Summer Training at
Max Super Speciality Hospital, Mohali

Identifying Factors Influencing Waiting Time in Out-Patient Pharmacy of a Tertiary Care Hospital
Rational Use of Restricted Antibiotics in Medical Intensive Care Unit of a Tertiary Care Hosital

By
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Under the guidance of
Dr. Tanjul Saxena

MBA Hospital and Health Management
2015-2017

The IIHMR University, Jaipur
2016

INSTITUTE OF HEALTH
MANAGEMENT RESEARCH
(WHO Collaborating Centre for District Health System Based on Primary Health Care)

IIHMR UNIVERSITY

TO WHOM SO EVER IT MAY CONCERN

This is to certify that **Nupur Gupta,** student of **MBA Hospital and Health Management** from the IIHMR University, Jaipur has undergone summer training at **Max Super Speciality Hospital, Mohali** from 1st April to 31st May, 2016.

The Candidate has successfully carried out the study designated to her during summer training and her approach to the study has been sincere, scientific & analytical.

The Internship is in fulfilment of the course requirements.

I wish her all success in all her future endeavours.

Col. (Dr.) Ashok Kaushik
Dean (Academics & Student Affairs)
The IIHMR University, Jaipur

Dr. Tanjul Saxena
Associate Professor
The IIHMR University, Jaipur

MAX HEALTHCARE

Ref: MOH/TR/CP/J135

May 31st, 2016

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Nupur Gupta D/O Mr. Sanjiv Kumar Gupta** has completed her training in the department of **Hospital Operations** at Max Super Speciality Hospital, Mohali on 31st May 2016.

The project undertaken by her during the training period was:

- **Identifying factors influencing waiting time in outpatient pharmacy in a tertiary care hospital.**
- **A study on rational use of restricted antibiotics in medical intensive care unit of a tertiary care hospital.**

She possesses a keen observation and conducts herself with confidence.

During her training (April 01st 2016 to May 31st 2016) she was part of hospital set up and was reporting to **Dr. Vishvadeep Goyal (DGM-Hospital Operations)**

We wish her all the best in her future endeavors.

For Max Super Specialty Hospital

Lily Sahota

Lily Sahota
AGM – Human Resources

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NABH ACCREDITED

Acknowledgement

A summer project is a golden opportunity for learning and self-development. I consider myself very lucky and honoured to have so many wonderful people lead me through in completion of this project.

I wish to express my gratitude to **my mentor, Dr. Vishavdeep Goyal, Assistant General Manager- Operations,** who allowed me to do multiple projects in the pharmacy department. I'm extremely thankful to him for attaching me to **Ms. Anamika Singh, Clinical Pharmacist, my immediate supervisor and co-mentor,** who in spite of being extraordinarily busy with her duties, took time out to hear, guide and keep me on the correct path during the training. Thank you ma'am for giving necessary advices and guidance and arranging all the facilities to make my life easier.

I also express my deepest thanks to **Ms. Neha Rampal, Deputy Manager- Human Resources, Ms. Neerja, Senior Laboratory Assistant and Ms. Dolly Darshan Singh, Deputy Manager- Medical Quality** without whom my training in this esteemed organization would not have been possible.

It would be an incomplete acknowledgement without placing on record my best regards, deepest sense of gratitude to **Mr. Arvind, Ms. Rosy, Mr. Shashi, Mr. Manish, Mr. Manpreet, Ms. Poonam, Ms. Nandini, Mr. Rajeev, Mr. Darpan and Mr. Satinder, Pharamcists and data entry operators** in the OP-Pharmacy for helping me throughput the training period in noting down various important observations and guiding wherever necessary. It was a theoretical as well as practical value addition to both, my knowledge and my study.

Last but not the least, I express my deepest thanks to my mentor, **Associate Professor, Dr. Tanjul Saxena,** IIHMR University, Jaipur for her prompt replies, able guidance and constant words of encouragement. She guided me in choosing right projects along with ideal methodology and analytical techniques, for which I shall be thankful to her forever.

Nupur Gupta
Roll no. 0313

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List of Abbreviations

Abbreviation	Full Form
ADR	Adverse Drug Reaction
AMR	Antimicrobial Resistance
ASP	Antimicrobial Stewardship Programme
CPRS	Computerised Patient Record System
ENT	Ear, Nose, Throat
ER	Emergency Room
GDA	General Duty Assistant
HAI	Hospital Acquired Infection
HIS	Hospital Information System
Inj.	Injection
IP	In-Patient
IPD	In-Patient Department
ICU	Intensive Care Unit
LEED	Leadership in Energy and Environmental Design
LAMA	Leave Against Medical Advice
MICU	Medical Intensive Care Unit
MRSA	Methicillin-resistant *Staphylococcus aureus*
MDR	Multi Drug Resistance
NABH	National Accreditation Board for Hospitals & Healthcare Providers
NABL	National Accreditation Board for Testing and Calibration Laboratories
ONCO	Oncology
OP	Out Patient
OPD	Out-Patient Department
PCC	Patient Care Coordinator
PCE	Patient Care Executive
RA	Restricted Antibiotics
Tab.	Tablet
TPA	Third Party Administrator
UTI	Urinary Tract Infection

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About Max Super Speciality Hospital, Mohali

History of Max Hospitals

Max Healthcare Institute is a healthcare institute based in New Delhi, India. The Institute is a wholly owned subsidiary company of Max India Limited. Established in 1985, Max India Limited is a Public Limited company listed in the Bombay Stock Exchange and National Stock Exchange of India with more than 37,000 shareholders.

The institute operates eleven centres in Delhi, NCR and neighbouring Punjab region, providing health care services in more than 30 disciplines. The company provides patient services including nuclear medicine and cardiac imaging, labs, scans, interventional cardiology, cardiacpacing and electrophysiology, neurosciences, orthopedics, gynecology and obstetrics, pediatrics, cancer care, kidney transplant, bone marrow transplant, maternity services, diagnostic services, paediatric, neurophthalmology, internal medicine, general surgery, urology, nephrology, gastroenterology, mental health and behavioural sciences, rehabilitative services, and pulmonology.

Mr. Analjit Singh is the Founder & Chairman Emeritus of Max India Limited, Chairman of Max Life Insurance Company Limited, Max Healthcare Institute Limited and Max Bupa Health Insurance Company Limited.

With over 2600 beds and 13 top hospitals in Delhi-NCR, Punjab and Uttarakhand, 2300 world-class doctors, Max Healthcare is one of the leading chain of hospitals in India. With over 500 ICU beds, the most advanced technology and state-of-the-art infrastructure, Max Healthcare is one of the best hospitals in India.

Max healthcare is committed in meeting all healthcare needs of customers, starting from the maintenance of good health to providing global standards in diagnostics, therapeutics and surgical requirements at the time of need.

It aims to exceed customer's expectations in terms of quality, service, safety and value for money through constant innovation and better product delivery.

Performance, Trust and Service excellence are enshrined in Max India Group's Vision, Mission and Values. In addition to these "life-centred' businesses, Max India manufactures speciality products for the packaging industry through its division- Max Speciality Products (MSP). MSP too has a strong service excellence orientation that strives on building long lasting partnerships.

The institutes focus is "completely satisfying customer needs profitably" by using DMAIC and Lean methodology.

Vision and Mission

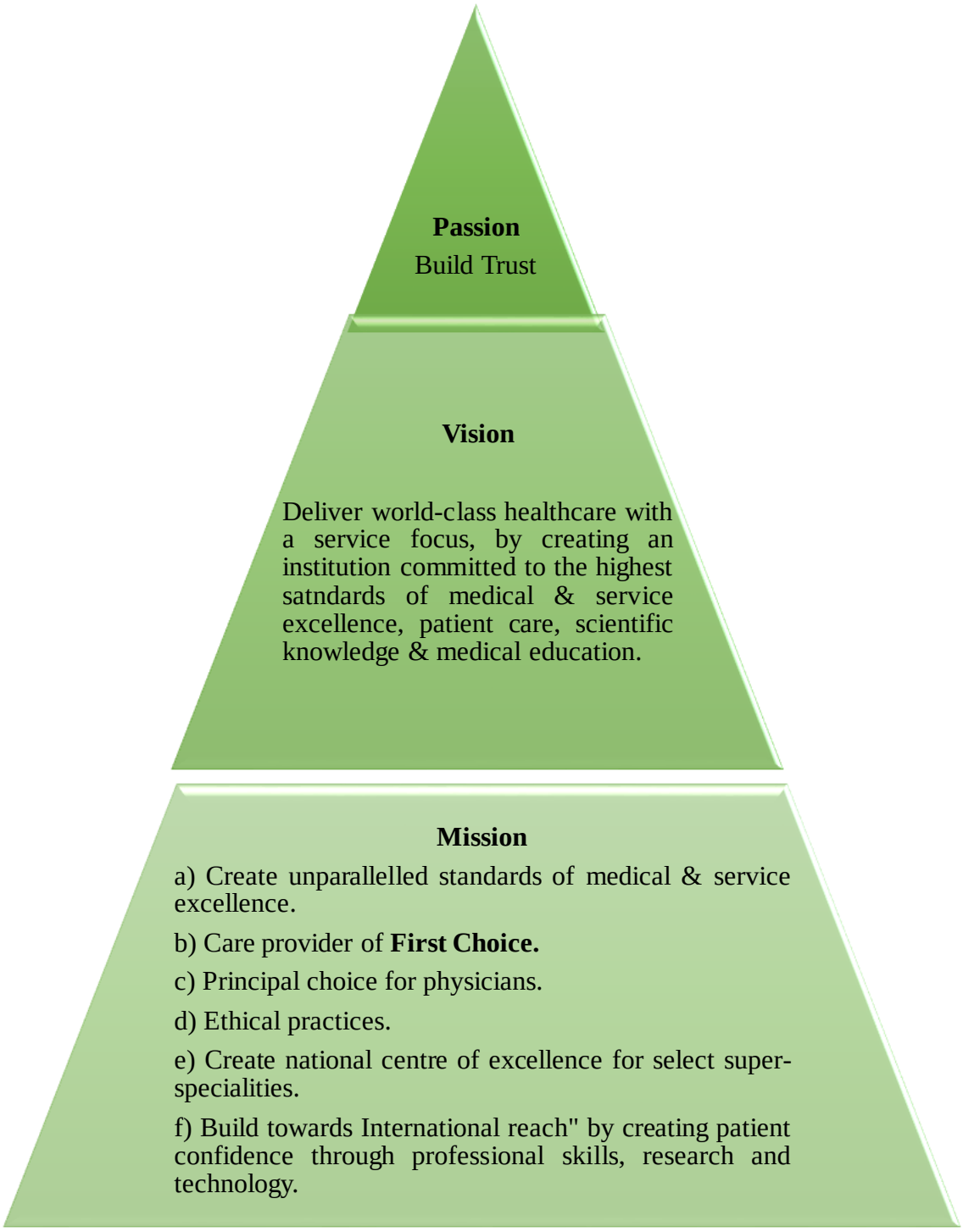


Figure 1. Vision and Mission of Max Hospital, Mohali

Objectives

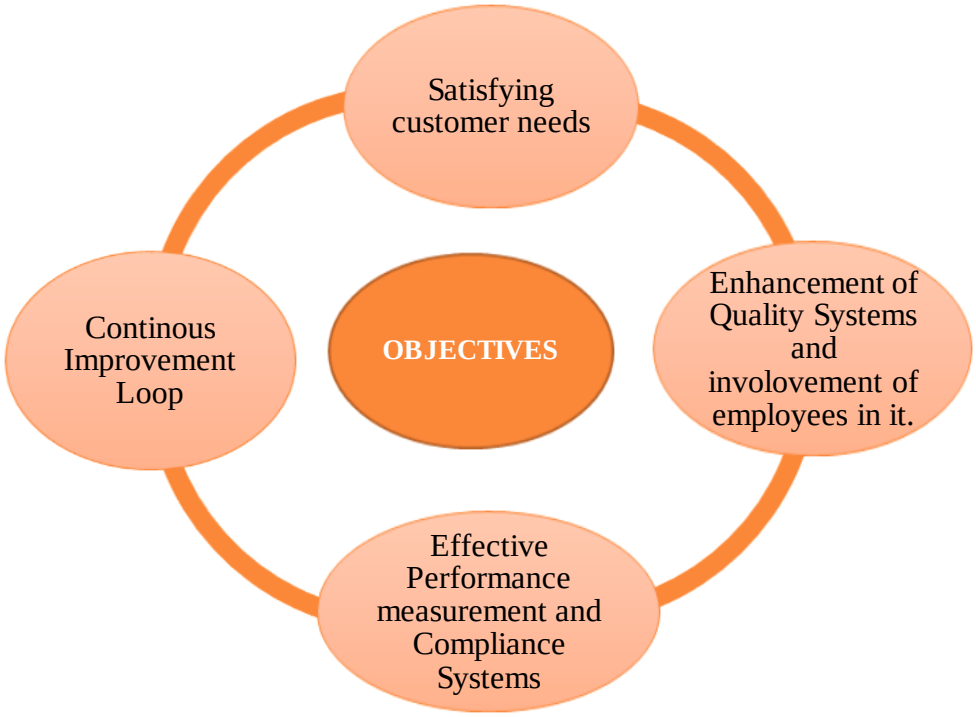


Figure 2. Objectives of Max Hospital, Mohali

The Logo

Figure 3. Logo of Max Healthcare

The cross is the accepted symbol for Healthcare all over the world. It is a truly suitable symbol for a group that endeavours to enhance the quality of life through healing and care. The healthcare green is fresh, close to nature and symbol of life.

