening

Evening - 4:30 PM – 8.00 AM in the morning

Average OPD during a day - 300 patients

The OPD process (touch points) in the Max Super specialty hospital is given below
FLOW CHART-1 (SOURCE: Front desk staff Max Super Specilaity Hospital, Mohali)



Inpatient Department (IPD):

The IPD is the department where the patients are admitted to the hospital. This means that the IPD patients are those who spend at least one night in the hospital for their treatment.

Observations:

All the admission process is explained at the IPD help desk.

Three kinds of patients come to the department:

- Cash
- Credit
- PSU

The insured patients are admitted after they receive approval from the Insurance Company.

For PSU patients, a referral letter is important from his/her department. The room is entitled according to the company's policy.

The corporate, PSU & insurance patients submit a financial undertaking to clear all the dues if not cleared by the appropriate authorities.

The patient is discharged before 12 pm.

Discounts are offered for senior citizens or people in any association etc.

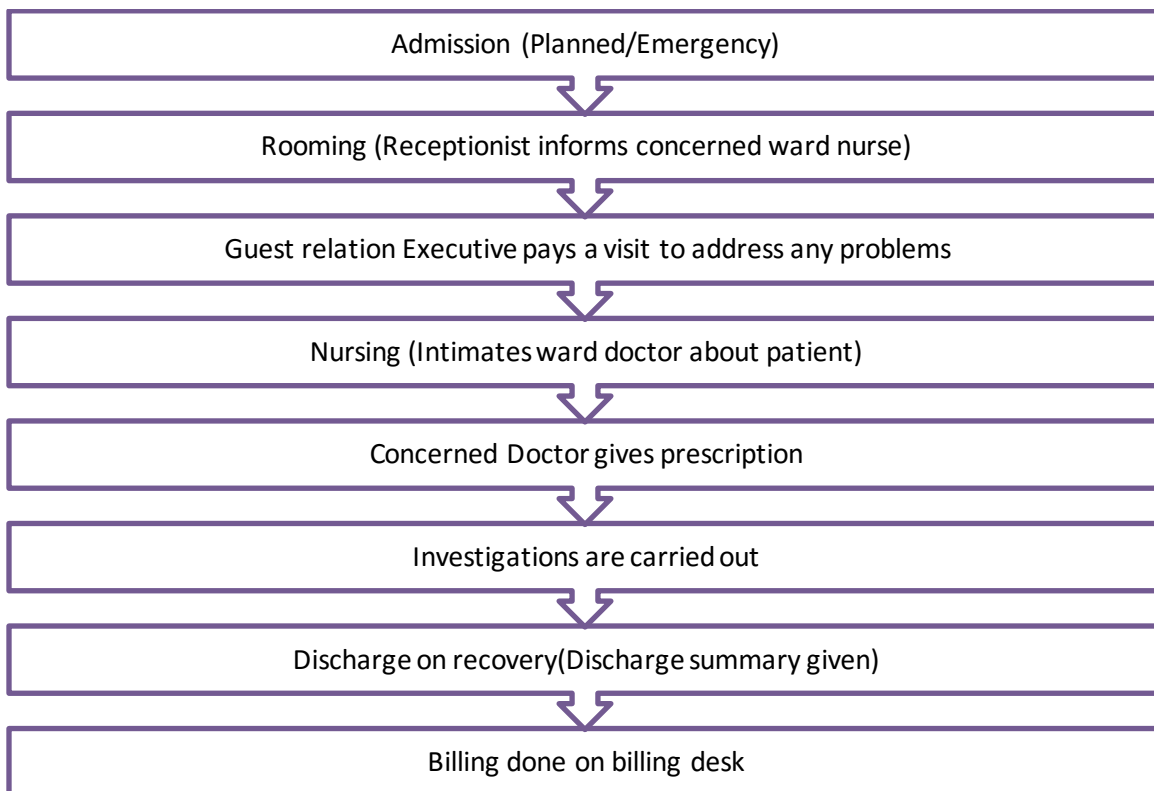
The cash Credit ratio is 60:40

Turnaround time for 1 patient is approx. 15 minutes.

Average per day patient admission: 40-50 patients

Discharge: 40-60 patients.

The general process flow (touch points) for the IPD patients in the Max Super speciality hospital is as follows: Flow chart-2 (SOURCE: Front desk staff Max Super Speciality Hospital, Mohali)



3.3 QUALITY Department:

A Health Care Organization is by definition a complicated organisation as it is the unreal consequence of service and a mix of diverse professional people. Quality management in healthcare has a major importance in the health sector. Quality concepts are fundamental in healthcare sector. Though, quality is not a tangible characteristic of a service but Quality management in health care is a huge concept. Because of the new definition of the standard with patient happiness as the consequence of service, quality management has developed more aggressively than ever before. The quality of services offered to patients is critical. The quality team here at Max Super Specialty Hospital, Mohali is active, always on the toes taking care of all the aspects assuring good patient care.

3.4 Cardiac sciences department:

The department of Cardiac Sciences at the Max Hospital, Mohali has one of the greatest cardiac facilities in the area which is providing excellent care for patients with a bunch of very highly qualified who are really dedicated towards their work having mastery of skills from various other cardiac sub-specialities.

The department has an inheritance of 10 years. Highly capable team has well-qualified and experienced doctors in sub-speciality services as well.

When the patient comes to the hospital, there are various touch points that the patient has to go through starting from his/ her entry to the exit which are listed as follows:

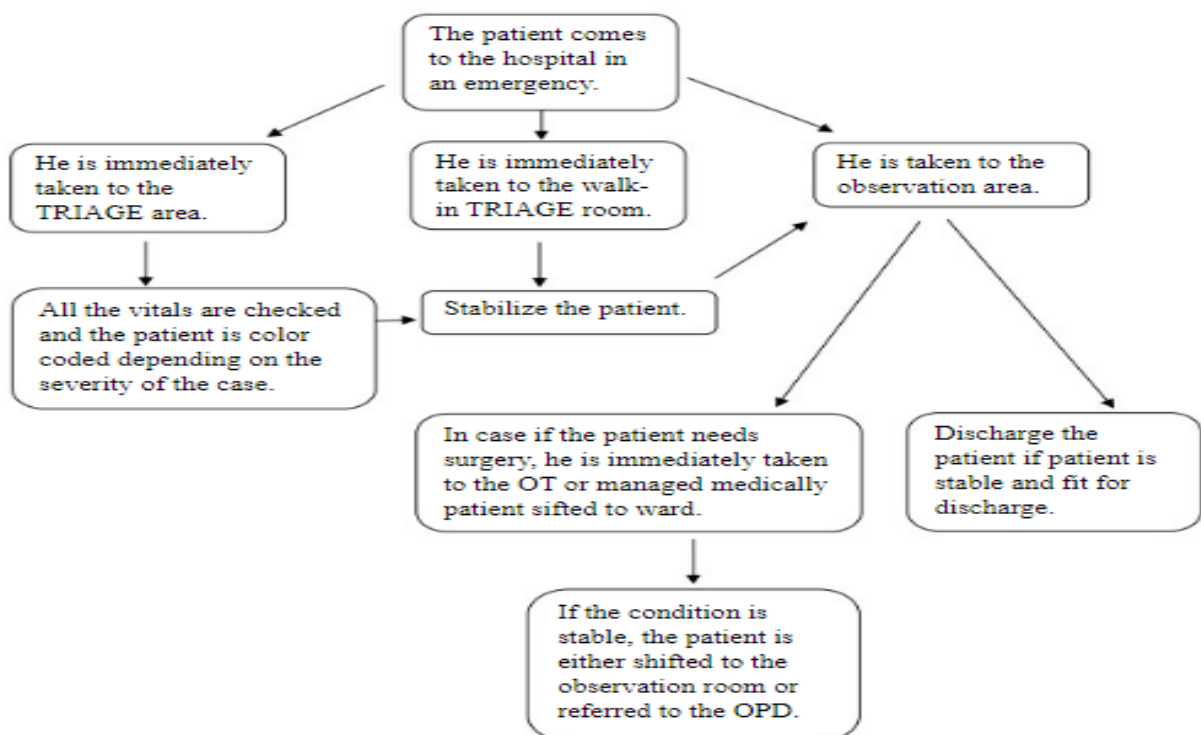
- Reception (ground floor)
- Consultation with doctor
- Pharmacy
- Treatment room
- Billing and discharge