Max Super Speciality Hospital, Mohali

Introduction

Max Super Speciality Hospital, Mohali is another milestone towards realizing the dream of great visionary Mr. Analjit Singh, chairman and managing director of Max Healthcare Ltd.

The 217-bedded super speciality hospital is known for its personalised service and dedicated care for its patients.

Max Super Speciality Hospital, Mohali aims to bring comfort and convenience to its patients.

They believe in understanding their patients' health related problems and offer the right treatment to them. The hospital specializes in offering a broad array of services and amenities like Blood Bank, 24*7 Pharmacy for our-patients.

They use the most technologically advanced medical equipment to achieve excellence in research and treatment. They also have an art of diagnosis system to understand health problems better and choose the right treatment for their patients.

The state-of-the-art hospital extends dedicated care and personalised service to its patients: a pool of committed doctors and support staff help patients to get back to their normal routine at the earliest.

Facts & Figures

- Name: Max Super Speciality Hospital
- Location: Phase 6, Mohali (Punjab)
- Speciality: Tertiary Care Super Speciality Hospital
- Number of Beds: 217

Important dates:

- **September 2011**- OPD was inaugurated by honourable chief minister of Punjab Sh. Prakash Singh Badal.
- **December 2011**- IPD was inaugurated.

Research Activities

- Disease Management Programmes
- Health Promotion and Counselling Services

Awards & Certifications

Max Super Speciality Hospital has been endowed with multiple certifications assuring the highest level of medical and service quality.

Figure 4. Logo of NABH

NABH Accreditation: The accreditation is a recognition of Max Healthcare's commitment to provide the highest quality of care to its patients.

Figure 5. Logo of NABL

NABL Accreditation: Max Healthcare laboratories have successfully obtained NABL accreditation in the field of medical testing.

Figure 6. Logo of LEED Certified Green Hospital by IGBC

They are **LEED certificate Green Hospital** - Four out of Six* such hospitals in India are Max Hospitals.

Collaboration:

Max healthcare and GE healthcare have joined hands to advance Cancer care in India through research and Co-creation of multifaceted cancer care solutions.

Collaboration between Max Planck Society: Germany and Department of Science and Technology, India to understand the role of Ubiquitin-related modifiers in regulation of RNA splicing.

Number of Departments

Clinical Departments:

- Infection control
- Central Sterile Services Department
- Physiotherapy
- Cardiothoracic & Vascular Surgery ICU
- Neonatal ICU
- Labour, Delivery and Recovery
- Operation Theatres

- Triage/Emergency
- High Dependency Units
- Radiology
- General ward
- Laboratories
- Medical ICU
- Cardiac Care Unit
- Catheterization Laboratory
- Dialysis

Clinical Facilities:

- Blood Bank
- Computerized Tomography (CT) Scan
- Electrocardiogram (ECG)
- Endoscopy
- Histopathology/Laboratory
- Imaging Services
- Magnetic Resonance Imaging (MRI)
- Radio Immuno Assay
- Sonography
- Integrated Hospital Information Systems
- Computerized Billing
- Documented Infection Control Policies/Manuals
- Other major equipment – Gamma Camera, Treadmill Stress Test (TMT)

Non-Clinical Departments:

- Reception/Helpdesk/Information Desk
- Cafeteria/ Canteen
- Insurance Desk
- Pharmacy inside the hospital
- Ambulance Service
- Bio- Medical Engineering
- Laundry Management
- Maintenance & Facilities Management like housekeeping etc.
- Management of Bio-medical waste
- Mortuary services
- 24 hours Security
- Social service
- Supply chain Management/ Material Management System
- Finance
- Human resource
- Medical records
- Quality assurance
- Research
- Patient welfare department
- Information technology

Outsourced staff

- Laundry- A-one, Maurya
- Food & Beverage- High Tech Hospitality
- House-keeping- Avon

Services Provided

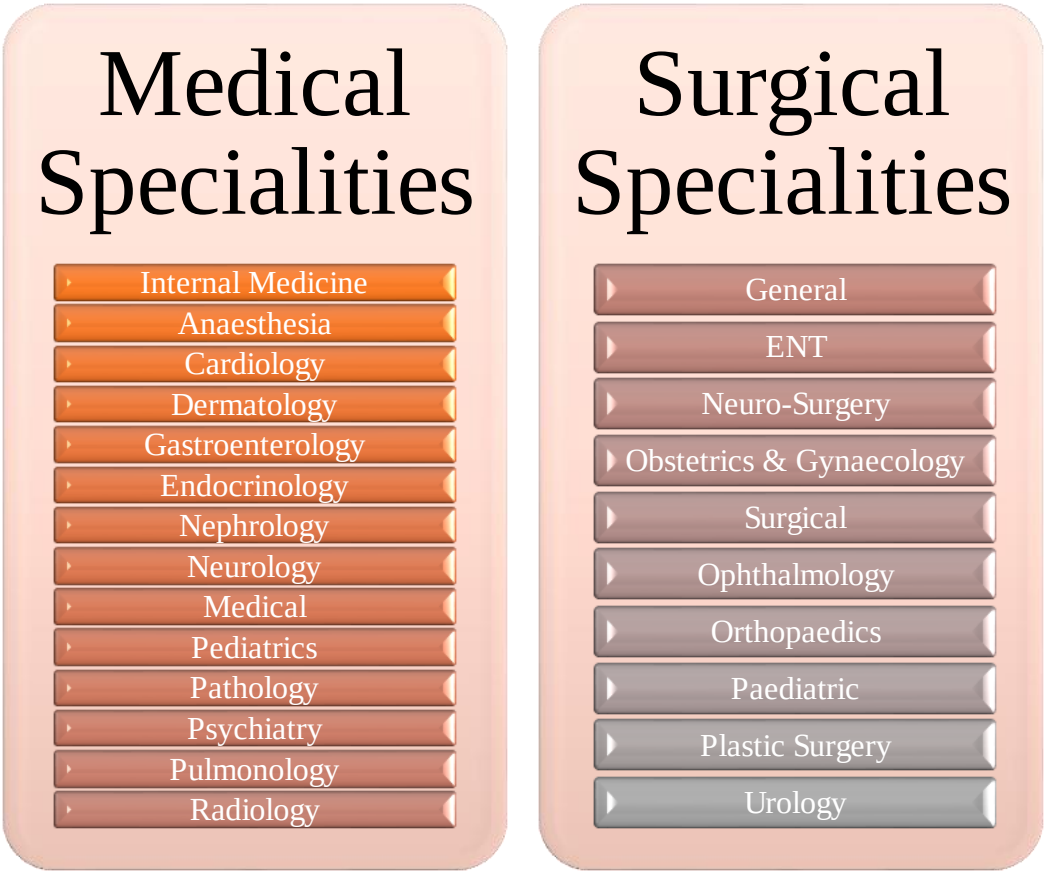


Figure 7. Various Specialities Provided by Max Hospital, Mohali

Table 1. Figures about Max Hospital, Mohali

Total number of beds	217
Number of General wards/classes	133
Number of Special wards/classes	Oncology Day-care Ortho ward Emergency ward Gynaecology wards Dialysis ward

	Multi-speciality-Single room, Twin sharing, Economy
Number of functional beds in Special wards	MSP Economy-82 Single-28 Twin sharing-30 Dialysis-10 ER-6 Oncology Day-care-15
Total number of Operation Theatres (OT)	8
Number of Emergency Wards	6
Number of functional beds in Emergency wards	6
Number of ICU	10
Total number of beds in ICUs	84
Number of Labour rooms(only for Gynaecology & Obstetrics)	1
Number of NICUs	1
Number of Ambulances	3
Surgical Specialities	32
Number of minor OT's	0
Number of major OT's	8

Handling Visitors

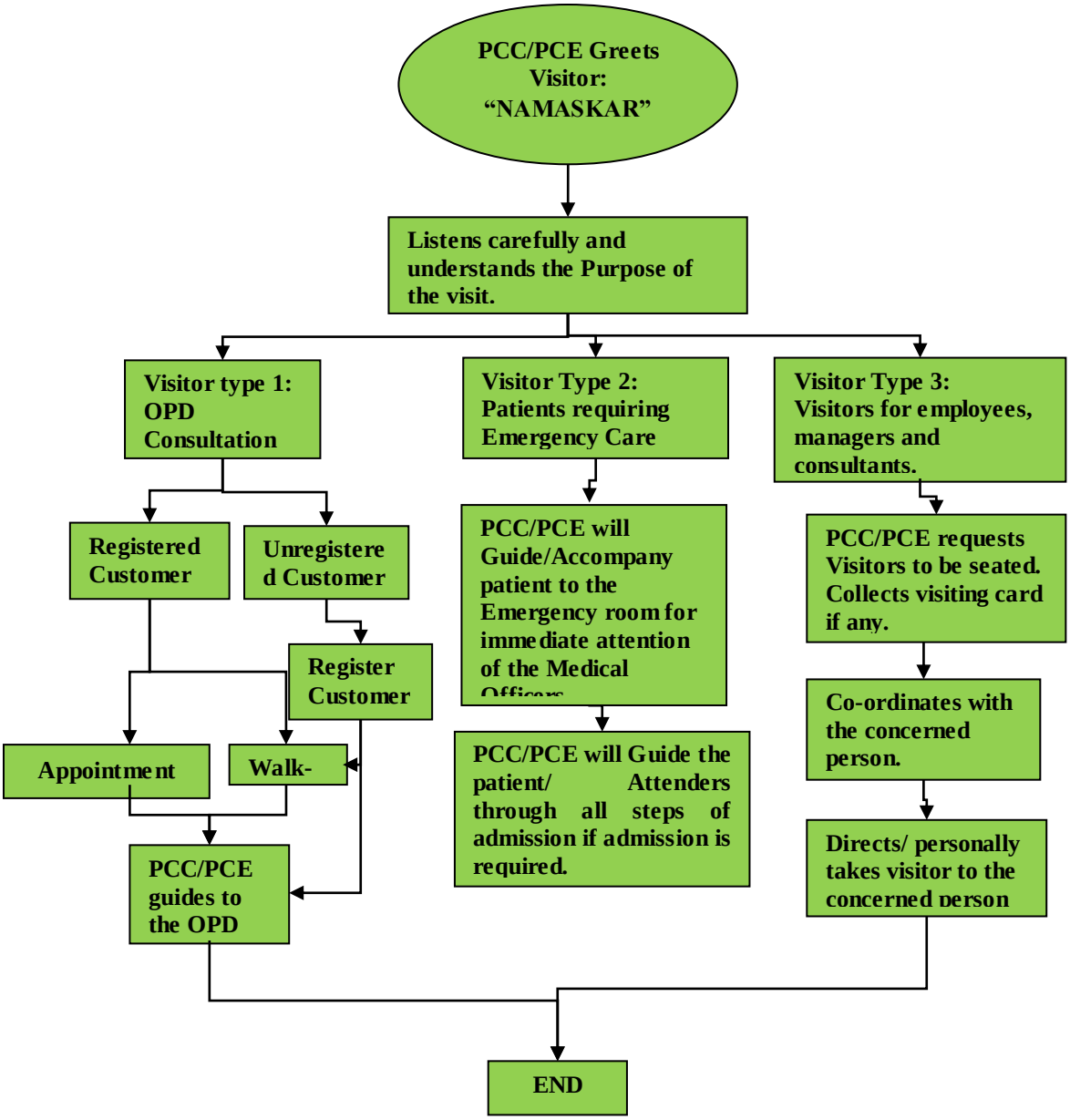


Figure 8. Flow chart of Handling Visitors

Out Patient Department

Outpatient department is a hospital department where healthcare professionals see outpatients, which consists of consulting rooms and support areas—e.g. nurses station, treatment rooms and waiting rooms. Outpatient departments are often physically located near support services (e.g. X-ray, ECG, surgical appliance department, pharmacy etc.).

Handling Appointments

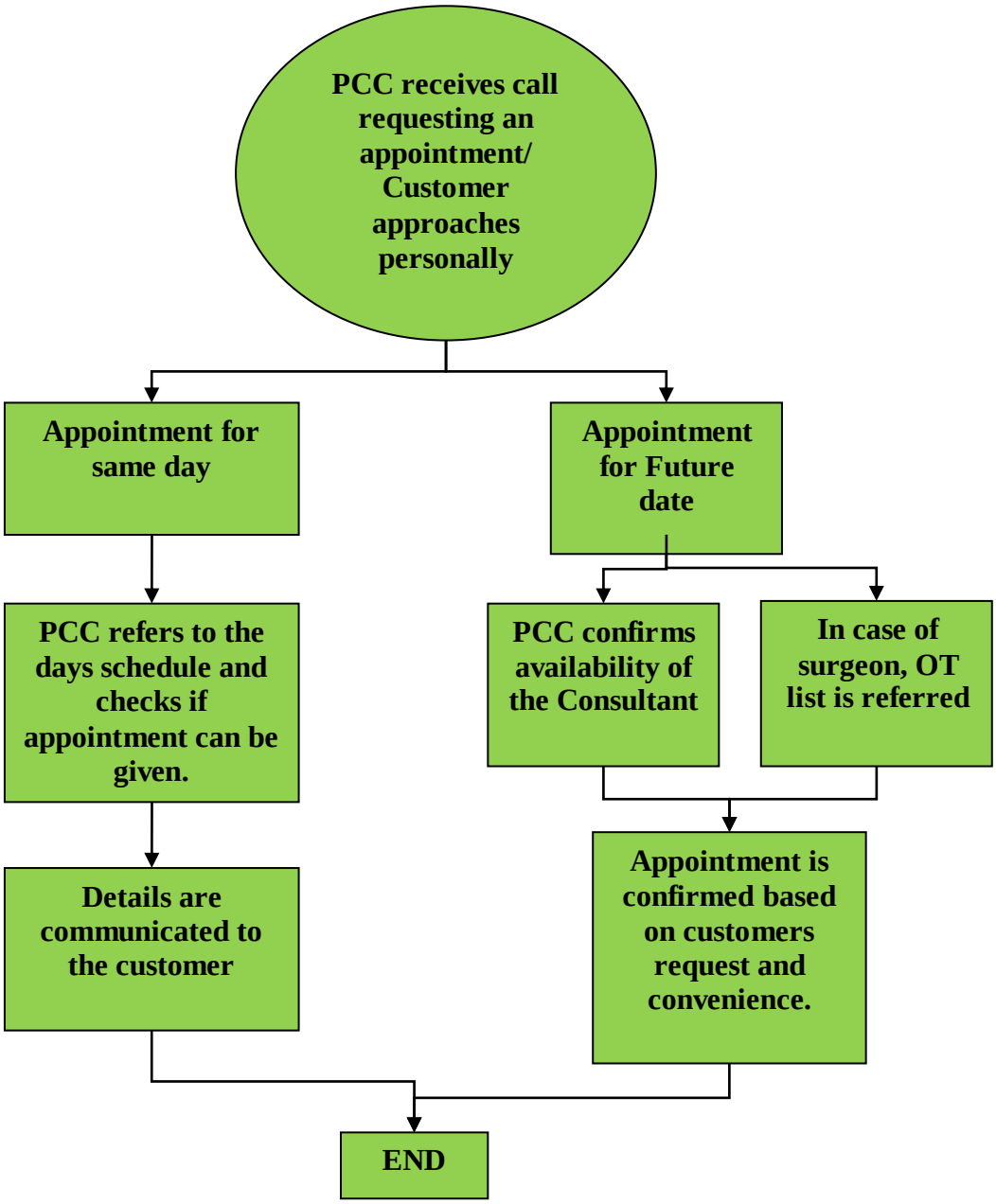


Figure 9. Flow Chart of Handling Appointments

Walk In Appointments

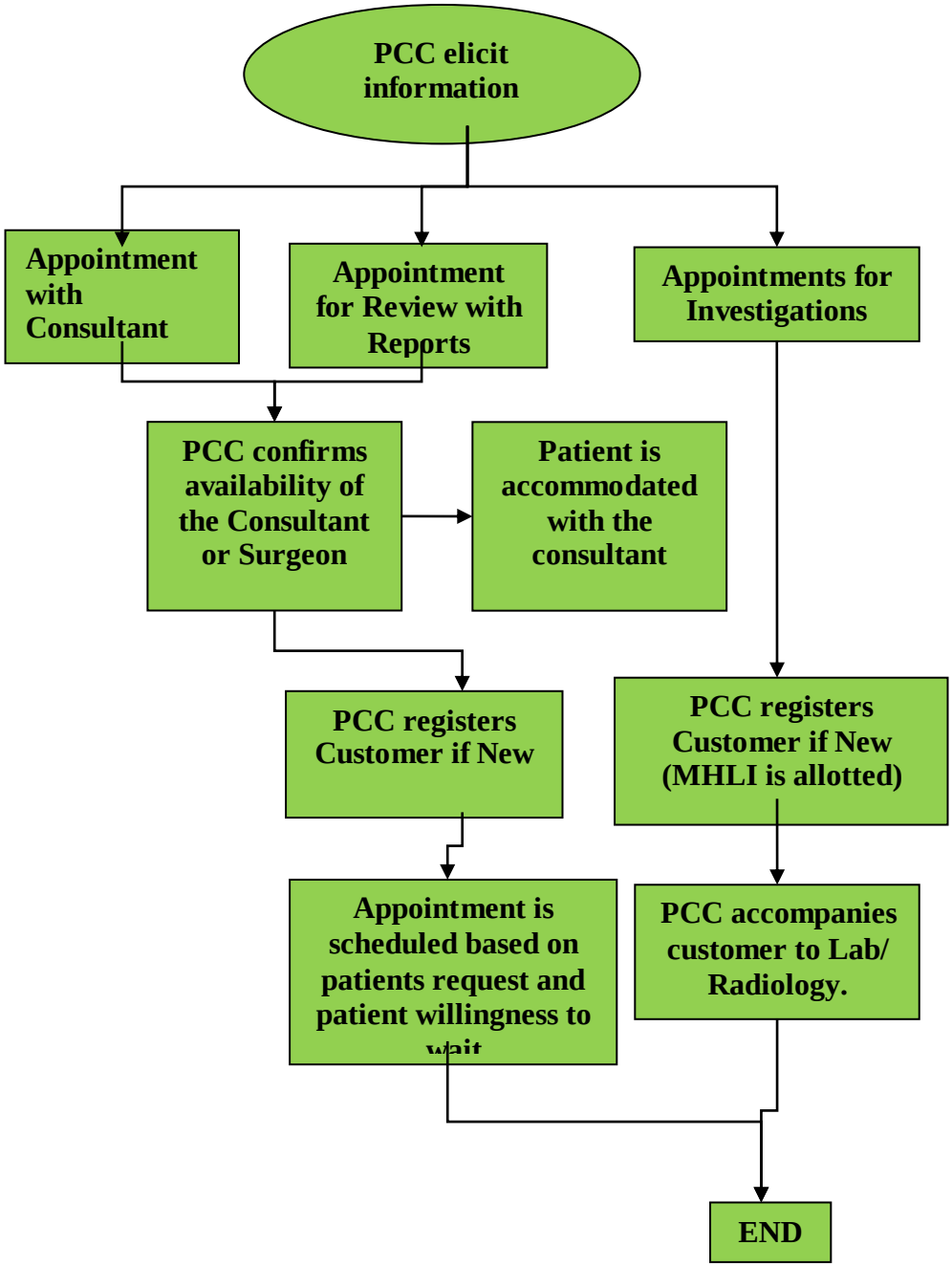
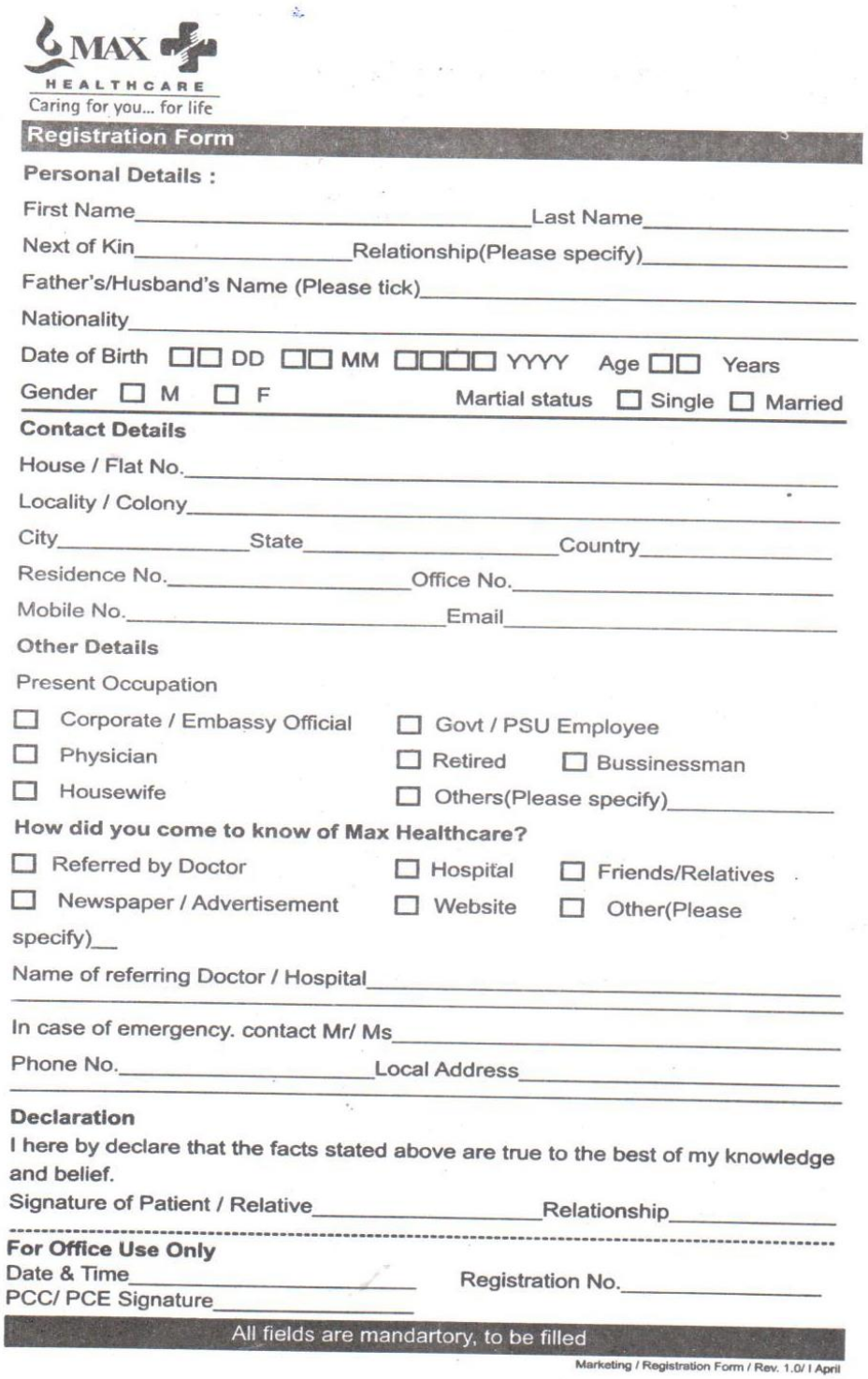


Figure 10. Flow Chart of Walk In Appointments

Registration Form



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Registration Form

Personal Details :

First Name_____ Last Name_____

Next of Kin_____ Relationship(Please specify)_____

Father's/Husband's Name (Please tick)_____

Nationality_____

Date of Birth ☐☐ DD ☐☐ MM ☐☐☐☐ YYYY Age ☐☐ Years

Gender ☐ M ☐ F Martial status ☐ Single ☐ Married

Contact Details

House / Flat No._____

Locality / Colony_____

City_____ State_____ Country_____

Residence No._____ Office No._____

Mobile No._____ Email_____

Other Details

Present Occupation

☐ Corporate / Embassy Official ☐ Govt / PSU Employee

☐ Physician ☐ Retired ☐ Bussinessman

☐ Housewife ☐ Others(Please specify)_____

How did you come to know of Max Healthcare?

☐ Referred by Doctor ☐ Hospital ☐ Friends/Relatives

☐ Newspaper / Advertisement ☐ Website ☐ Other(Please specify)__

Name of referring Doctor / Hospital_____

In case of emergency. contact Mr/ Ms_____

Phone No._____ Local Address_____

Declaration

I here by declare that the facts stated above are true to the best of my knowledge and belief.

Signature of Patient / Relative_____ Relationship_____

For Office Use Only

Date & Time_____ Registration No._____

PCC/ PCE Signature_____

All fields are mandartory, to be filled

Marketing / Registration Form / Rev. 1.0/ I April

Figure 11. Patient Registration Form

OPD Patient Registration, Consultation, Diagnostic and Treatment Process

1. Setting up an appointment

- Patient Fixes OPD Consult or Diagnostics Appointment over phone / walk in.
- Appointment fixed in Appointment schedule / Equipment schedule
- Patient visits the facility and is guided to the OPD counter for Registration process by Helpdesk

2. Patient Registration & invoice generation

- Patient meets the PCE/PCC & fills the registration form or gives details if already registered.
- Patient Details entered in HIS
- Discount is given if patient is a senior citizen or from any corporate with which we have an arrangement
- Patient pays by Cash / Credit Card or Credit bill raised if corporate patient.
- Patient invoice generated (as per Standard Tariff list) with the Registration No. & service detail.
- If any wrong entry is made or test could not be conducted, refund voucher to be generated
- Manual invoice generated as per approved pricing policy in case HIS not working or if any new service or tariff introduced.
- The new service/ tariff is intimated to IT for incorporation into HIS
- Manual invoices are updated in HIS if incorporated in HIS same day.
- If tariff is not incorporated in HIS then approval from accounts taken to update the HIS whenever new service/ tariff incorporated in HIS and scrolls is signed by Duty Manager.
- At the End of shift, PCC/ PCE takes out cash scroll from HIS.

3. Patient Consult / Diagnosis & Treatment.

- Patient has been guided to the Nursing counter

  Nurse records patients' vitals followed by consultation with Doctor.

4. Patient visits Labs/ Pharmacy

- Patient visits various Diagnostic dept. and tests are conducted in Labs and is informed about the date of collecting the Report

  Patient visits pharmacy if Drugs prescribed by doctor.

5. Review Consultation appointment made

- Patient contacts PCC/PCE at OPD counter for fixing review appointment date.

  In case report not available, generate daily pending report list and follow up.

IPD Working

Inpatient services are hospital services and items furnished to inpatients including beds, nursing, diagnostic, therapeutic, medical and surgical services.