Observational learning: Did a project to know the effect of Covid-19 on the patients of cardiac sciences department. Gave training to staff of cardiac sciences department about workplace ethics, qualities of a good employee, made the roster for the ease of duty division among staff, framed an employee wellness program for the wellness of staff of the department of cardiac sciences, organized programs on the occasion of world nurse day on 12th May and international yoga day on 21st June.

3.5 ACCIDENT AND EMERGENCY DEPARTMENT:

An emergency is defined as a sudden sickness or injury that need rapid medical treatment to avoid disability or death. The most common cause of patients reporting to accidents and emergency department is trauma/injury in a road traffic accident.

Flow chart 3: Patient Flow in accident and emergency (Source: Emergency department, Ground floor, Max Super Specilaity Hospital, Mohali)



Colour coding in TRIAGE

RED - (immediate) used for those to label those who have no survival rate without immediate treatment but having chance of survival.

YELLOW - (observation) used for those who need observation and are stable.

GREEN - (wait) used for those who need medical care, who are more critical patients whose treatment have been done.

WHITE - (dismiss) used for those who are having minor injuries and for them doctor's care is not needed.

BLACK - (expectant) used for those who are deceased and will not survive even after treatment

- At MAX super speciality hospital, Mohali the emergency department is active round the clock with experts trained in emergency medicine. ER or the emergency room is one of the most important and busy departments of the hospital. It consists of in-hospital care by emergency physicians, emergency nurses, housekeeping and other assistants. They run 24x7 and 365 days a year. Since trips to the ER are typically unplanned, a range of diseases and injuries, which might be dangerous to life and require rapid attention, must be treated initially.

- The emergency medicine department is located on the ground floor and has dedicated access for patient entry to Emergency Room (ER). The ER floor area is divided into the following areas broadly:

- a) Triage Area (Triage 1, 2, 3, etc.)
- b) Isolation Room (Isolation 1)
- c) Registration Desk
- d) Nursing & In-house Billing Desk
- e) Attendants Waiting Area
- f) Resuscitation Area (Room or Beds) (Resus 1, 2, etc.)
- g) Treatment Area (Treatment 1, 2, 3, etc.)
- h) Clean Utility, Dirty Utility & Toilets
- i) Emergency Physician Consultation Room

j) Decontamination Area (near ambulance parking or triage area)

There are in total 20 beds in the ER (including the isolation room bed). Access to the emergency room is dedicated and separated from the main entrance. 24hr security personnel controls access to the ER. There is clear & prominent signage is present, indicating the entrance into the ER.

The patient could stay in an emergency only for 5-6 hours, after that patient is on a shift to the ward, OT depends on the patient condition or discharge the patient if the patient is stable.

Staffing per shift

1 consultant

1 junior consultant

2 junior residents

5 nursing staff

1 emergency technician.

3.6 Lab radiology

The hospital laboratory services provide essential diagnostic services which help the physician/doctor making important decisions related to the treatment of the patient.

The sample collected from the patients on an outpatient basis is done through the sample collection department. For the in-house patients, it is directly dispatched through the sample dispatch boys.

The departments present at the Hospital Laboratory are:

1) Biochemistry

2) Hematology

3) Microbiology

4) Transfusion Services/Immunology

5) Surgical Pathology

6) Cytology

7) Histopathology

8) Radioimmunoassay.

Critical Care Unit (ICU):

The critical care units are those which provide very high-quality care to patients having critical illnesses. The members of the critical care consultants group provide consultation with the patients. They also consult the primary consultants to provide high quality services to the patients.

Max hospital, Mohali has the critical care units are segregated into:

- MEDICAL ICU
- SURGICAL ICU
- CATH CCU
- NEONATAL ICU
- RENAL ICU
- CTVS ICU
- HDU

3.7 PHARMACY:

It is a department or service, responsible for the supply of medications to hospital wards as well as ambulatory patients.

Two subgroups:

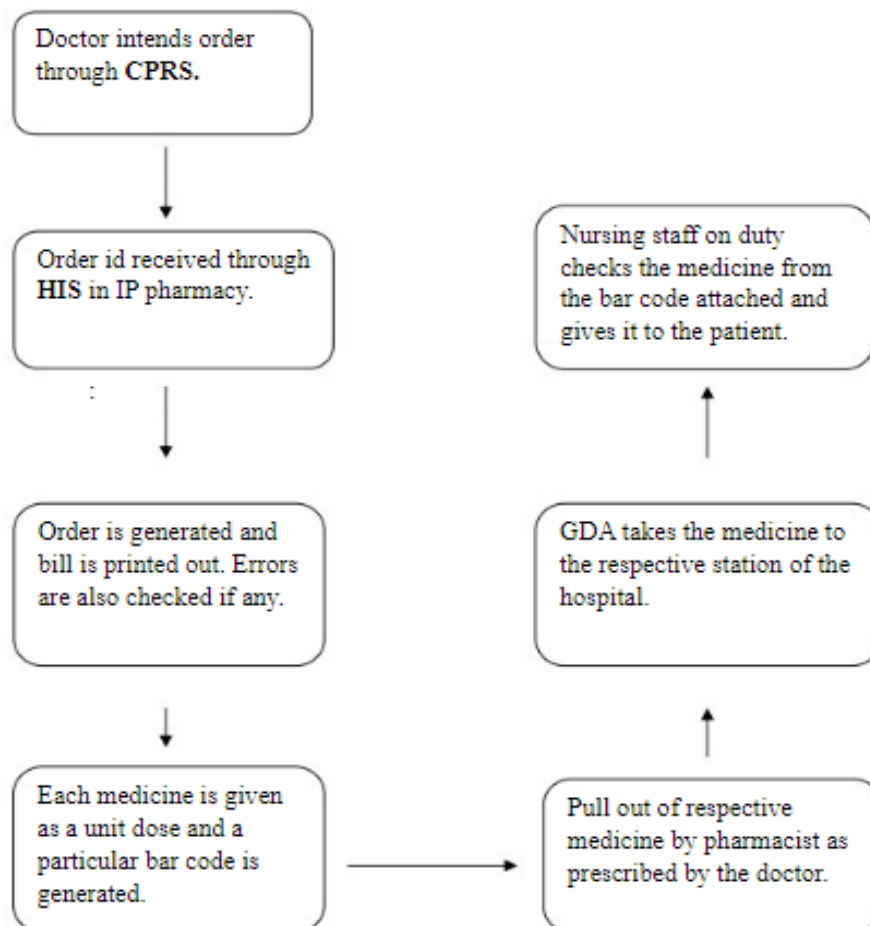
- Inpatient (IP) Pharmacy
- Outpatient (OP) Pharmacy