Admission Procedure

Pre Admission Investigation Process

- Patient approaches IP desk with admission request form issued by the doctor
- Patient details entered in HIS, advance collected and Estimation is provided to the patient.
- Advance receipt & Pre admission no generated
- Patient is told about the reporting time and entry is made in Expected Admission register

Patient Admission Process

- Patient informed about the charges and other essential details like Estimated Expense, inpatient Information, etc. required during the stay.
- Availability of room is checked from the Bed manager.
- Patient details entered in HIS and face sheet generated
- Advance amount taken from the patient by cash / credit card / as per the estimated cost
- For TPA patient pre authorization form is given to be filled up by the patient and the doctor (see insurance process) and signature is taken on in patient Information Sheet for TPA Hospital Policy.
- Passes are issued to the patient as per visitor policy and entry made on Face Sheet (Office Copy).
- Patient folder is created & sent to the wards along with a Front Office Staff / GDA.
  For any International patient International Patient Services are informed

Admission Process Map

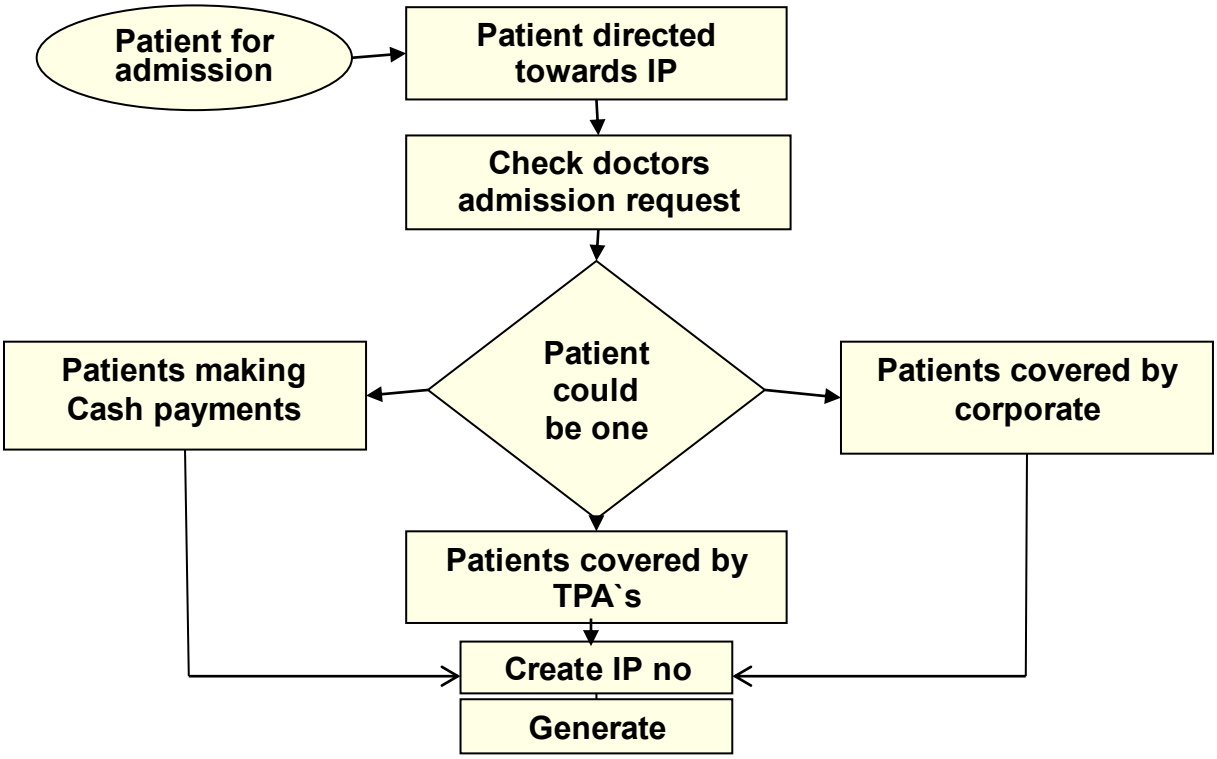
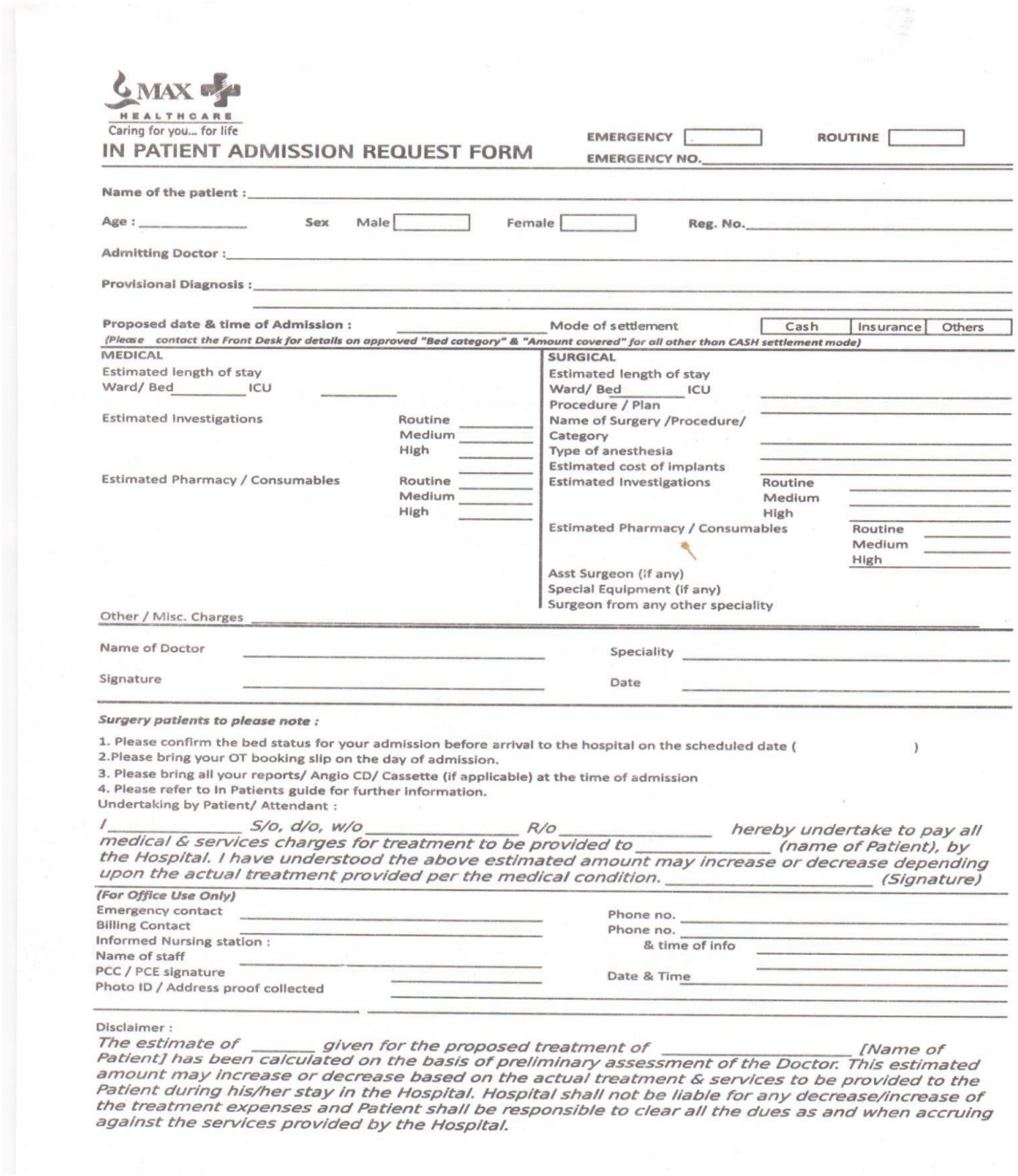


Figure 12. Admission Process Map

Admission Request Form



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IN PATIENT ADMISSION REQUEST FORM

EMERGENCY [ ] ROUTINE [ ]
EMERGENCY NO._____

Name of the patient :_____

Age :_____ Sex Male [ ] Female [ ] Reg. No._____

Admitting Doctor :_____

Provisional Diagnosis :_____

Proposed date & time of Admission :_____ Mode of settlement | Cash | Insurance | Others |

(Please contact the Front Desk for details on approved "Bed category" & "Amount covered" for all other than CASH settlement mode)

MEDICAL
Estimated length of stay
Ward/ Bed_____ ICU_____
Estimated Investigations
Routine _____
Medium _____
High _____
Estimated Pharmacy / Consumables
Routine _____
Medium _____
High _____

SURGICAL
Estimated length of stay
Ward/ Bed_____ ICU_____
Procedure / Plan
Name of Surgery /Procedure/ Category
Type of anesthesia
Estimated cost of implants
Estimated Investigations
Routine _____
Medium _____
High _____
Estimated Pharmacy / Consumables
Routine _____
Medium _____
High _____
Asst Surgeon (if any)
Special Equipment (if any)
Surgeon from any other speciality

Other / Misc. Charges _____

Name of Doctor _____ Speciality _____

Signature _____ Date _____

Surgery patients to please note :

1. Please confirm the bed status for your admission before arrival to the hospital on the scheduled date ( )
2. Please bring your OT booking slip on the day of admission.
3. Please bring all your reports/ Angio CD/ Cassette (if applicable) at the time of admission
4. Please refer to In Patients guide for further information.

Undertaking by Patient/ Attendant :

I_____ S/o, d/o, w/o_____ R/o_____ hereby undertake to pay all medical & services charges for treatment to be provided to_____ (name of Patient), by the Hospital. I have understood the above estimated amount may increase or decrease depending upon the actual treatment provided per the medical condition._____ (Signature)

(For Office Use Only)
Emergency contact _____ Phone no. _____
Billing Contact _____ Phone no. _____
Informed Nursing station : & time of info _____
Name of staff _____
PCC / PCE signature _____ Date & Time _____
Photo ID / Address proof collected _____

Disclaimer :

The estimate of _____ given for the proposed treatment of _____ [Name of Patient] has been calculated on the basis of preliminary assessment of the Doctor. This estimated amount may increase or decrease based on the actual treatment & services to be provided to the Patient during his/her stay in the Hospital. Hospital shall not be liable for any decrease/increase of the treatment expenses and Patient shall be responsible to clear all the dues as and when accruing against the services provided by the Hospital.

Figure 13. Admission Request Form

Observational Analysis

Positive Features

- All the signage is in local language and placed appropriately.
- Eleven steps of hand washing protocol, Mission-Vision and department specific charts are put up at every Nurses Station, desks and supervisor rooms.
- Security guards are assigned at the entrance of every ward/area and elevators to maintain decorum.
- In-house ATM facility available.
- Special play area for children

Limitations

- Number of washrooms in OPD area is less compared to patient load.
- According to NABH guidelines, there should be a prayer room in the hospital, which is not present in Max Super Speciality Hospital, Mohali.
- Radiation exposure is on three floors (Lower Basement- Radiation Therapy, Ground Floor- Radiology and Nuclear Medicine departments and First Floor- Endoscopy/Bronchoscopy, Cath Labs).
- IPDs and ICUs are supposed to be quiet, acknowledging the demand of the patients, but nursing staff creates lot of noise.
- There is no queue system in pharmacy.
- There is no waiting area for pharmacy. It's combined with the OPD waiting area.
- Space constraint in OPD and Cafeteria as well as less sitting arrangement.
- Delayed response of the staff to the bell alarm by patients in IPD.
- Despite of different coloured uniforms for clinical and non-clinical staff, there still is no distinction in the overalls of physicians and paramedical staff.
- Informed consent to be filled by patient or their family members before undergoing any procedure is not in local language and incompletely filled.
- Red and Yellow coloured bags are used in the OP-Pharmacy where only green coloured bags should be used. Red bags are used for high alert medication and the yellow bags are used for stat/now orders.
- Number of chairs is present is a big problem in IPDs.

Suggestions

1. Chairs in the waiting area can be better organized and more chairs can be added by utilizing space properly.
2. Only green coloured bags should be used in the pharmacy replenishing their stock well in time by setting an appropriate Re-Order Level.
3. Dress Code for all the staff should be properly worked out assigning different colours to different staff members to avoid confusion. Charts explaining the colour code can also be displayed at various places.
4. A floor monitor (Can be made someone from the supervisors' team) should be assigned specifically to maintain discipline among the staff members.
5. Proper queue system should be implemented in the OP-Pharmacy with a help of a security person or a token system.
6. Nurses should be briefed and strictly monitored to answer the in-patient's call within a span of five minutes.
7. More chairs and other furniture should be bought and adequately distributed.
8. Informed consent should be duly signed and completed there and then at the time of admission or procedure. Strict action should be taken against the assigned staff who fails to do so.
9. A pooja room/area should be accommodated near the front desk on ground floor.

Conclusion

Max Super Speciality Hospital, Mohali is one of the leading hospitals in Punjab providing healthcare services to patients from the whole of North India. Average OPD patients for a day sum up to 324 resulting a jam packed setting from morning to evening. The occupancy of IPD also reaches a 100 percent indicating heavy patient load. The three cafeterias present in the premises along with the Food and Beverage department fully cover the patients, their attendants and staff well. The staff is well mannered and courteous. But since nothing is perfect, the management of this hospital isn't free of errors either. However, the able and dedicated staff of the hospital leaves no stone unturned in minimizing those. Since we didn't get an opportunity to visit every department and observe their functioning in detail, we could only list down the more visible cases of mismanagement. But we can easily say that with a very skilled team of doctors and dedicated nursing, administration and non-administration staff, Max Super Speciality Hospital, Mohali can achieve greater heights.