IP Pharmacy

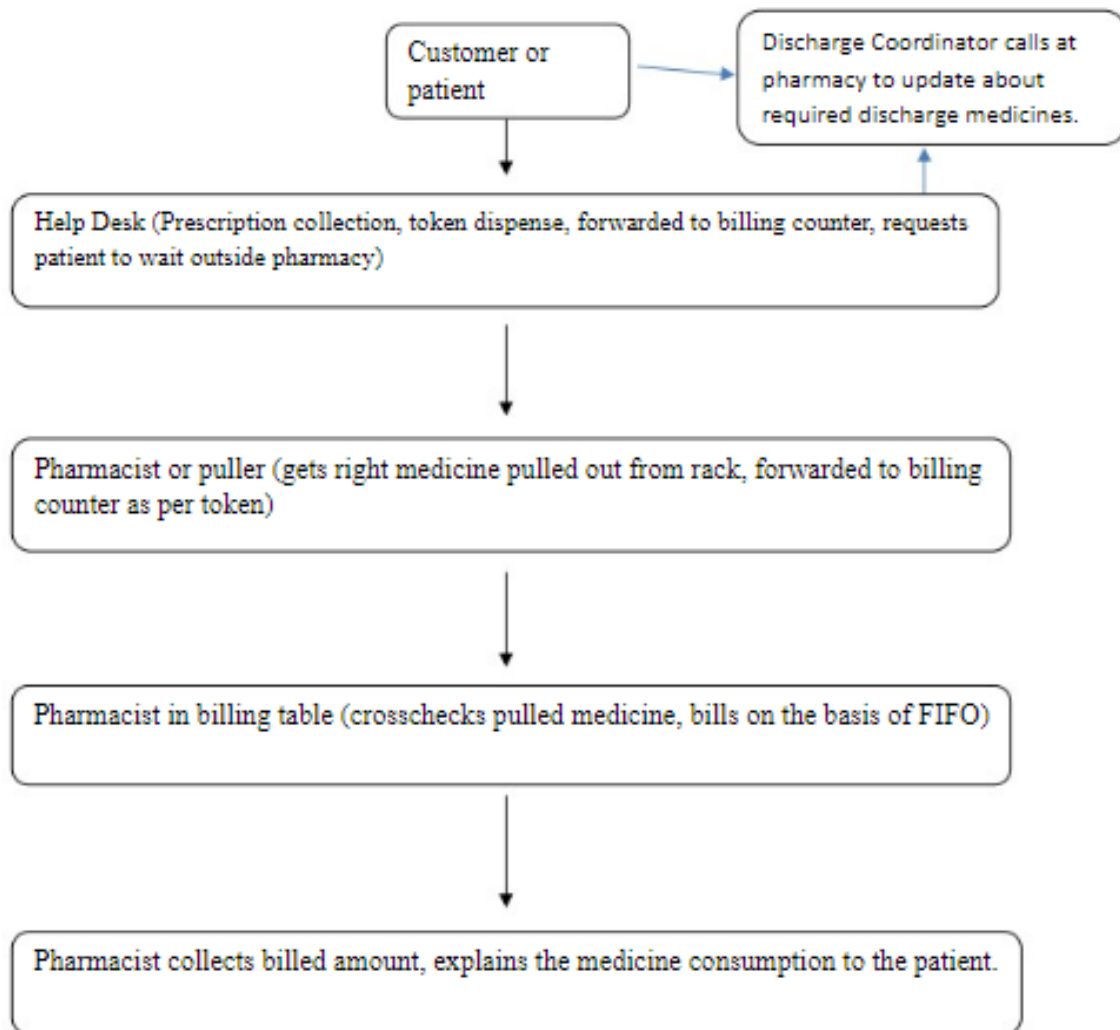
- All medicines are placed in alphabetical order.

- Room temperature of Ip pharmacy is maintained between 15-25 °C and for medicines which need particular temperature are kept in Refrigerator- 2°C to 8°C Deep fridge- -20°C to -10°C Humidity- 50%-60%

Flow chart 4: Process Flow in IP Pharmacy (Source: IP Pharmacy, Max Super Speciality Hospital, Mohali)



Flow chart 5: Process flow of Outpatient pharmacy (Source: IP Pharmacy, Max Super Speciality Hospital, Mohali)



3.8 Medical Record Department:

Observations:

- According to the government policy normal records of the inpatient are kept for 3+2 years.
- Records of deaths are kept for 10 years.
- Newborn baby records are kept till 18 years + 3 years.
- Before destroying the birth and death record a notification is published in 2 languages in the newspaper.
- In the case of MTP, the patient's name is not mentioned in the records.
- The medical record department is in the basement, -1 level. The hospital stores physical records of the patients i.e., hard copies of the files. The files are stored according to the registration number of the patient. The hospital also maintains soft copies by scanning the files which are stored in the CTVS system oh hospital.

Discrepancies:

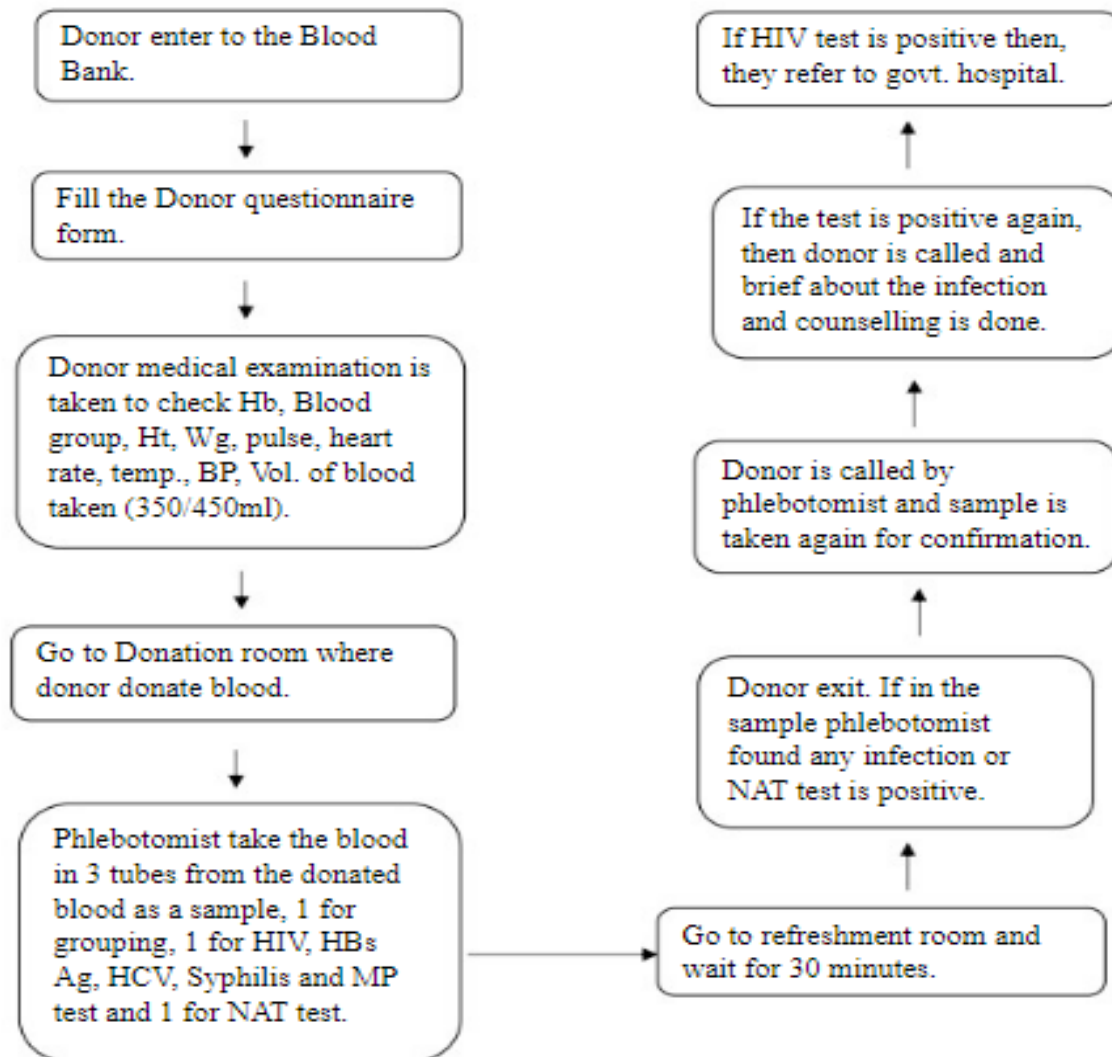
The discrepancies occur due to

- Errors in progress notes
- Incomplete consent form.

Blood Bank:

Max Hospital, Mohali, has a licensed blood bank with Max labs. It successfully meets the request for a rare blood transfusion. It offers 24 hrs. service and has an excellent diagnostic and support service. It is a reliable Centre for the testing of blood for transfusion-transmitted diseases. It offers fresh blood transfusions for emergency/trauma cases.

Flow chart 6: Explanation of blood donation procedure (Source: Blood bank 3rd floor, Max Super Speciality Hospital, Mohali)



Infrastructure

Blood issue counter & counsellor room

Donation room

Serology room

Infectious marker room

Autoclave room

Component lab - when blood is taken from the right arm of the donor then the component is separated automatically by apheresis apparatus but if blood is taken from the left arm of the donor then blood components are separated manually in the component lab.

Refreshment room

3.9 ECHS Department:

The department is located in the cellar and is working through an ECHS network of Polyclinics, Medical Centres, Government Hospitals, Empanel private Hôpitals and government hospitals on the implementation of a former Service Center for Cooperation in Health to provide Medicare for ex-Service providers, pensioners, and dependants.

3.10 Biomedical engineering department:

The biomedical engineering department is located in basement 1 of the hospital. This department is outsourced from various companies through tenders or the level of requirement. This department is responsible for all the medical consumables of the entire facility. Their duties include:

- Repair faulty equipment with the least possible downtime and financial burden.
- Follow planned preventive maintenance to prevent the breakdown of equipment.
- Train the staff (doctors, nurses, technicians and paramedics) for the proper usage of equipment.
- Coordinate with original equipment manufacturers for technical support.
- Coordinate with the purchase and administrative departments for procurement of spares and parts at the earliest.

Food and Beverage Services:

Dietary services are essential to provide clean, healthy hygienic food to the patients, residents, staff and visitors.

The dietary needs of each patient are assessed by the dieticians in consultation with the doctors and a diet chart is prepared for every patient. Daily routine visits by the dieticians to the patients and their compliance to the food advised is assured.

At Max Hospital, Mohali, the food and beverage services are managed by the hospital canteen itself providing good quality hygienic food to the patients. They work in coordination with the dieticians to provide services to the patients according to their specific needs. A choice of Indian and international cuisines is given. The ideal schedule is as followed:

BREAKFAST	7:00 AM-8:30 AM
MID-MORNING MEAL	10:30 AM-11:30 AM
LUNCH	1:00 PM -3:00 PM
EVENING TEA	4:00 PM -5:00 PM
DINNER	8:00 PM-9:30 PM

Linen and Laundry Department:

The laundry service is in the basement. It receives linen from all departments of the hospital. Linen is segregated and each type of linen is washed in different cycles. The linen is recycled back within 24hrs. The linen of Covid patients is washed two times with extra safety.

3.11 Gas Manifold Department:

The department located in the upper basement ensures the continuous central oxygen line functioning and supply of the hospital.

Fire Safety and Protection:

The department located at the basement assures of detection and protection of the facility from emergencies like fires, sewage and drainage.

3.12 Security Department:

Located at the upper basement level of the hospital, the department deals with issues like thefts, missing/absconding patients, medico-legal cases, fire safety, reports collection, lost and found etc. The department is also responsible for launching various emergency codes according to the incidents. The department undergoes routine visits from the patient welfare department and also conducts emergency drills within the facility. The department also supervises the parking and transportation of the hospital. Ambulance service is also taken care of by this department.

3.13 IT department:

The IT department is located in the upper basement of the hospital. The employees are responsible for the smooth functioning of the internal HMIS. Any support required, hardware or software, is provided by IT to the hospital.

3.14 Accounts department:

Since Max Healthcare is a chain of corporate hospitals, they give due importance to the finances. The finance department works closely with the corporate relations and other departments.

3.15 Human Resources (HR) Department:

The department located in the administrative building is integral to the functioning of the hospital. Tasks like hiring and recruiting, selecting benefits and compensation, managing personnel and troubleshooting claims are conducted by the department.

Part-II: Project Report

4. INTRODUCTION

4.1 Critical Values:

Critical/Panic values are defined as values that are outside the traditional range to a degree which will constitute an instantaneous health risk to the individual or require immediate action on the part of the ordering physician. It is the policy in which clinical laboratory to call the critical values listed to a licensed provider as soon as completed and verified in compliance with hospital policies and approved by the Stanford Children's Health and Stanford Health Care hospital boards of directors.

Notification by the Laboratory of Critical Values:

The ordering physician's office will be contacted, and the results will be sent to a Registered Nurse or Physician.

- A record of the call will be kept that includes the caller's first initial, last name, title, and the time the call was made.
- The individual receiving the call will be prompted to repeat the critical value results back for verification.
- If no one answers, the physician's answering service or a physician who is filling in for the ordering physician will be contacted.
- If a responsible individual cannot be reached within 30 minutes, the supervisor will be contacted. All efforts (times and phone numbers phoned) into the computer will be documented, and a Panic Notification Form will be filled out. The supervisor will be in charge.

- The supervisor will enter the crucial value reporting to the Clinical Pathology Resident or Laboratory Director into the computer. The "clinically accountable individual" is the Clinical

Chemistry

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Anion Gap	Any age	>30	mmol/L
Bicarbonate (Whole Blood)	Any age	<10 >40	mEq/L
Calcium *	Any age	<6.5 >13	mg/dL
Chloride	Any age	<80 >120	mmol/L
CO2	Any age	<10 >40	mmol/L
	<17 yrs >17 yrs	>450	
Glucose (GDM) GDM Glucose Tolerance GMD Glucose Tolerance 1hr GMD Glucose Tolerance 2hrs GMD Glucose Tolerance 3hrs	Any age	<50 >300	mg/dL
Glucose; PXP Glucose meter (POCT)	Any age	<40 >300	mg/dL
Iron, Serum	Any age	≥350	ug/dL

CO Hemoglobin	Any age	>20	%
Free (ionized) Calcium *	Any age	<0.8 >1.6	mmol/L
Glucose	0-2 days >2 days & <1 year >1 year	<35 <40 <55	mg/dL
Glucose	<30 days >30 days &	>200 >300	mg/dL
Magnesium	Any age	<1.0 >3.5	mg/dL
pCO ₂	Any age	>65	mmHg
pH	Any age	<7.20 >7.60	pH units
pH - Arterial & Venous Blood Gases, Cord Blood	Any age	≤ 7.00	N/A
Base Excess - Arterial & Venous Blood Gases, cord blood	Any age	≤ -10.0 = >10.0	mmol/L

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Phosphorus	<3 years of age 3-12 years of age >12 years of age	≤ 2.5 ≤ 2.0 ≤ 1.5	mg/dL
pO ₂ (arterial)	Any age	<50	mg/dL
Potassium	Less than 1 week Older than 1 week Any age	<2.5 <3.0 >6.0	mmol/L
Potassium; ISTAT (POCT)	Any age	<3.0 >6.0	mmol/L
Sodium	Any age Any age	<125 >160	mmol/L
TCO ₂ (Whole Blood)	Any age	<10 >40	mEq/L
Total Bilirubin	<1 day >1 day <2 days >2 days <30	≥ 7 ≥ 11 ≥ 15	mg/dL

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
	days		
Troponin I	Any age	≥ 0.3	ng/mL
Troponin I:	Any age	≥ 0.1	ng/mL

* Calcium: mmol/L (SI unit) = 0.25 (conversion factor) x mg/dL (conventional unit).

COAGULATION

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Fibrinogen	Any age	<100	mg/dL
Heparin, unfractionated	Any age	<0.1 >0.7	IU/mL IU/mL
PTT	Any age	≥ 100	sec
PT INR	Any age	>5.0 INR	N/A
PT INR; ISTAT (POCT)	Any age	>4.5	N/A

HEMATOLOGY

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Absolute Neutrophil Count	Any age	≤ 0.5 (Outpatient only)	K/ μ L

Cell Count, <u>Any body fluid</u>	Any age	Intracellular organisms. (<u>Non CSF</u> - Blasts and Tumor cells to be called as soon as a provider is available, which for inpatients is immediate, for others called next business day.)	
Cell Count, CSF only	Any age	WBC Count >30 (excluding peripheral blood contamination)	/μL
Cell Count, CSF only	Any age	Blasts or Tumor Cells	
Gram Stain	Any age	Positive	N/A
Hematocrit (PCV)	Any age	≤21.0 ≥65.0	%

Hemoglobin	Any age	≤7.0	g/dL
Malaria Screening	Any age	Positive	N/A
Platelet Count	Any age	≤10,000 ≤50,000 (L&D, OB outpatient	/μL

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
		clinics, and Perinatal Diagnostic Center only) ≤100,000 with 2+microangiopathic changes	
Slide Review/Diff	Any age	Presence of intracellular organisms. Blasts on peripheral smear (1st time or relapse only).	%
Stool	Male/Female <18 Years	Sperm	N/A
Urinalysis	Female <18 Years Male <18 Years	Sperm or Trichomonas Trichomonas	N/A
WBC	Any age	≤0.5 (Outpatient only) ≥50	K/μL

MICROBIOLOGY

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Any assay: Potential	Any age	Presence of potential B. anthracis or any BT agent.	N/A

Bioterrorism Agent		Bacillus anthracis (Category A) <u>Francisella tularensis</u> (Category A) Yersinia pestis (Category A) Brucella species (Category B)	
Blood Culture	Any age	Any clinically important positive result per protocol	N/A
Mycobacterium Tuberculosis PCR Test	Any age	Positive on Tissue or Culture	N/A
Mycobacterium Tuberculosis PCR Test	Any age	Positive on Tissue or Culture	N/A
Stool culture	<18 years	Positive Shiga toxin producing E. Coli	N/A

VIROLOGY

ANALYTE	AGE RANGE	CRITICAL VALUE	UNITS
Antigen test, culture, serology, or molecular test	Any age	Positive or suspicious for any Pandemic (Influenza or SARS) or Bioterrorism Agents (Smallpox, Viral hemorrhagic fever agents)	N/A
Any CSF Assay	Any age	Positive (including virus growth or molecular test)	N/A

5. LITERATURE REVIEW:

- In an 18-month study conducted by Mohan CK, Sugathan NV, Chandraja CV* Cuba Sarada Krishna Homoeopathic Medical College Nagercoil, Tamil Nadu, India, only 516 critical values were recorded by the biochemistry and haematological laboratories. The percentage of reporting was 0.012 percent of the total test findings reported. When each clinical investigation was validated, the reporting time was variable. Individual critical-value outcomes were found to take an average of 8 to 10 minutes to transmit till documentation in the case of inpatients, while it could take up to twice as long in the case of outpatients. Only 87 cases were called back, and they were only done in an emergency; the rest were reported in person by Laboratory technicians to the appropriate physician or nurse.

- According to a De Gruyter investigation, there were 2018 (1.02%) critical values reported, with 13.1 percent of these being delayed notifications. When compared to ICU and emergency department, the majority of them were found in laboratory tests ordered from patients of service and polyclinics (26.7 percent, 26 percent, 6.2 percent, and 4.9 percent, respectively, p0.01). For biochemical parameters, the number of delayed notifications was much higher. Mild-delayed reporting latencies were 18.54.4 minutes for 62.8 percent of total delayed notifications, while advanced-delayed reporting latencies were 47.111.3 minutes for 37.2 percent. The majority of the critical outcomes were communicated to non-physicians members of the health-care team (55.6 percent).

6. RATIONALE:

After reviewing the literature, the causes of delay in critical value alert time were different in different hospitals. Since Max super speciality hospital, Mohali has also been facing issues with critical value alert time, a study was conducted to find out the significant causes.

7. OBJECTIVE:

To analyse the determinants influencing critical value alert time and intervention strategies to amend it in Max Super Speciality Hospital, Mohali

8. METHODOLOGY:

This is a four-step managing technique used to regulate and continually improve operations. PDCA (plan–do–check–act or Plan–do–check—adjust). The Deming cycle/cycle/wheel, the Shewhart cycle, control circles/cycles or plan-to-study–act are also known (PDSA). I alluded to this tool because it is one of the best-known utilities.

The Four Steps:

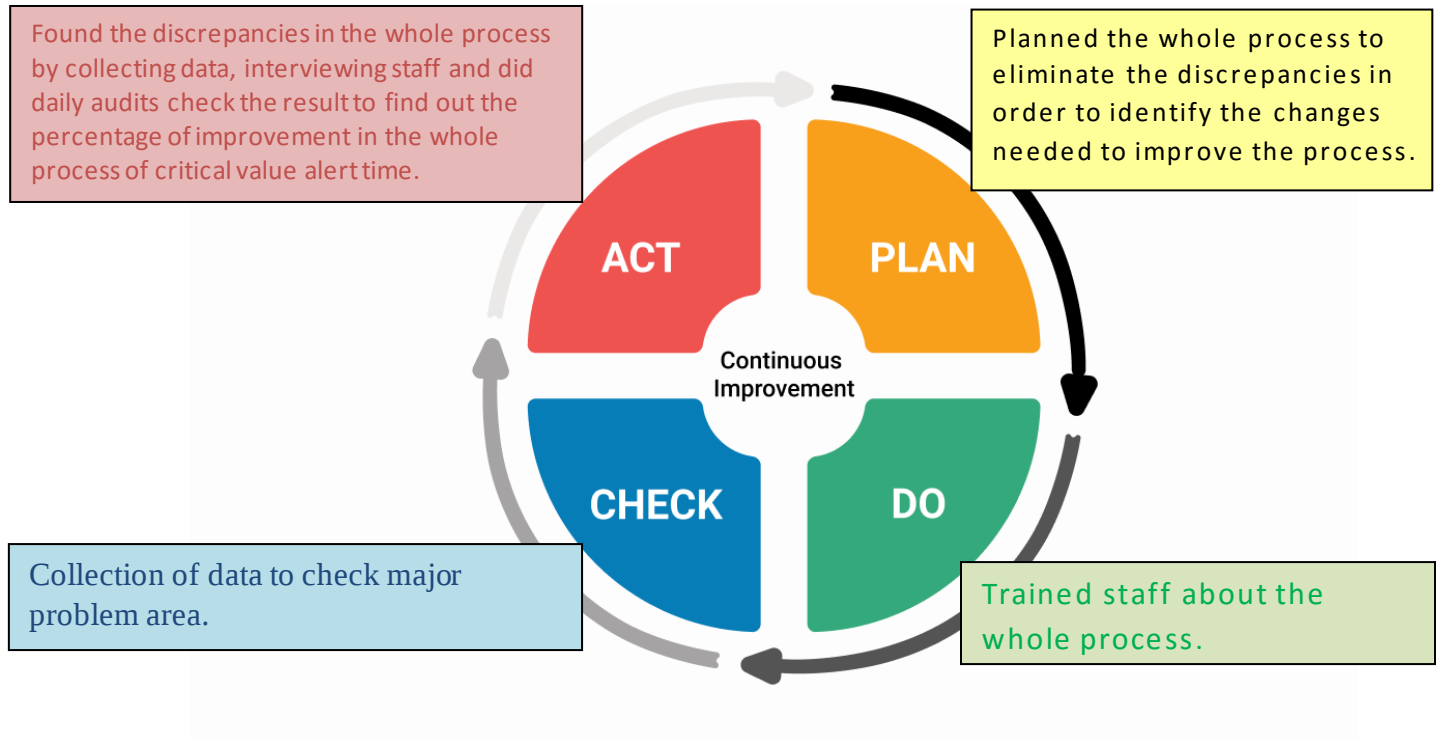
1.Plan: establishing objectives and methods essential to achieve outcomes in the expected output at this stage of the Quality Control cycle (the target or goals).

2.Do: Implementing the strategy in this phase, implementing and producing the product. It collected data to be utilised in the subsequent 'check' and 'act' phases for diagram and analysis.

3.Checks: to detect any difference by comparing the real results with the predicted results.

4.Act/Adjust: After comparing outcomes, any important discrepancy between actual and predicted results is corrected. The business examines the discrepancies in this stage to identify

the fundamental reasons and identifies where modifications may be applied to improve the process or product.



Management Tools for Quality Control used during the study:

- Check Sheet
- Cause and Effect (fishbone) Diagram
- PDCA

Area of Study: The study was conducted on entry of the patients admitted in the month of March and April 2021 with critical values in the MSP1, MPSP2 of 2nd floor 3rd floor, Eco ward 3rd floor and in different ICU'S

Study Design: Exploratory study

Duration of Study: 25th May to 21st June

Sample Size: 100 Patients.

Sample Technique: Convenience Sampling

8.1 MODES OF DATA COLLECTION:

Sources of Data- Primary

Data Collection Tool- Laboratories data, CTVS system of Max hospital, record registers of wards and ICUs

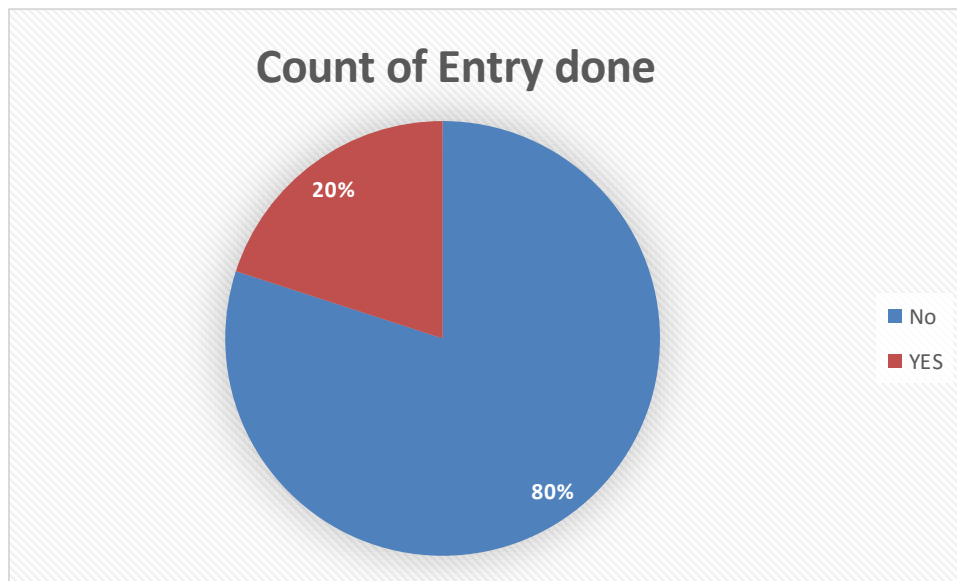
Data Entry- MS-Excel Sheet was prepared, in the form of a checklist

Only 20 per cent of entries out of 100 were registered on the record register provided by the hospital from the data of months March and April. To find the reason, verbal questions were asked from a staff of different areas. Major findings were:

- Communication gap between inter-departments.
- Absence of systematic entry on day to day basis

9. FINDINGS

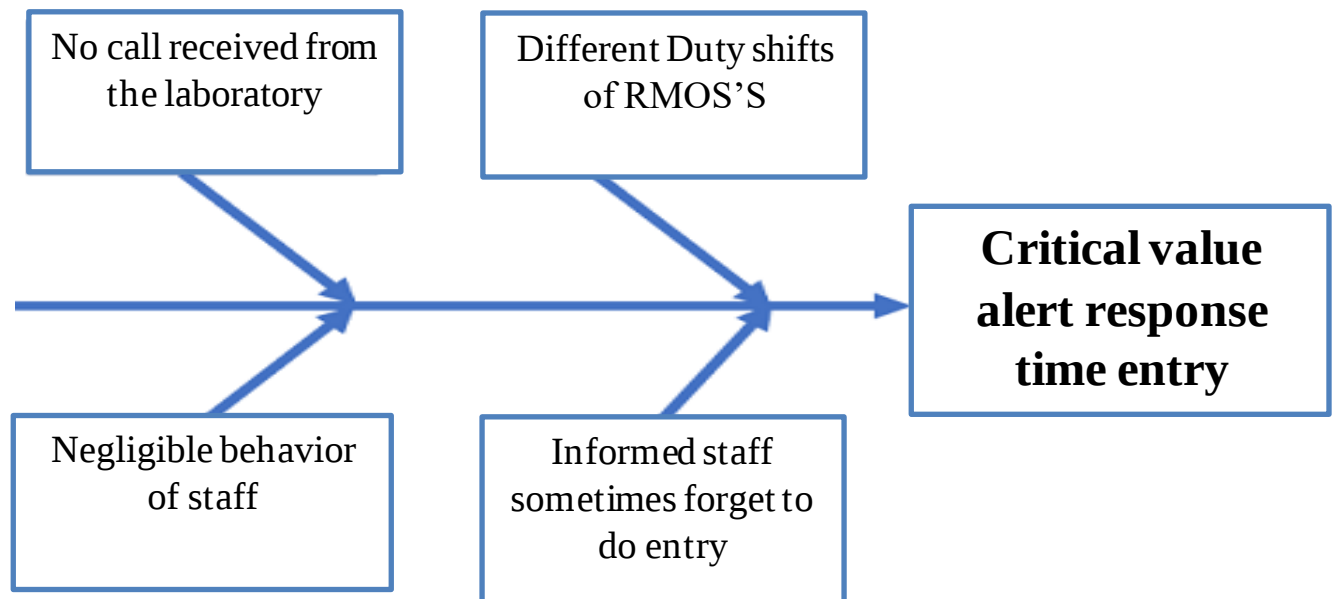
MAY AUDIT FINDINGS:



Only 20 percent entries out of 100 were registered on the record register provided by the hospital from the data of month March and April. To find the reason, verbal questions were asked from staff of different areas. Major findings were:

- Communication gap between inter-departments.
- Absence of systematic entry on day to day basis.

CAUSES EXPLAINED THROUGH LOCWIN FISH BONE DIAGRAM:



Interventions:

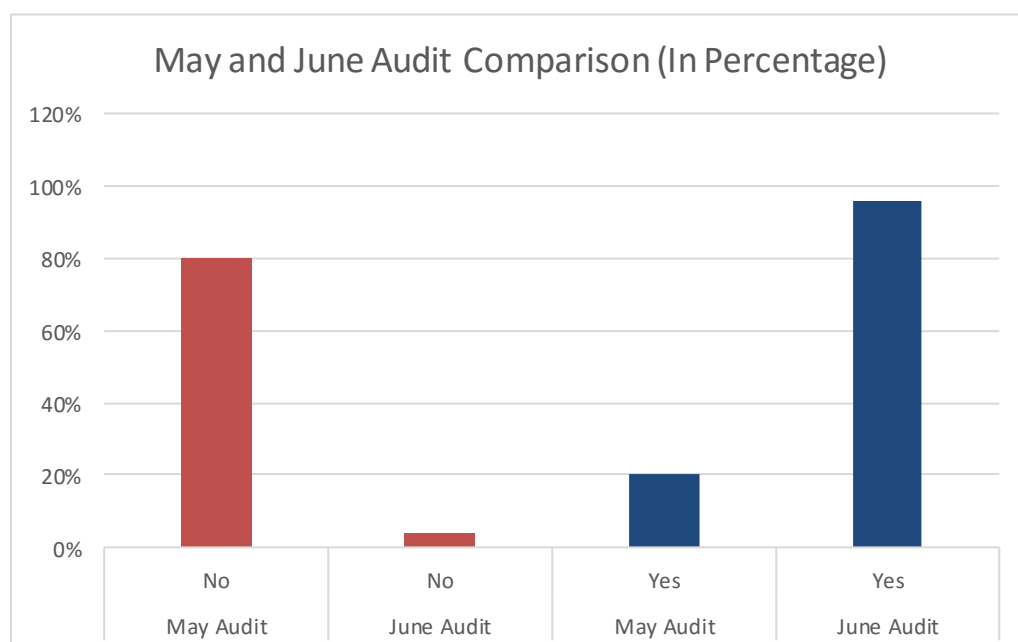
- Systematic entry action plan was developed in the various departments for day to day entry so that neither human error nor systematic error will occur.
- Responsible staff was trained to the updated standards to work to eliminate the discrepancies.
- Necessary actions were taken to improve the work process regarding this problem.

Interventions were followed for 15 days; post intervention a 3-day audit was done in from June 23, 2021 to June 25, 2021 to check the outcome of interventions.

JUNE audit findings (Post intervention):

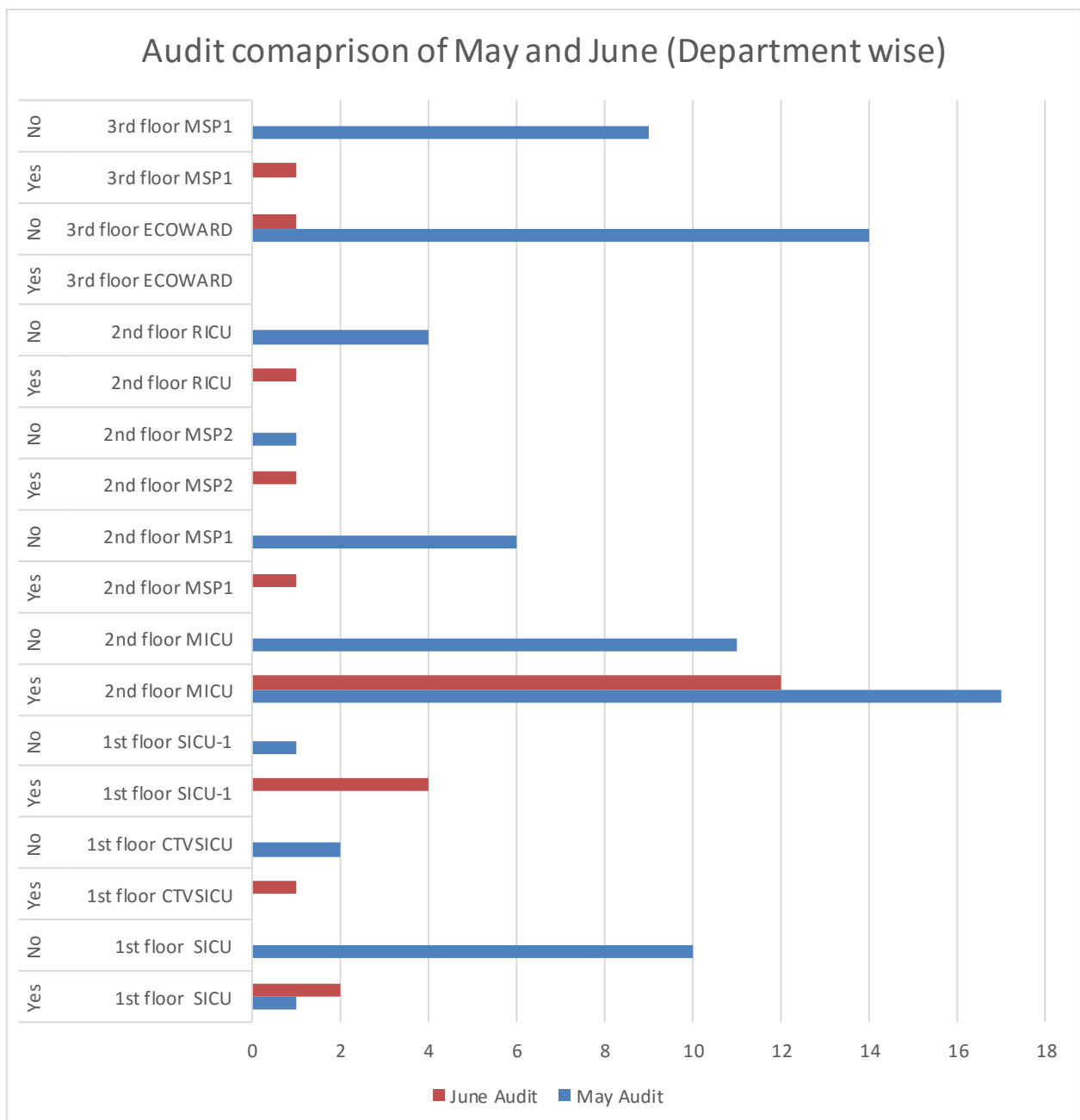


In the Audit findings, we can clearly witness the outcomes from interventions as entries not registered have dropped and number of entries have increased dramatically, staff is proactive and making entries on regular day to day basis.



Additionally, we put across numbers of May and June audits which were before and after intervention and represented them visually through bar chart for a comparison and better understanding.

We can observe relatively high number of entries in percentages, and the non-entries have decreased significantly, same can be observed comparison with numbers, the non-entries have been decreased and staff is maintaining records on daily basis after the interventions.



10. Recommendations:

Even though there were significant improvement post intervention of departments, there's always room for improvement and with changes due to covid and technological advancement healthcare institutes should integrate useful changes.

- Even though NABH inspections and audits are conducted to maintain the hospital's high standards, critical values should be documented so that they do not cause embarrassment for the organisation. Clinical auditing should be performed on a regular basis.
- The medium for documenting these critical values from the laboratory is telephonic mode, which introduces the possibility of human error. To avoid this, a standard call back procedure should be implemented strictly.
- Once the critical value is reported to the relevant staff member, action should be taken promptly, and follow-up documentation should be completed within 24 hours.
- In the preceding points, emphasis was placed on the documentation portion following any necessary intervention. The reason is simple, as a healthcare provider, one's goal should be to provide the best treatment at affordable cost. Scholars and management students can analyze data and contributing to their best knowledge in respective fields such as management and research.

11. Conclusion:

The audit duration was of May June 2021, the time where the covid second wave was at its peak. Where every hospital was working on its full capacity to provide services and struggling to manage resources most efficiently. The effect of this was inevitable on respective departments of hospitals and their staff. Considering all this audit results came out to be very satisfactory and there were positives outcomes. the only factor that affected ECOWARD was absence of communication with laboratory department which could be the burden of covid, rest is nice and well maintained. We have already highlighted improvements, except ECOWARD all the departments showed significant improvements. Lastly concluding interventions and findings in the post audit proves that interventions were constructive in nature and positive results (from 20 to 96 percent) were observed. Possibility of adopting this will be helpful in future.

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ANNEXURE-:

Sr No.	Name of the department	Date of Visit	Interacted with
1	Cardiac Sciences	10-5-21 to 2-7-21	Dr Deepak Puri, Director CTVS
2	Quality	24-5-21 to 2-7-21	Dr Swati Marwah, Head of department
3	Medical Administration	25-5-21	Dr Jasbir Kaur, Medical Superintendent
4	Medical Record Department	30-5-21	Mrs. Hema
5	Engineering	5-6-21	Mr. Harpreet
6	Laboratory	26-6-21	Mr. Yogesh
7	Bio-MEDICAL Engineering department	7-6-21	Mr. Gautam
8	Dietics	9-6-21	Miss Aastha
9	Human Resource Department	12-5-21	Mrs. Mankanwar
10	Fire Safety	14-6-21	Mr. Rahul Vats
11	Linen and Laundry	17-6-21	Mr. Kamal
12	Radiology	20-6-21	Mr. Zubin
13	Nuclear Medicine	25-5-21	Mr. Santosh
14	Gas Manifold	3-6-21	Mr. Aman