Identifying Factors Influencing Waiting Time in Out-Patient Pharmacy of a Tertiary Care Hospital

Introduction

Patient waiting time in an OP Pharmacy deals with the period of time a patient or their attendant has to wait to buy their medicines. The time spent is usually to take the prescription, dispense or pull out medicines, wait for billing, billing of medicines and counselling the patient about how and when to take their medicines. For the purpose of this study, it has been defined as the length of time from when the patient actually hands over his prescription to the pharmacist to when he receives his or her medication and leaves the pharmacy.

Excessive waiting times may be symptomatic with inefficiencies in the various components of the pharmacy process flow and should be addressed as part of good management practice. It can also be attributed to faults in prescription, as seen in this study. The experience of waiting can be extremely distressing in itself. Sometimes when patients would have to wait a long time with their waiting situation not been addressed, the clients might leave and never come back. Patients also leave if they feel that their time has been disrespected or the pharmacist hasn't been paying attention to them or the medicines they require aren't completely available. However, some waiting periods may also aid to proper diagnosis/counsel or even save lives by identifying a medication error or an ADR. Experts emphasize that waiting times do not have to be long to annoy patients and the way to solve a wait-time problem will be different for every practice and setting. This research was aimed at identifying and measuring factors influencing patient waiting time in an OP pharmacy and to proffer recommendations that could be implemented by boards of hospital management to improve the OP pharmacy's performance.

Rationale

The amount of time customers spend waiting in line can affect their satisfaction with an organization's services. For the customer at the end of a waiting line, the long waiting time negatively affects his or her satisfaction and decreases the likelihood that he or she will return to the organization in the future as a small increase in service times for each customer magnifies into a significant increase in waiting time for him or her. Furthermore, it is proposed that customer dissatisfaction could result in a loss of long term profits because of decreased customer retention, fewer repeat visits, and conveyance of dissatisfaction with the organization to others. Therefore, the importance of reducing wait times is evident and should be considered along with superior customer service is a major goal of an organization.

Review of Literature

A patient's experience of waiting can radically influence his/her perceptions of service quality. In a study carried out at the University of Southern California, Los Angeles, USA, it was shown that the overall satisfaction of patients with pharmacy services is closely related to their satisfaction with waiting time. Long waiting time has been given as a reason why some patients do not buy their medication from a particular pharmacy.

In a study carried out in an OP Pharmacy of a 547-bedded hospital in Nigeria, it was concluded that most of the patient waiting time there was accounted for by delay components of the dispensing procedure with average dispensing time to be 17.09 minutes, and 89.5 percent of this was due to delay components like patient queues for billing prescription sheets and subsequent payment to the cashier apart from operational components such as patients' indirect access to dispensing pharmacist and the tortuous procedure for prescription billing and payments.

Reynolds Army Community Hospital, Oklahoma, USA, in 2012 cut down their pharmacy waiting time from over 20 minutes to less than five minutes (two minutes and 32 seconds is their best) by introducing more counters, a fully automated prescription system that requires a barcode safety check on every prescription thereby reducing medication errors due to drug identification and modifying their process to enable their customers to complete their transactions at one window, instead of visiting multiple windows. Their goal is to maintain the wait time below 15 minutes. They only had 20 patients out of nearly 10,000 patients in February, 2012 who waited over 15 minutes, and no one in March, 2012.

Keeping in view various studies across the World done to tap waiting time of OP pharmacies of different hospitals, this study was carried out to identify loopholes in the processes of in house pharmacy of a tertiary care hospital, Mohali and also calculate its average waiting time.

Objectives

1. To calculate the average waiting time of the OP pharmacy of a tertiary care hospital, Mohali.
2. To calculate the highest and lowest dispensing, wait for billing, and billing times.
3. To assess the various operational factors for increasing waiting time.
4. To identify the various factors in a prescription that can lead to an increase in the waiting time.

Data Collection

Setting: The study was carried out in the OP Pharmacy of a tertiary care hospital, Mohali. It is located on the ground floor near the entrance. It has a large undivided window with three computer systems for billing and two printers. There are two refrigerators, multiple shelves and a cabinet to store vaccines and various medicines. The pharmacy has seven pharmacists and three data entry operators who follow shift system. There is also an IP-Pharmacy and a store located just a floor below in the upper basement. These two, however, are out of scope for this study except the store which is occasionally accessed to get items like walker, walking stick, urine bags etc. The peak rush hours of the pharmacy were observed to be between 11:30 to 1 and occasionally 3:00 to 4:00 pm.

Research Design: Descriptive, cross-sectional, qualitative study.

Study Population: The study was conducted among OPD patients and discharge summaries of IPD patients which is supplied from OP pharmacy.

Sample Size: 236 patients for pharmacy waiting time

221 prescriptions for prescription audit

Sampling Technique: Purposive/Convenience sampling.

Methodology: The study was carried for over a 20 day period where patients were observed at random. A time-monitoring card was maintained for all the 236 selected patients (See Annexure 1) where patient's name, time for dispensing medicines, time for waiting for billing and time for billing along with any significant event with the prescription was noted. The time was noted using the clock in pharmacy and the minutes were later calculated while analysing the data in Microsoft Excel. All the events were recorded along with general observations which caused increase in waiting time. **Since, there was no proper queueing system despite presence of dividers, the queuing time has not been considered in this study. The pharmacists picked up another prescription as soon as they had finished dispensing the medicines of the previous customer and kept it for billing.**

Process Flow:

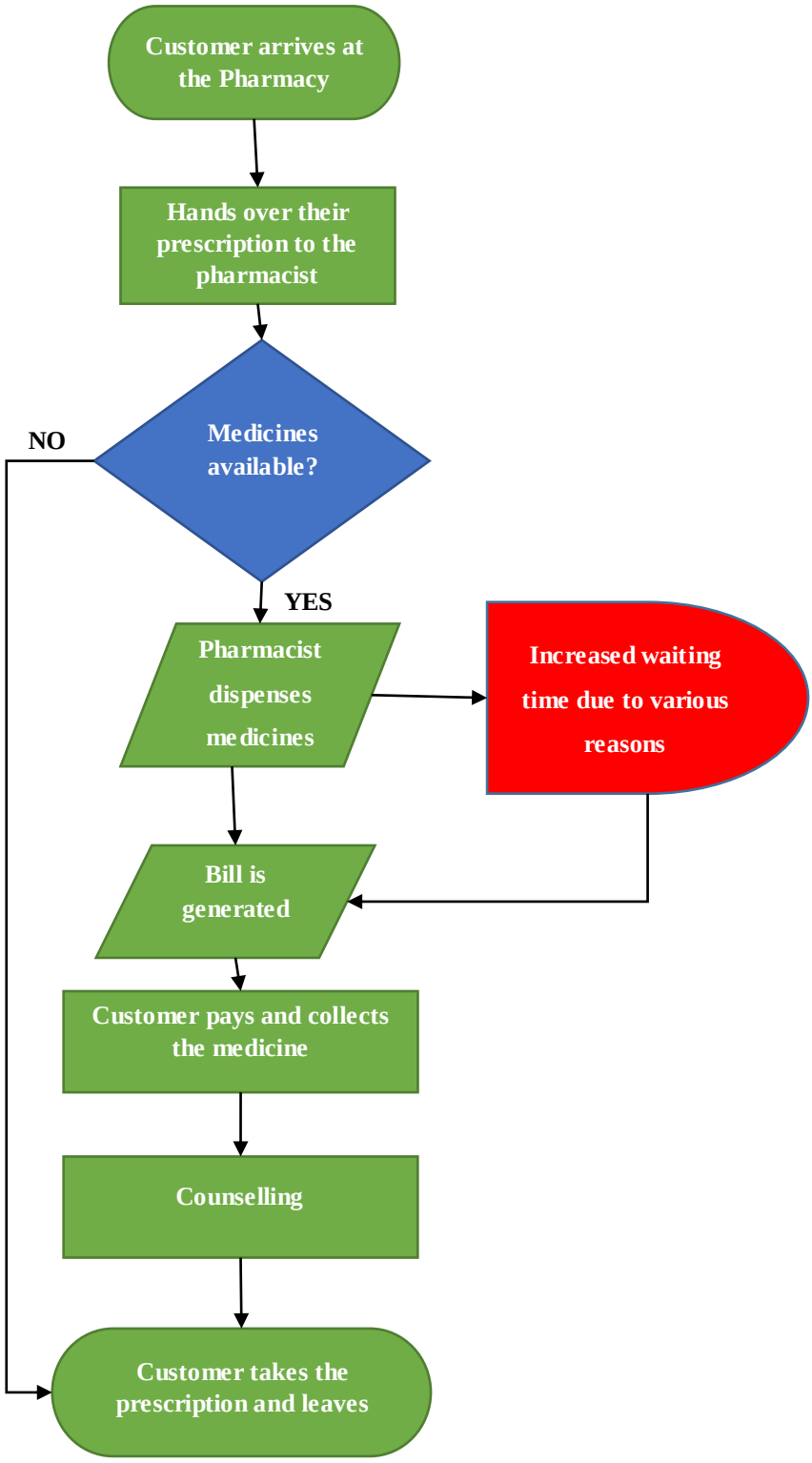

Figure 14. Process Flow of OP Pharmacy

Also, most of the prescriptions included in this study were scanned (except when scanner wasn't available) using a Portronics Scanny 4 Mini LCD Portable Scanner for a **prescription audit** on parameters relevant to pharmacy waiting time. They included whether the **prescription is printed or not, prescription order is clear and legible, route of administration other than oral is mentioned, date written, whether any unapproved abbreviations have been used, the prescription order is written in capital letters** (Annexure II).

Observations and Analysis

Waiting Time of 236 patients, following was the observed:

Table 2. Maximum, Minimum and Average Time Taken in OP Pharmacy

	Dispensing time of Medicines (Minutes)	Waiting time for billing (Minutes)	Time taken in Billing (Minutes)	Total Waiting Time (Minutes)
Average time	02:20	01:33	03:25	07:04
Most time taken	11:00	10:00	19:00	22:00
Least time taken	00:00	00:00	00:00	00:00
Standard Deviation	01:58	02:05	02:45	04:10

Following events occurred with the various prescriptions. Multiple events were also the case with several prescriptions:

Table 3. Various Issues with Prescriptions encountered during observation

VARIOUS ISSUES WITH PRESCRIPTIONS	NUMBER OF INCIDENCES	PERCENTAGE
NONE	**80**	**33.90**
Fewer medicines bought by Customer	60	25.42
Name of Doctor not written on prescription	25	10.59
Out of Stock	**25**	**10.59**
Name not written on prescription	18	7.63
Alternate Medicine/Salt given	13	5.51
BRAND UNAVAILABLE	11	4.66
BANNED MEDICINE	10	4.24
Medicines not dispensed by pharmacist	9	3.81
Extra Medicine Bought	8	3.39
No Supply from Company, Alternative not given	8	3.39
Customer didn't buy at all	6	2.54
Complete Medicine not available	4	1.69

Illegible Handwriting	4	1.69
All drug strengths unavailable	4	1.69
Ambiguity regarding availability of medicine	3	1.27
Other bills generated in between	3	1.27
No Supply from Company, Alternative given	1	0.42
Database not updated	1	0.42
Ambiguity between Sound-Alike Drugs	1	0.42
Alternate Medicine/Salt not accepted by customer	1	0.42
Number of days on prescription not written	1	0.42
Non-cooperative customer	1	0.42
Expired Medicine as not prescribed much	1	0.42
Dispute over return of medicines	1	0.42

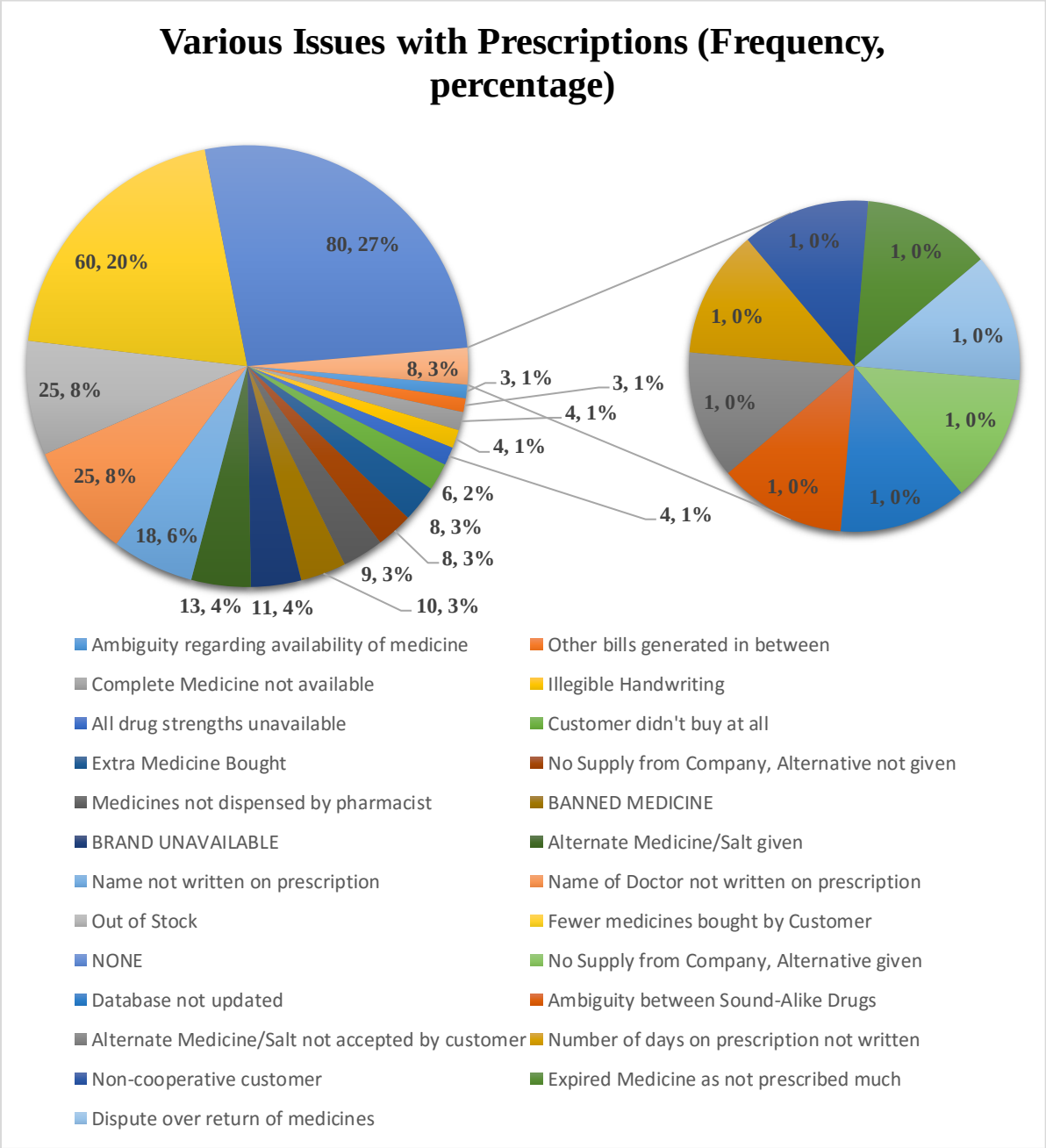

Figure 15. Pie Chart depicting various issues with prescriptions

Prescription Audit

Following are the observations from the prescriptions audited on several parameters:

Printed Prescriptions

Table 4. Printed Prescriptions

Number of printed prescriptions:	63	28.51% (Out of 221)
Discharge Medication prescriptions:	20	9.05% (Out of 221)
OPD Printed Prescriptions	43	19.46% (Out of 221)

Illegible Prescriptions

Table 5. Illegible Prescriptions

Number of Illegible Prescriptions	14
Percentage (Out of 221)	6.33%

Route of Administration, other than oral (IM, IV, SC etc.)

Table 6. Route of Administration other than oral

No. of prescriptions with route of administration not written	11	42.30% (Out of 26)
No. of prescriptions with route of administration written	15	57.69% (Out of 26)

Rest of the prescriptions- 195 out of 221 (88.68 percent) did not require any alternate route of administration.

Date not written

Table 7. Date not written

No. of prescriptions where date not written	12

Percentage (Out of 221)	5.43%

Number of prescriptions using "Do Not Use Abbreviations"

Table 8. Prescriptions with "Do Not Use" Abbreviations

Number of Prescriptions where unaccepted abbreviations used	90
Percentage (Out of 221)	40.72%

Abbreviations like OD, HS, BBF, QID, and HBR are not present in the list of approved abbreviations.

Number of Prescriptions written in capital letters

Table 9. Prescriptions Written in Capital Letters

Number of Prescriptions written in capital letters	86
Percentage (Out of 221)	38.91%
Number of Prescriptions written in capital letters which are not printed	23
Percentage (Out of 221)	10.41%

Interpretation

Waiting Time

1. **Average waiting time** of the pharmacy was calculated to be **7.04 minutes only**.
2. The highest time for waiting was 22 minutes while the least was a few seconds (0 minutes) where customer may have bought only one tablet.
3. Contrary to the literature reviewed where dispensing time in various pharmacies was higher than the billing time, the average billing time in this OP Pharmacy (3.25 minutes) is higher than average medicines dispensing time (2.20 minutes) which

can be attributed to slow system, unresponsive HIS, name of patient and doctor not written on prescription which is required while generating bill, medicines not dispensed by pharmacist (that is, dispensed by data entry operators, which means no one remains available to generate bills and the medicines dispensed may also be incorrect), other bills generated in between and majorly counselling which has been included in the billing time only. Other minor reasons include quantity not put in or incorrect quantity input by the data entry operator.

4. Majority of the prescriptions were free of any issue (33.90 percent). Their average time was 6.39 minutes, only 25 seconds less than the general average time, which means that the delays caused by various reasons discovered is not very substantial. It may also be noted that majority of the issue-free prescriptions had higher time because of counselling which is an integral part of the whole pharmacy dispensing system and therefore cannot and should not be considered as an issue.
5. Medicines being out of stock (10.59 percent) is the most common problems among all the prescriptions, followed by name of patient not written on the prescription, name of doctor not written on prescription, brand of prescribed medicine not available, banned medicines, Ambiguity regarding availability of medicine, medicines not dispensed by pharmacist, alternate not given for medicine which is short from company, all drug strengths unavailable, illegible handwriting on prescriptions, complete medicine not available and other bills generated in between.
6. Other events as found in the study which **do not contribute to the increase in waiting time** but are a common occurrence include **ambiguity between Sound-Alike drugs, expired medicine as not prescribed much, extra medicine bought, alternate medicine/salt given and fewer medicines bought by customer.**

Prescription Audit

7. Only 43 out of 221 prescriptions (19.37 percent) are printed and therefore can be read absolutely without doubt.
8. Out of 221, 14 prescriptions (6.33 percent) were illegible whereas only four were troublesome to the pharmacists in actuality. This means that the pharmacists are now well versed with the handwriting of various doctors and usually can read them.
9. Out of 26 prescriptions which had injections, ointments or drops in them, 11 prescriptions (42.30 percent) did not have the route of administration written on it.

10. Dates were not written on 5.43 percent prescriptions. This is troublesome in cases where the doctor writes new schedule of medicines on the previous prescription and the pharmacist is unable to distinguish between old and new schedule and ends up dispensing extra medicines.
11. Approximately 40.72 percent doctors use unapproved set of abbreviations which can be a reason of confusion while counselling. While HS can be confused for Half Strength as well 'at bed time', OD is generally used as 'Once Daily' whereas it means 'in right eye' or 'Overdose'. BBF, AL and AD is an abbreviation unique to few doctors in the hospital where they use it for 'Before Breakfast', 'After Lunch' and 'After Dinner'. QID stands for four times a day but is not present in the list of approved abbreviations (Annexure III) by the hospital under study.
12. Only 10.41 percent of handwritten prescriptions were written in capital letters to make the pharmacist's lives easier.

To summarize all the general and prescription specific factors affecting waiting time, Ishikawa's Cause and Effect diagram or Fish Bone diagram was made as shown below:

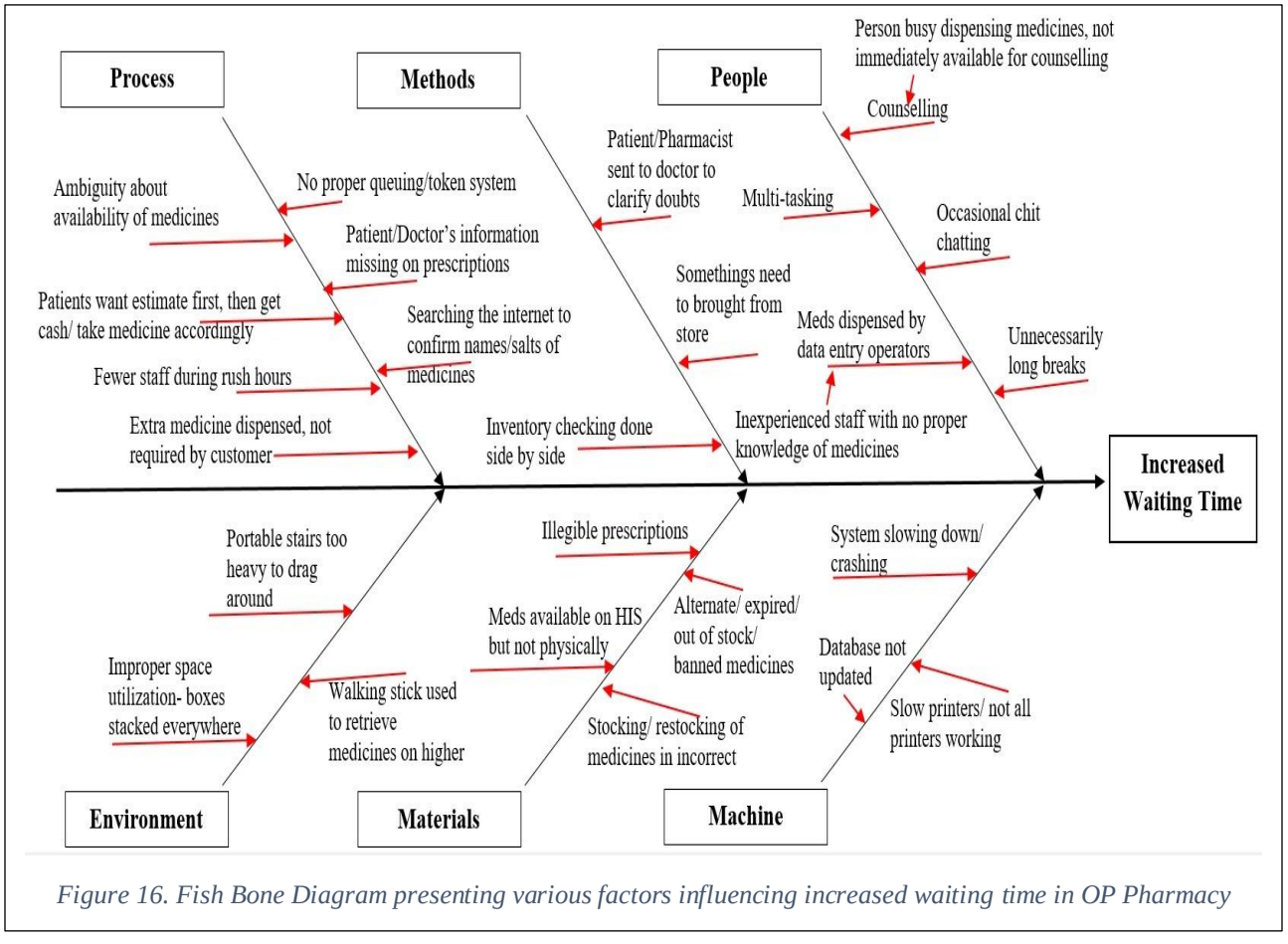

Figure 16. Fish Bone Diagram presenting various factors influencing increased waiting time in OP Pharmacy

Now that all the faults in the process of the pharmacy have been discussed, strengths of the OP pharmacy department should also be mentioned.

Strengths

1. Good team work among staff on professional level.
2. Technically well versed, pharmacists as well as data entry operators.
3. Work efficiently during peak hours.
4. Friendly rapport with each other.
5. Able to maintain their calm during stressful situations (peak hours, fewer staff, howling customers)
6. Maintain a register to note down out of stock medicines side by side.
7. Respectful to customers.
8. Frequently bought medicines (except psychotropic drugs), placed on one counter to save precious time.
9. Dedicated shelves for look-alike drugs, sound-alike drugs, psychotropic drugs, high alert medication (assigned specific colours), syrups and creams with their information written on same coloured paper for reference at any time.

Recommendations

Materials:

1. A laminated list of banned medicines should be made available in the pharmacy for reference at all times.
2. Prescriptions should be computerized/ printed pan hospital to avoid delays due to illegible handwriting.
3. Medicines near expiry should be identified and replenished well in time.
4. An extensive list should be worked out with the help of pharmacists and doctors of frequently prescribed medicines and their alternatives- approved by doctors' signatures to ensure customer satisfaction and not waste valuable time in going back to the doctor to get the alternative approved.
5. Editable templates of frequently dispensed set of vaccines can be created with the help of IT Department to save time during billing of vaccines.
6. Editable templates can also be made for set of medicines frequently prescribed together.

7. Medicines should be stocked in correct slots within 5 hours of procurement to avoid inconsistency between their HIS and physical quantity. This will also reduce the out of stock medicines incidents as the medicines will be replenished timely.
8. Bags of different sizes can be introduced to give different amount of medicines to avoid wastage of materials. Giving just one pack of medicines in a medium sized bag wastes a lot of money and material.
9. Bags of colour other than green (yellow and red) were seen being used in the OP Pharmacy. Red bag is generally used for high alert medication while yellow is used for stat and now orders. These should not be used to give general medicines to the customers.

Machine:

1. Printers should be serviced time to time to avoid sudden/untimely breakdowns.
2. Extra printer can be provided in the pharmacy as two billing systems share one printer.
3. Database should be cleaned and updated regularly with new medicines and discontinued/banned medicines should be removed.

Process:

1. Proper queuing system should be introduced and strictly implemented. Pharmacists should strictly dispense medicines according to the line.
2. Only one person per prescription should be allowed to stand at the counters.
3. Prescriptions with incomplete information (Patient's name/ Doctor's name/ Doctor's signature/ Date/ Dose etc.) should immediately be corrected and the concerned physician should be immediately warned/penalized.
4. Name of the patient, if not written, should be written side by side on the prescription, by the pharmacist or data entry operator.
5. Logs should be maintained for entry and exit of pharmacists/data entry operators to keep in check their break times. No staff should be allowed to be outside the pharmacy for more than 5 minutes under any circumstances, except during lunch break. Proper justification should be given if the time exceeds 5 minutes.
6. In spite of maintaining a log of out-of-stock medicines, non-availability of medicines needs to be checked. Re-Order Level (ROL) of at least frequently prescribed medicines in OP Pharmacy can be calculated and stocked accordingly.

7. Doctors who prescribe banned medicines or have illegible handwritings or need to be consulted for any matter during dispensing medicines should be contacted through phone first. In case the consultant is unreachable, only then should a pharmacist/data entry operator be allowed to go to the doctor directly. This will help keep a check on long, unexplained breaks by staff.
8. A dedicated counter for senior citizens can be assigned.
9. With some investment, a token system can be installed where a person submits the prescription at the counter and obtains a token number and is called again when their medicines are dispensed and ready to be billed. Biometric Token System can also be installed.
10. A security person can be assigned to ensure queueing system at pharmacy counters and avoid chaos.

Methods and People:

1. Instead of data entry operators, a complete team of pharmacists can be employed for billing purposes too. This would ensure correct dispensing of medicines and counselling even if the billing person has to get up to dispense medicines. As for existing staff, they seem to be well versed with various medicines, their salts and counselling. But the medicines they dispense should be checked by a pharmacist before giving to the customer. They can also be further trained to increase their efficiency.
2. A pharmacist can be deployed exclusively for counselling. However, with only 7 pharmacists with at least one always on leave, this may be difficult. Addition of pharmacists in the already existing team would ease the load to a great extent.
3. It is logical to assume that the OP-pharmacy is less busy at night. Therefore, tasks like inventory checking, stocking and restocking, checking for expired medicines, maintaining the Schedule H1 drugs file can be included in the job profile of pharmacists working in the night shift and should be checked daily to ensure their proper fulfilment of duties.
4. Fifteen minutes break can be given to each staff member to avoid burden and relieve stress and boredom.
5. Things which need to be brought from the store should first be intimated there. A staff member should leave to get it only when the IP pharmacy/store staff member

says that the item is ready to be taken. Since the IP pharmacy is located just a floor below, it should not take more than five minutes.

Environment:

1. Space in the pharmacy should be properly utilized. Unnecessary boxes should be removed as soon as they are empty.
2. A lighter weight staircase should be provided to access the medicines lying at top shelves, apart from the existing staircase.
3. Dustbin of the pharmacy should be covered to improve aesthetics and working environment.

Conclusion

While the average waiting time of 7.04 minutes of the OP-Pharmacy of the subject tertiary care hospital is commendable, it can further be reduced by factors identified in this observational study. Top factors contributing to increased waiting time are out of stock which also decreases customer satisfaction and name of patient and doctor not written on the prescription which delays billing process. Counselling is another factor which increases the billing time significantly than dispensing time. And the fact that it is done by data entry operators sometimes, may further increase the time. The need of the hour is to resolve the problem of out of stock medicines. Small changes like light-weight stairs and a security guard assigned to maintain queues outside pharmacy can be implemented without delay. Further studies should be based on a more consumer oriented approach linking pharmacy sales with customer feedback and satisfaction.

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A Study on Rational Use of Restricted Antibiotics in Medical Intensive Care Unit of a Tertiary Care Hospital

Introduction

Antimicrobial resistance (AMR) has emerged as a major health problem all over the world. Infections caused by resistant microbes fail to respond to treatment, resulting in prolonged illness, greater risk of death and increase in hospital acquired infections. Treatment failures also lead to longer periods of infectivity, with increased numbers of infected people moving in the community. This in turn exposes the general population to the risk of contracting a resistant strain of microorganisms. Also, there is general consensus that in-hospital antimicrobial resistance influences patient outcome and the allocation of resources. Changing antibiotic resistance patterns, rising antibiotic costs and the introduction of new antibiotics have made selecting optimal antibiotic regimens more difficult now than ever before. Because of this, broad spectrum antimicrobial resistant drugs have often been the target of attempts to restrict and control their use. Restricted antibiotics refers to those antibiotics that could contribute to development of multi-resistant. **The hospital under study also follows its own restricted antimicrobials policy, where such drugs should be prescribed to a patient if and only if the doctor has a proper clinical justification. The hospital's CPRS is designed in a way to ensure that no restricted antimicrobial is prescribed without justification. It also has its own list of restricted antibiotics and request form for the implementation of this policy (Annexure IV), however, the forms are currently not in use as the CPRS system solves the purpose of providing clinical justification.**

Restricted antibiotics prescribed in the hospital include:

1. Amphotericin B
2. Caspofungin
3. Colistimethate
4. Imipenem
5. Liposomal Amphotericin B
6. Meropenem
7. Micafungin
8. Polymyxin B
9. Teicoplanin
10. Voriconazole
11. Voriconazole
12. Linezolid

Rationale

The ICU is an important area for the emergence of antibiotic resistance, because of the frequent use of broad-spectrum antibiotics; the crowding of patients with high levels of disease acuity within relatively small specialized areas; reductions in nursing staff and other support staff due to economic pressures, which increase the likelihood of person-to-person transmission of microorganisms leading to increase in both, community acquired and hospital acquired infections; and the presence of more chronically and acutely ill patients, who require prolonged hospitalization and often harbour antibiotic-resistant bacteria. Therefore, implementation of restricted antibiotics policy and its regular monitoring is a must in every hospital, especially ICUs.

Objectives

1. To assess whether samples for culture are being sent after admission to MICU within 24 hours.
2. To assess which type of organisms cause infections that have occurred in MICU and whether they are hospital acquired or community acquired.
3. To observe whether restricted antibiotics are being prescribed as per restricted antibiotics policy.
4. To observe whether antibiotics is changed according to organism susceptibility reports.
5. To study whether clinical justification was provided every time a restricted antibiotics was prescribed.
6. To identify the most and the least prescribed restricted antibiotics.

Review of Literature

Christian Medical College, Ludhiana list the following as good antimicrobial prescribing practices: 1. Send for the appropriate investigations in all these infections as recommended. These are the minimum required for diagnosis, prognosis and follow up of these infections. 2. All antibiotic initiations would be done after sending appropriate cultures 3. Change in antibiotic would be done after sending fresh cultures 4. Follow the Hospital policy when choosing antimicrobial therapy whenever possible. If alternatives as chosen, document the reason in the case records. 5. Check for factors which will affect drug choice & dose, eg, renal function, interactions and allergy. 6. Check that the appropriate dose is prescribed. If uncertain, contact Infectious disease physician, Pharmacy, or check in the formulary. 7.

The need for antimicrobial therapy should be reviewed on a daily basis. For most infections 5 – 7 days of antimicrobial therapy is sufficient (simple UTIs can be adequately treated with 3 days of antibiotic). 8. All IV antibiotics may only be given for 48 – 72 hours without review and consideration of oral alternatives. New microbiological or other information should at this stage often permit a switch to oral antibiotic(s), or switch to an IV narrow spectrum alternative, or cessation of antibiotics (no infection present). 9. Once culture reports are available, the physician shall step down to the narrowest spectrum, most efficacious and most cost effective option. If there is no step down availed, the reason shall be documented and is subjected to clinical audit. 10. Empiric Therapy - Where delay in initiating therapy to await microbiological results would be life threatening or risk serious morbidity, antimicrobial therapy based on a clinically defined infection is justified. Where empiric therapy is used the accuracy of diagnosis should be reviewed regularly and treatment altered/stopped when microbiological results become available. 11. Microbiological samples must always be sent prior to initiating antimicrobial therapy. Rapid tests, such as Gram smears, can help determine therapeutic choices when empiric therapy is required. 12. Prescribing antibiotics just in case an infection is present is rarely justified. Where patients are in hospital close observation is usually a better option.

The following protocol is ideal to ensure rational use of antibiotics:

• Identify the type of infection – Respiratory, intra-abdominal, pneumonia, blood stream, urinary tract and skin and soft tissue.

• Define the location – ICU or ward patient.

• Accordingly refer to the respective blood stream line or urinary stream line charts for ICU or general ward worked out by extensively by a team of multi-speciality doctors.

• Refer to the empiric/presumptive therapy column.

• This will give the protocol drug to start.

• If a column has more than one drug option –

- Choose the drug showing better susceptibility data in the left hand side table OR
- Doctor's discretion advised.

• Send respective cultures before starting antibiotic therapy.

• Once culture / sensitivity report available:

- Presumptive therapy antibiotic may require to be changed.

- Consult Microbiologist / ID physician to decide the choice of antibiotic (based on narrowest spectrum antibiotic which covers the pathogen isolated)

• In all cases physician's discretion is advised based on patient condition

In the policy worked out by Doncaster and Bassetlaw Hospitals to ensure appropriate use of restricted antimicrobial agents and that adequate consultation precedes their use, they suggest that restricted antibiotics should only be supplied with Consultant Microbiologist's approval (in which case, a code must be obtained) OR when used in line with a current pre-agreed list of approved indications (A list of current approved indications should be available on the HIS). Only antimicrobial agents that are listed in the Trust formulary may be used without the consent of a Consultant Microbiologist. The pharmacy technicians should not dispense a restricted antibiotic unless the inpatient supply form is microbiology department approved or there is a pre-agreed indication for the particular antibiotic. If there is any doubt about whether approval has been given, the Antimicrobial Pharmacist or the Consultant Microbiologist should be contacted.

Antibiotic Stewardship programmes and Antibiotic Cycling are some other effective policies to control unchecked usage of restricted antibiotics. Antimicrobial stewardship is the systematic effort to educate and persuade prescribers of antimicrobials to follow evidence-based prescribing, in order to stem antibiotic overuse, and thus antimicrobial resistance. The following are some examples in this regard: fluoroquinolone use and MRSA; vancomycin use and vancomycin-resistant enterococci; cephalosporin use and cephalosporin-resistant Enterobacteriaceae; and carbapenem use and carbapenem-resistant Acinetobacter, Pseudomonas, and Enterobacteriaceae. Recent research demonstrated that restricting ciprofloxacin use improve susceptibility of P. aeruginosa to the Group 2 carbapenems, such as imipenem or meropenem. A reduction by 90 percent in the use of ciprofloxacin between 2000 and 2010 led to a concurrent reduction (25 percent to 10–15 percent) in the proportion of carbapenem-resistant P. aeruginosa, although carbapenem use increased from 12 daily defined doses (DDDs)/1,000 patients in 2004 to 28 DDDs/1,000 patients in 2010.

Antibiotic heterogeneity, such as antibiotic cycling (also known as "antibiotic rotation") or antibiotic mixing (also known as "antibiotic diversity"), continues to be a debatable subject, although many investigators have studied its effects on antibiotic resistance with the help

of clinical investigations or theoretical models. Antibiotic cycling involves an exchange of one class of antibiotics with those of a different class possessing a similar spectrum of activity, but different mechanisms of antibiotic resistance (e.g., β-lactams, aminoglycosides, and fluoroquinolones). In theory, it seems that such strategies can strongly block the establishment of a stable resistant population, but clinical evidences do not vindicate the modelling predictions. In 2004, mathematical modelling suggested that antibiotic cycling is unlikely to reduce antibiotic resistance, and that antibiotic mixing may prove to be more effective

Data Collection

Setting: The study was carried out in the MICU of a tertiary care hospital located on the second floor of the main building. It has 37 beds including 4 isolation beds for barrier nursing. It has an average occupancy rate of 30 or 81.08 percent.

Research Design: Descriptive, cross-sectional, qualitative study.

Study Population: The study was conducted among all patients suffering from different/multiple diseases admitted to MICU over a period of 15 days.

Sample Size: 82

Methodology: The study was carried out over a 15-day period in which all the existing and new patients of MICU were monitored. **The CPRS system was used to note down information like name, age, gender, SSN number, consultant, speciality, date of admission in MICU, date of discharge, primary diagnosis, culture sent within 24 hours, sample taken for culture, cultures, restricted antibiotic start, was antibiotic started according to antibiotic policy, was antibiotic changed according to the culture report, antibiotic, dose, frequency, start date, stop date, antibiotics showing sensitivity and justification.** This data was further analysed to draw meaningful inferences.

Observations and Analysis

1. Following table depicts the percentage of samples sent for culture within 24 hours of admission. Ideally, every patient's sample should be sent for consultation. However, as seen in the table, practically this has not been fully achieved.

Table 10. Compliance with MICU Policy for Cultures

Were samples sent for Culture within 24 hours of admission within MICU?	
Yes	61
No	21
Percentage Failure in Compliance of MICU Policy	**25.61%**

2. Following table gives the statistics for the number of patients who were prescribed restricted antibiotics along with their compliance statistics with the Antibiotics Policy.

Table 11. Compliance Statistics of Restricted Antibiotics Policy

How many patients were given Restricted Antibiotics?	30	35.59% (Out of 82)
How many of them started according to Antibiotics Policy?	15	50.00% (Out of 30)
How many of them *did not* start according to Antibiotics Policy?	15	50.00% (Out of 30)
How many of them were changed according to culture reports?	20 (Including cases where right RA had been started from the beginning)	66.67% (Out of 30)
How many were *not changed* according to culture reports?	10	33.33% (Out of 30)

3. Following table depicts the restricted antibiotics prescribed to 30 out of 82 patients studied. Rest of the patients were not prescribed any restricted antibiotics.

Table 12. Various Restricted Antibiotics Prescribed

Restricted Antibiotics	**Frequency**	**Not started according to policy**	**Not changed according to culture report**
Inj. Amphotericin B	3	1	1
Inj. Caspofungin	1	1	0
Inj. Colistimethate	4	2	1
Inj. Imipenem	3	2	0

Inj. Liposomal Amphotericin B	1	0	1
Inj. Meropenem	**24**	14	8
Inj. Micafungin	1	1	1
Inj. Polymyxin B	3	1	0
Inj. Teicoplanin	**14**	9	4
Inj. Voriconazole	1	0	1
Tab. Voriconazole	2	0	1
Inj. Linezolid	1	0	0

4. Following table summarizes various organisms found to infect various type of samples along with the general frequency of occurrence of the organism in the sample population.

Table 13. Various organisms causing infection, type of samples in which they occurred and frequency

Name of organism	Type of samples	Frequency
Acinetobacter baumannii	Blood, tracheal secretions, sputum, bronchus and alveolus (CS)	5
Candida albicans	Blood, tracheal secretions, sputum	3
Candida tropicalis	Blood, urine	3
Enterobacter cloacae	Urine	1
Enterococcus faecium	Urine, Pus	4
Escherichia coli	Urine, Blood, Swab- Pus, Swab-wound, Culture tip	17
Klebsiella pneumoniae	Blood, secretions, pus, drain fluid, urine, tracheal secretions, sputum, bronchus and alveolus (CS)	12
Non-albicans Candida species	Urine	1
Pseudmonas aeruginosa	Urine, secretions, sputum, tracheal secretions	5
Sphingomonas paucimobilis	Urine	1
Staphylococcus aureus	*Blood, urine, secretions*	3
Suggestive Zygomycetes (Mucorales)	*Scraping from lesions on palate*	1

5. Following antibiotics were prescribed to patients even when their culture reports were sterile

Table 14. Restricted Antibiotics started even sterile reports

Name of Restricted Antibiotics started even when culture reports sterile	Frequency
Inj. Amphotericin B	1
Inj. Meropenem	13
Inj. Polymyxin B	2
Inj. Teicoplanin	1
Tab. Linezolid	1
Tab. Voriconazole	1

6. There were **10** out of 58 prescribed RAs (17.24 percent) were observed where **clinical justification for prescribing restricted antibiotics were not mentioned**. These were observed for **Meropenem, Teicoplanin, Imipenem and Colistimethate.** Various clinical justifications given were:
    a. Patients at risk of MDR infections.
    b. Resistant to all other antibiotics.
    c. Not responding to previous antibiotics therapy.
7. There were **12 cases** where infection was seen in a sample other than that that was sent within 24 hours of admission and came back sterile or where samples were not sent within 24 hours at all. These were usually sent for culture 2-3 days after admission to MICU.
8. Possible **HAIs** were observed in s**even cases (8.54 percent)** among these 82 samples involving organisms like *Acinetobacter baumannii, Pseudomonas aeruginosa, Candida tropicalis (2), Enterococcus faecium(2), Klebsiella pneumoniae*.
9. Following type of discharges were seen among the 82 patients monitored:

Table 15. Types of Discharges

Type of Discharge	Count
Normal	59
Expired	7
LAMA	10
Yet to be discharged	6

Interpretation

1. Samples of 25.62 percent of the patients studied were not sent for culture within 24 hours of admission to MICU. This shows serious non-compliance with the hospital's own policy of doing so. However, it may be possible that the clinical condition of these patients was such that the doctors didn't need to send their samples for culture, example- Total Leucocyte Count within the range of 4-10 per nano litre or 4000-10000 per micro litre. Or they were purely cases of sheer negligence.
2. Only 50 percent of the patients were given restricted antibiotics according to the Antibiotic policy. Furthermore, only 33.33 percent of them were changed according to the results of culture reports. It was also observed that certain already started restricted antibiotics showed negative susceptibility in the reports but were still continued thereafter. This may be explained by the fact that patient's previous treatment involved the use of same antibiotic, therefore this antibiotic has to be given to prevent Multi-Drug Resistance. Or it's been given based on familiar symptoms pertaining to a condition known to have been treated by that antibiotic till the actual results arrive or simply as a prophylactic precaution.
3. Meropenem and Teicoplanin are the most prescribed restricted antibiotics in MICU. Sadly they also make their way in the list of restricted antibiotics prescribed without justification as show in point 6.
4. *Escherichia coli* and *Klebsiella pneumoniae* were the most prevalent microorganisms in the study. *Klebsiella pneumonia* was also seen to be hospital acquired in this sample population.
5. Patients were also administered with restricted antibiotics in spite of their culture reports shown to be sterile. This can again be explained by the fact that patient's previous treatment involved the use of same antibiotic, therefore this antibiotic has to be given to prevent Multi-Drug Resistance or simply as a prophylactic precaution. Meropenem is again the most frequently prescribed restricted antibiotics in this category.
6. **The 10 cases where restricted antibiotics were prescribed without any clinical justification points out serious flaws in the CPRS system of the hospital and can be majorly to irrational use of restricted antibiotics. This is one issue that must be addressed since giving justification for RAs is the only method adopted by the hospital under study to rationalise the use of antibiotics.**

7. Cases where it was seen that common sample sites like blood and urine did not show positive results but the patient still showed signs of deterioration is a topic of concern. It can either be attributed to doctor's tendency to undermine certain symptoms only to find them life-threatening later, negligence while ordering tests or hospital acquired infections which show their symptoms later during the treatment. There were also three cases where there were no reports from the laboratory for that particular sample several days after collection. This shows serious mismanagement on the part of laboratory authorities.
8. HAIs is also an issue in MICU where cross infections were seen in 8.54 percent of the cases. These need to be prevented implementing many established successful strategies to avoid HAIs.
9. While majority of the patients- 71.95 percent were treated successfully, sadly 8.54 percent patients couldn't survive and 12.20 percent patients took LAMA for various reasons. These statistics should be improved to increase customer satisfaction.

Recommendations

1. **The hospital under study does have an extensively worked out Antibiotics Policy. However, the only action in the name of RA carried out here is asking for a clinical justification when prescribing, which too isn't free of errors.** Therefore, a more stringent policy should be applicable. Example:

   Antibiotics Stewardship Programme: Antimicrobial stewardship is the systematic effort to educate and persuade prescribers of antimicrobials to follow evidence-based prescribing, in order to stem antibiotic overuse, and thus antimicrobial resistance. Many institutions conduct ASPs to optimize antimicrobial therapy, reduce treatment-related cost, improve clinical outcomes and safety, and reduce or stabilize antimicrobial resistance. ASPs have demonstrated a link between antimicrobial use and the emergence of resistance. The formal guidelines for ASPs were developed in 2007 by the Infection Diseases Society of America (IDSA) and the Society of Healthcare Epidemiology of America (SHEA). Typically, ASPs are executed by multidisciplinary antimicrobial utilization teams comprising physicians, pharmacists, microbiologists, epidemiologists and infectious disease specialists, with adequate experience in their respective fields.

   ASPs are based primarily on education, coupled with the "front-end" interventions (e.g., restricting the availability of selected antimicrobial agents) or the "back-end"

interventions (e.g., reviewing broad-spectrum empirical therapy and then streamlining or discontinuing therapy on the basis of antimicrobial susceptibility testing (AST) results and clinical response). In the "front-end" interventions, the following aspects can be included: (i) the development of situation-specific treatment guideline; (ii) education of prescribers; (iii) AST; (iv) accurate organism-identification; (v) understanding pharmacokinetic (PK) and pharmacodynamic (PD) properties of drugs which helps selecting optimal dose and duration of antibiotics; (vi) minimizing the effect of antibiotics on the microbiota and host immune homeostasis; and (vii) formulary restriction and preauthorization. Formulary restriction and preauthorization is particularly considered as the main strategy in IDSA/SHEA guidelines and several studies show that this strategy has been proven successful in reducing the use of antibiotics and pharmacy cost.

In the "back-end" interventions, the following aspects can be included: (i) clinical decision support; (ii) post-prescription review and feedback; (iii) the development of protocols for de-escalation of therapy on the basis of AST and clinical response; (iv) diagnostic testing using biomarkers such as procalcitonin or C-reactive protein (CRP); (v) determination of therapy length; and (vi) antibiotic heterogeneity (cycling and mixing). Post-prescription review and feedback is one of the cornerstones of ASPs. Although the therapy can be continued indefinitely, at the discretion of the treating clinician, for 48–72 hours after initial antimicrobial prescription, post-prescription review by multidisciplinary antimicrobial utilization teams is required to either modify or discontinue treatment, depending on the clinical responses and guidelines; also, appropriate feedback can be provided to prescribers in order to modify or discontinue therapy. Several studies demonstrated useful outcome from post-prescription review and feedback strategy

The hospital can work out its own customized Restricted ASP guidelines for RA as done by Christian Medical College, Ludhiana and John Hopkins, USA. It involves clear descriptions of all RA and guidelines for prescribing them before and after the culture reports according to the age, diagnosis and previous treatment of the patient. This may be time consuming but will prove to be a full proof method to check MDR (1, 2).

2. The flaw in the CPRS where it allows the doctors to prescribe RA without giving any justification should be immediately identified and corrected.

3. Since the average occupancy of MICU is 20, the medication being given to various patients, especially RA should be monitored at least daily. Change of medication after culture reports and justification provided for RA should be emphasized upon.
4. The CPRS system can further be modified to incorporate reminders for the doctors and nursing staff to send the patient's appropriate samples for culture within 24 hours of their arrival in MICU.

Conclusion

From review of literature we gathered that ASPs are a very effective way to rationalise the use of RA. This practice is yet to be implemented by the tertiary care hospital in question. The only measure taken here is the CPRS system demanding for a justification while prescribing RA which too is flawed. Ten RAs in this study were prescribed without any justification. Also, the standard policy of sending samples for culture within 24 hours of admission to MICU was not followed in 25.91 percent cases. HAIs and not changing of antibiotics after susceptibility tests is also a prevalent issue. The need of the hour is to immediately correct the flaw in CPRS system to ensure justification of prescribed RAs. Also, a detailed ASP should be planned and implemented to further rationalise use of RAs. Once the ASP is implemented, a follow-up study should be conducted to assess the success of the intervention.

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Annexures

Annexure I- Time-Monitoring Card for Pharmacy Waiting Time

Date	S.No.	Name of Patient	Waiting time						Observations about Prescription	Issue with Prescription
			Medicines Dispensing Time		Billing Wait		Billing			
			Start	Stop	Start	Stop	Start	Stop		

Annexure II- Checklist for Prescription Audit

Scan no.	S. No.	Name of Doctor	Printed prescription	Prescription Order are Clear & legible(If Manual)	Route of administration (other than oral- IV, IM , SC)	Date written	Whether Do Not use Abbreviation's have been used in prescription	If yes, which abbreviations	Capital Letter

Annexure III- Standard List of Medication Related Abbreviations

ABBREVIATION	MEANING
Bd	Twice daily
Tds	Three times a day
unit(s)	International unit
PO	Per oral/by mouth
NG	Nasogastric
Inj.	Injection
IV	Intravenous
IV drip	Intravenous drip
IM	Intramuscular
PR	Per rectum

PV	Per vagina
a.c.	Before meal
CAP	Capsule
LA	Local anaesthesia
NPO	Nothing per os (mouth)
R_X	Take thou(treatment)
SOS	When necessary only
Stat	At once/immediately
Supp	Suppository
PP	Post prandial
Vit.	Vitamin
Wt	Weight
p.c.	After meal
Tab	Tablet
Res	Respule
Oint.	Ointment
Neb	Nebulisation
RT	Ryles tube

Annexure IV- Restricted Antibiotic Usage Indication Form

Patient Identification Label

RESTRICTED ANTIBIOTIC USAGE - INDICATION FORM

Consultants are required to fill the "Indication Form" if prescribing the below listed "Restricted Antibiotics". **List of Restricted Antibiotics:** 1. Carbapenems – Imepenem, Meropenem, Ertapenem, Donipenem 2. Colistin, Polymyxin-B 3. Linezolid 4. Teicoplanin 5. Daptomycin 6. Tigecycline 7. Antifungal – Voriconazole, Amphotericin B, Caspofungin, Micafungin, Anidulafungin	**Diagnosis:** **Date of Admission of patient:** **Date of Starting the Restricted antibiotic:** **Mark Category:** ○ **Antibiotic** ○ **Antifungal** **Name of Antibiotic/ Antifungal**

Mention any Positive Investigation Reports/ Indications related to Infection:	**Lab Investigation/ Culture to be sent:** **Culture report:**

Indication:	**Please Tick wherever appropriate**				
Pneumonia		**SSI**		**Community Acquired**	
UTI		**Intra abdominal**		**Hospital Acquired**	
Blood Stream Infection (BSI)		**Any Others** (Please mention):			

Risk Factors for ESBL:	**Please Tick**	**Risk Factors for MDR Infection:**	**Please Tick**
Prior Antibiotic Use (within 90 days)		Prior Antibiotic Use (within 90 days)	
Recent Hospitalization (> 2 days, within 90 days)		Recent Hospitalization (> 2 days, within 90 days)	
Current Hospitalization (> 5 days)		Current Hospitalization (> 5 days)	
Prolonged Mechanical Ventilation (> 3 days)		Chronic/ Nursing home care	
Immunosuppression		Dialysis	
Risk Factors for Invasive Candidiasis/ Candidemia	**Please Tick**	**Risk Factors for MRSA**	**Please Tick**
Immunosuppression		Immunosuppression	
Dialysis		Dialysis	
Prolonged Hospitalization (> 5 days)		Exposure to MRSA	
Previous Broad Spectrum Antibiotic use		Age > 65 years	
CVP/ HD Catheter/ PA Catheter		Chronic/ Nursing home care	
Total Parenteral Nutrition		Multifocal Candida Colonisation	

Consultant:	
Name:	Date:
Signature:	Time: