

**TO STUDY THE FACTORS AFFECTING AVERAGE LENGTH OF STAY
(ALOS) OF PATIENTS WITH A VIEW TO SUGGEST MEASURES TO
REDUCE THE ALOS TO IMPROVE CUSTOMER SATISFACTION AND
REVENUE GENERATION IN A TERTIARY CARE HOSPITAL.**

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree

of Master of Business Administration (MBA)

in

Hospital and Health Management

by

Suhani Rastogi

Under the Supervision and Guidance of

Dr (Col) Mahender Kumar

2022

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled to study the factors affecting average length of stay (alos) of patients with a view to suggest measures to reduce the alos to improve customer satisfaction and revenue generation in a tertiary care hospital is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Name of Student: Suhani Rastogi

Date: 20th June 2022

Certificate of completion

Certificate No – 2022/10984

CERTIFICATE OF ACHIEVEMENT



Max Institute of Medical Excellence

Certifies that

Suhani Rastogi

has completed Internship in the department of

Medical Administration

at Max Super Speciality Hospital, Patparganj, New Delhi

from 23rd March 2022 to 19th June 2022

A handwritten signature in blue ink, reading "Vinitaa Jha".

Dr Vinitaa Jha

EVP Research & Education
Max Healthcare Institute Ltd

CERTIFICATE

This is to certify that dissertation titled to study the factors affecting average length of stay (alos) of patients with a view to suggest measures to reduce the alos to improve customer satisfaction and revenue generation in a tertiary care hospital is a record of the research work undertaken by (Name of Student) in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management)/MBA (Pharmaceutical Management)/MBA (Rural Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide- Dr (Col) Mahender Kumar
IIHMR University, Jaipur
Date- 28th June 2022

School Dean- Dr (Col)
Mahender Kumar
IIHMR University, Jaipur
Date-28th June 2022

Abstract

Background

The length of stay (LOS) is an important indicator of the efficiency of the hospital management. Reduction in the number of in-patient days results in decreased risk of infection and medication side effects, improvement in the quality of treatment, and increased hospital profit with more efficient bed management. The purpose of this study was to determine what factors are associated with length of hospital stay, based on raw data collected in months of April and May, to manage hospital, stay more efficiently.

Materials and methods

Research subjects were retrieved from database of patients admitted in MAX Hospital, Patparganj between 1st April to 31st May. Patients were analyzed according to the multistage sampling technique. Cluster sampling, here in this study each specialty is considered as a cluster. From here purposive sampling was done according to mode of payment i.e., Category B (Corporate and CGHS) and Category C (Cash and TPA).

Results

Overall, 55.7% [979] of inpatients were discharged within 4 days. The department of pulmonology had the highest average LOS at 5.9 days. Gastroenterology department has the highest prolonged stay of patients [33%] when compared with other 4 specialties. Orthopedics has the least prolonged stay [13%]. ALOS when compared payment mode wise, CTI patients have comparatively higher prolonged stay in May than in April. Maximum IPD patients belong to TPA category [54.10%]. Only 1.20% patients are international patients. Pulmonology patients belonging to PSU category have highest prolong stay i.e., more than 7 days [59.5%]. Gastroenterology patients belonging to CTI category have highest prolong stay, more than 4 days [71%].

Conclusion

Accurate understanding of the factors associated with the length of stay and progressive improvements in processing and monitoring may allow efficient management of the Average length of stay of inpatients.

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MAX SUPER SPECIALITY HOSPITAL, PATPARGANJ

List of Abbreviation

- ALOS: Average length of stay
- LOS: Length of stay
- CSSD: Central sterile supply department
- COW: Computer on wheels
- GDA: General duty assistant
- MRR: Medical Record room
- ICU: Intensive Care Unit
- IP: In-Patient
- PAC: Pre-anesthetic checkup
- TPA: Third party Administration
- TAT: Turnaround Time
- AHU: Air handling unit
- OPD: Outpatient department
- HDU: High Dependency unit
- NICU: Neonatal intensive care unit
- PICU: Pediatric intensive care unit

Acknowledgement

On the completion of my dissertation, I would like to express my gratitude to the people who has been the part of this endeavor in numerous ways. Firstly, I want to express my gratitude to almighty god for keeping me in good health, respects and love to my parents, my brother and my friends for constant encouragement and motivation in my higher studies.

The internship opportunity I had with MAX Hospital, Patparganj, Delhi was a great chance for learning and professional development.

I feel deeply privileged in expressing my deep sense of gratitude to Dr. Nidhi Saxena (Medical Superintendent) MAX Hospital, Patparganj, Delhi who inspired, guided, and helped me to complete my project at their respected organization. I take this moment to recognize her contribution gratefully.

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My sincere gratitude to my mentor Dr (Col) Mahender Kumar (Professor and dean IIHMR and Proctor) for his constant encouragement and for being my support all through the internship.

Sincerely,

Suhani Rastogi

OVERVIEW OF MAX HOSPITAL PATPARGANJ

- **HOSPITAL PROFILE**



Figure 1and 2: MAX Hospital, Patparganj

Max Super Speciality Hospital, Patparganj is 400+ bed Healthcare facility and a unit of Balaji Medical. Diagnostic Research Centre, providing services in medical disciplines of Cardiac Sciences, Oncology, Neurosciences, Obstetrics and Gynaecology, Orthopaedics, Urology and Kidney Transplants, Minimal Access, Metabolic, and Bariatric Surgery, among others. Equipped with 116 ICU beds and 14 HDU beds, Max Super Speciality Hospital Patparganj brings together patient-centric care and the latest innovations in medical technology.

With over 510 medical experts and leading doctors, and a nursing staff of over 770 nurses, each and every individual of the Max Patparganj family is committed towards providing the highest standard of medical care in the world. Armed with state-of-the-art technology, 11 high-end modular Operation Theatres, and a commitment to provide patient-centric care, we make sure that every patient who walks through the doors of Max Healthcare gets a holistic healing environment that they deserve. With our NABL accredited Max Lab and NABH accreditation, we aim to deliver the highest standard of healthcare.

With over 28 clinical specialities, Max Super Speciality Hospital, Patparganj offers the advantage of integrated medical care in a multidisciplinary setting provided by a faculty of highly qualified doctors, nurses, & healthcare professionals. Comprehensive specialist services are provided with advanced medical technology, making it a regional hub for complex procedures such as neurovascular interventional procedures, targeted cancer treatments, heart surgeries, orthopaedic surgeries, and Fertility treatments. Max Super Speciality Hospital, Patparganj is an established leader among healthcare providers with multiple awards and industry accreditations to its name for world-class infrastructure, advanced technology, and health and safety standards.

Hospital Values:

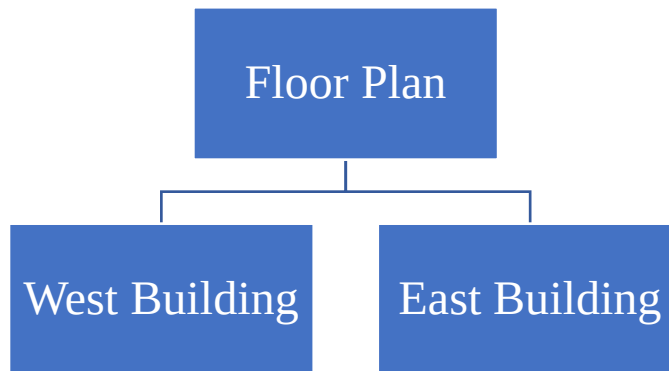
- **COMPASSION**-The hospital has a deeper level of patient understanding and are always empathetic to their needs. This encourages a culture of providing a higher standard of patient-centred care. The hospital staff respect each other and the patients and ensure that their needs are met with dignity. The hospital rises to the occasion each time for it recognise the positive social impact it can create.
- **EXCELLENCE**-The hospital asks more of themselves and are always passionate about achieving the highest standards of medical expertise and patient care. They understand that being the best is a continuous journey of becoming better versions of ourselves every day.
- **EFFICIENCY**-It creates a responsive healing environment, by being nimble to the needs of their patients and delivering what they really need with precision and timing. They are focused yet fast, personal yet practical, advanced yet seamless in delivering the exact care our patients need
- **CONSISTENCY**-It always deliver on their commitment and ensure the highest level of patient care is met at every stage, every time. The hospital believes that only through consistency can it achieve its patients' trust and fulfil their goals

Accreditations: MSSHP

- NABH accredited hospital in Patparganj, Delhi by Quality Council of India for maintaining high standards in Clinical Care and Support Services.
- 1st NABH accreditation received in 2011, confirming our commitment to maintaining high standards in Clinical Care and Support Services.
- NABL accredited, confirming our commitment to continuous quality improvement.



- **HOSPITAL LAYOUT**



MAX is a renowned name and has two buildings. The main buildings are on the opposite sides of the road. The buildings are connected through an underground tunnel which is basically meant for shuttles

(A) West BUILDING

BASEMENT-

- CSSD
- Staff canteen
- Training Hall
- Staff Library
- Staff changing Room
- Physiotherapy and occupational therapy (6 Treatment rooms)
- MRR
- Uniform issue room
- IP Bill/TPA Desk
- AHU Room

GROUND FLOOR –

- Reception
- OPD
 1. Anesthesia and Reconstructive surgery (Plastic surgeon)
 2. Cardiac Surgery

3. Cardiology
4. ENT
5. Anesthesia and Reconstructive surgery (Plastic surgery)
6. Pulmonology
7. Thoracic Surgery and robotic thoracic surgery

- Pharmacy
- Patient cafeteria
- Blood Bank
- Oncology day care
- Admixture lab
- Economy ward
- Economy extension ward
- Anesthesia and Reconstructive surgery (Plastic surgery)
- Pulmonology
- Thoracic Surgery and robotic thoracic surgery

1st FLOOR-

- OPD
 1. Department of Nephrology
 2. Department of Minimal access, Metabolic and Bariatric surgery
 3. Department of Gastroenterology
 4. Department of Endocrinology
 5. Department of Dentistry
 6. Department of Gynecology
 7. Department of Ophthalmology
 8. Department of Pediatrics
 9. Develop-Child Behavior preadolescent
 10. Dermatology and trichology
 11. Dietician
 12. Department of Orthopedics
- Dialysis Room (16 Beds)

- Sample collection Room
- Bhai Mohan Singh ward (21 Beds)

2nd FLOOR-

- Endoscopy Room
- HDU
- General Ward (8Beds)
- Single Sharing rooms (10 Beds)
- Double Sharing Rooms (14 Beds)
- Economy ward (13 Beds)
- surgical Day care (6 Beds)
- Typing Room
- Doctors Room

3RD FLOOR-

- NICU (18 Beds)
- Nursery (6Beds)
- PICU(8Beds)
- Labour Delivery room(10Beds)
- Operation Theatre(5Beds)
- Doctors room
- Patient Waiting rooms
- Pre/Post labour room
- Counselling Room

(B) East BUILDING

BASEMENT -

- Radiology
- Nuclear Medicine
- Day care
- IP Billing

- TPA Desk
- Corporate Desk
- MRI/ CT scan /Ultrasound/X-ray

GROUND FLOOR-

- OPD
 1. Department of Anesthesia
 2. Department of Bone marrow transplant and hematology
 3. Department of Medical oncology
 4. Department of Surgical oncology
 5. Department of Uro-oncology
 6. Department of Gi-oncology
 7. Department of Gynae oncology
 8. Department of Orthopedic oncology
 9. Department of Pead. Oncology
 10. Department of Radiation Oncology
 11. Department of Onco Thoracic Surgery
 12. Department of Orthopedics
 13. Department of General and Laparoscopic Surgery
 14. Department of G.I. Surgery
 15. Department of Internal Medicine
 16. Department of Pediatrics
 17. Department of Neurosurgery/spine/Neuro Oncology
 18. Department of Neurology
 19. Department of Tobacco Cessation clinic
 20. Department of Urology
 21. Department of Vascular Surgery

➤ 1st FLOOR

- MICU-12 Beds
- CCU-10 BEDS
- NEURO ICU- 8 BEDS
- NSICU-8 BEDS

- Cath Lab

➤ **2ndFLOOR**

- CTVS ICU -8 BEDS
- Wards (Classic Deluxe, Single, Double, Economy)

➤ **3rd floor**

- Wards (Single, Double, Economy)
- Diagnostic lab

➤ **4thFloor**

- Wards (Single, Double, Economy)

➤ **5thFloor**

- Wards (Single, Double, Economy)

➤ **6th Floor**

- Wards (Single, Double, HCC)

➤ **7th Floor**

- Wards (Single, Double, Economy)
- VIP Suite

➤ **8thFloor**

- Wards (Single, Double, Economy)

➤ **9th Floor**

- MICU
 - A Wing-12Beds
 - B Wing-8 Beds
 - C Wing-5Beds
 - D Wing-5Beds

IN-PATIENT DEPARTMENT (IPD)

- IPD is distributed over 2nd and 3rd floor of old building and 1st floor to 9th floor in new building.
- Every bedside has:
 - Details of consultant, nurse and mentor written at the top of every bed.
 - Room equipment checklist- side rails, Oxygen, Suction.
 - Important instructions.
- The rooms available in IPD have the following structure of beds per room:
 - Economy room- 4-5 beds per room.
 - Twin sharing- 2 beds per room
 - VIP Suite
- Every floor has a central nursing station with
 - Information board covering:
Designation and contact number of:
 - Duty doctor
 - Administration staff
 - Floor manager
 - Support staff
 - Ward secretary
 - Bed manager
 - Nurse's names with shift timing and designation (8-10 nurses per shift)
 - Computer on wheels (COW)
 - Cupboards with forms-down time form, investigation track sheet, blood request form, PAC sheet, informed consent, inventory files and registers.
 - Medication forms and Pantry
 - Biomedical Waste Disposal
 - Nurse to bed ratio- 1:5 or 1:6
 - General Duty Assistants (GDA)s – 2 to 3 in every shift
 - Quality Indicators are: Patient Fall, Hyperglycaemia, Needle Stick Injury
 - Process of admission of new patients to IPD

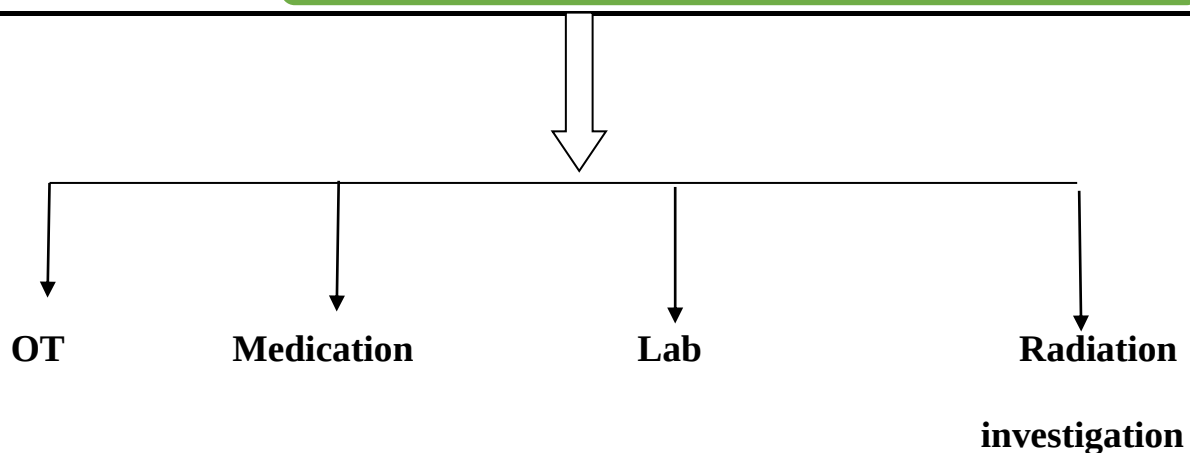
Patient comes to the floor along with a face sheet, admission request form and then ID band is tied on the wrist of the patient on receiving the patient.

Nursing assessment done (age, height, weight, vitals, allergies, risk assessment, requirement of an interpreter or not).

Concerned doctor is informed about the patient and the medications and instructions are entered in computerized patient record System (CPRS), reviewed by IPD Pharmacy.

Doctors rounds along with dieticians, floor mentors, nursing supervisor- Housekeeping Patient assessment is done and complaints are taken if any.

Plan of care decided for the patient.



- **Barrier nursing**

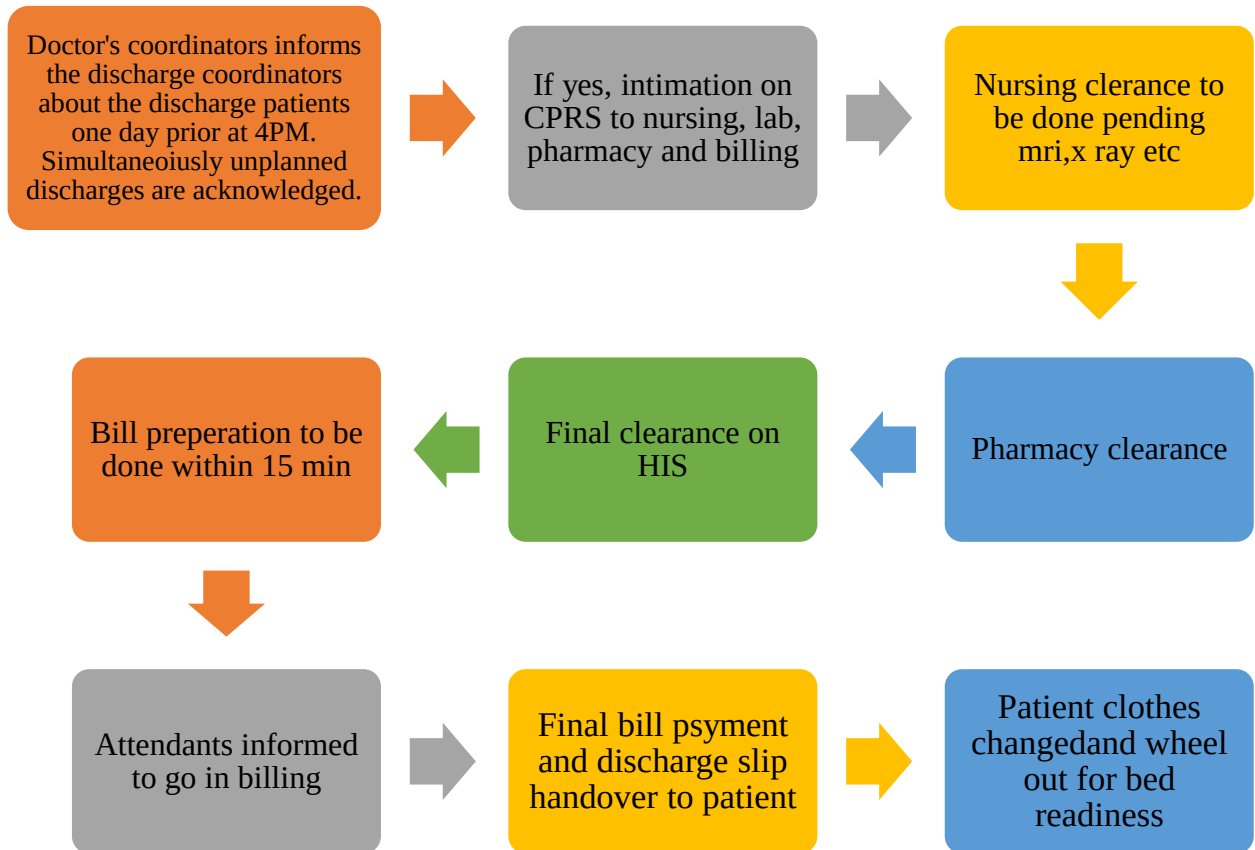
Isolation of the patient in case the blood or urine culture of the patient has been tested positive for any infection so that the infection doesn't spread to others.

- **Reverse barrier nursing**

Done in case where patient is immune compromised so that infection doesn't travel to him from others.

- **Discharge**

Process flow of patients from IPD



-
- ❖ Documents included in discharge of a patient- discharge slip, In-patient Bill (Summary + Detailed), Discharge Summary, Pre-authentication approval letter (in case of TPA), doctor's clarification and reports of the patient.
 - ❖ Delay in discharge is seen due to final bill clearance, TPA approval, finalizing discharge summary.

Chapter 1- Introduction

Hospital length of stay is a reliable and valid proxy for measuring the consumption of hospital resources. Average length of stay, however, albeit easy to quantify and calculate, does not suitably reflect the nature of such underlying distributions, and may therefore mask the effects that the different streams of patients have on the system.

Basically, hospital length of stay for an individual patient considered as the total number of patient days for an inpatient episode. The duration of an inpatient's hospitalization is one day if he is admitted and discharged on the same day and if he is admitted on one day and discharged the next day. Total length of stay (total discharge days) is the number of days of care rendered to a group of inpatients for admission to discharge. The sum of the length of stay of any group of inpatients discharged during a specified period. Physicians exert ultimate control over the way in which treatment procedure are used and the subsequent length of stay of patients. Diagnosis and treatment procedures for the same cause of admission vary among physicians of the same department.

This project uses routinely collected data from wards of MAX Hospital on patients who admitted in hospital for treatment in Gen surgery, internal medicine, gastroenterology, orthopaedics, and pulmonology, who were discharged from MAX hospital over period from 1st April 2022 to 31st May 2022. This will be the basis for a running example illustrating the alternative methods of analysis and models of patient's length of stay. Any hospital's length of stay mainly depends on following determinants-

- A. Case mix
- B. Diagnosis related group
- C. Disease staging
- D. Pre procedure LOS
- E. Post procedure LOS

As MAX hospital is a super specialty hospital so above three determinants like case mix, diagnosis related group and disease staging affect average length of stay of the hospital. In this study for a more nuanced assessment of efficiency, we break LOS down into its two key components: the time from patient's admission to the hospital until their procedure and the time from their procedure until their discharge. Hence, pre procedure LOS serves as a proxy for hospital's lean efficiency.

1.1 ALOS and Business impact:

Hospital length of stay is inversely proportional with profit making because if the length of stay is high then obviously bed turnover rate would be low which lead to low profit making. In context of MAX Hospital, it seems very realistic because as it is a super specialty hospital, so the case mix is very high and in all the speciality. Hence this hospital has a different protocol and package system for different speciality. If against the protocol a single patient's stay is exceeding, then this will become liability for the hospital because in that mean time hospital would like to perform yet another procedure to maximize the utilization of its resources.

Apart from bed turnover rate it also results as high bed occupancy and low patient satisfaction because high length of stay translates into a reduction in effective bed capacity and admission process admissions. Bed occupancy is not the index for the efficiency of the hospital but has a significant and quantifiable negative influence on the Emergency department, affecting patients both hospitalized and the patients who are waiting for admission.

1.2 DEFINITION AND TERMS USED:

(A) Bed occupancy:

The ratio of inpatient service days to bed count days in the period under consideration. The inpatient census represents the actual occupancy (number of occurrences). The bed count represents the possibility for occupancy (number of times it could have occurred or the maximum possible. It has found that patients with shorter stays are more satisfied with their experience than those with longer hospital visits. The study identifies four area that contribute to patient satisfaction with the discharge process:

Patient readiness to leave the hospital, an efficient, swift patient discharge process, clear instruction for care after discharge, coordination of arrangements following discharge so that the patient has all the support and equipment necessary.

(B) Bed turnover rate:

The number of times a bed, on average, changes occupants during a given period of time, the average number of admissions per bed per time period useful because two

time periods may have the same percentage of occupancy, but the turnover rates may be different. While conducting the study we need to be familiar with the following terminology which are commonly used in the hospitals and are required for understanding the process.

(C)Key personnel:

Senior doctors, Junior Doctors, Nurses, Discharge secretary, General duty Assistant, Billing Department, Insurance Company, Patients.

Problem Statement-

Hospital administrators and financial managers strive to achieve high bed turnover rate, because the unpredictability of illness and injury requires that bed should be available, if possible, at all, times. But high length of stay leads to low bed turnover which ultimately results in high bed occupancy and long waiting list for admission. The hospital administration wants to convert this problem of high bed occupancy in the hospital to optimum bed occupancy as well as to provide the quality of patient care to those in need of it at all the earliest possible.

Rationale:

- High length of stay causes long waiting list for admission.
- Available hospital policies to cater the length of stay are good but need some modifications.

Aim:

- The aim of the project is to study and analyse how to optimize the stay of the patient towards improving ALOS further.

Objectives:

- To find out the factors affecting for high average length of stay.
- To suggest measures to reduce high average length of stay thereby improving revenue generation and patient satisfaction.

Chapter 2 - Review of literature

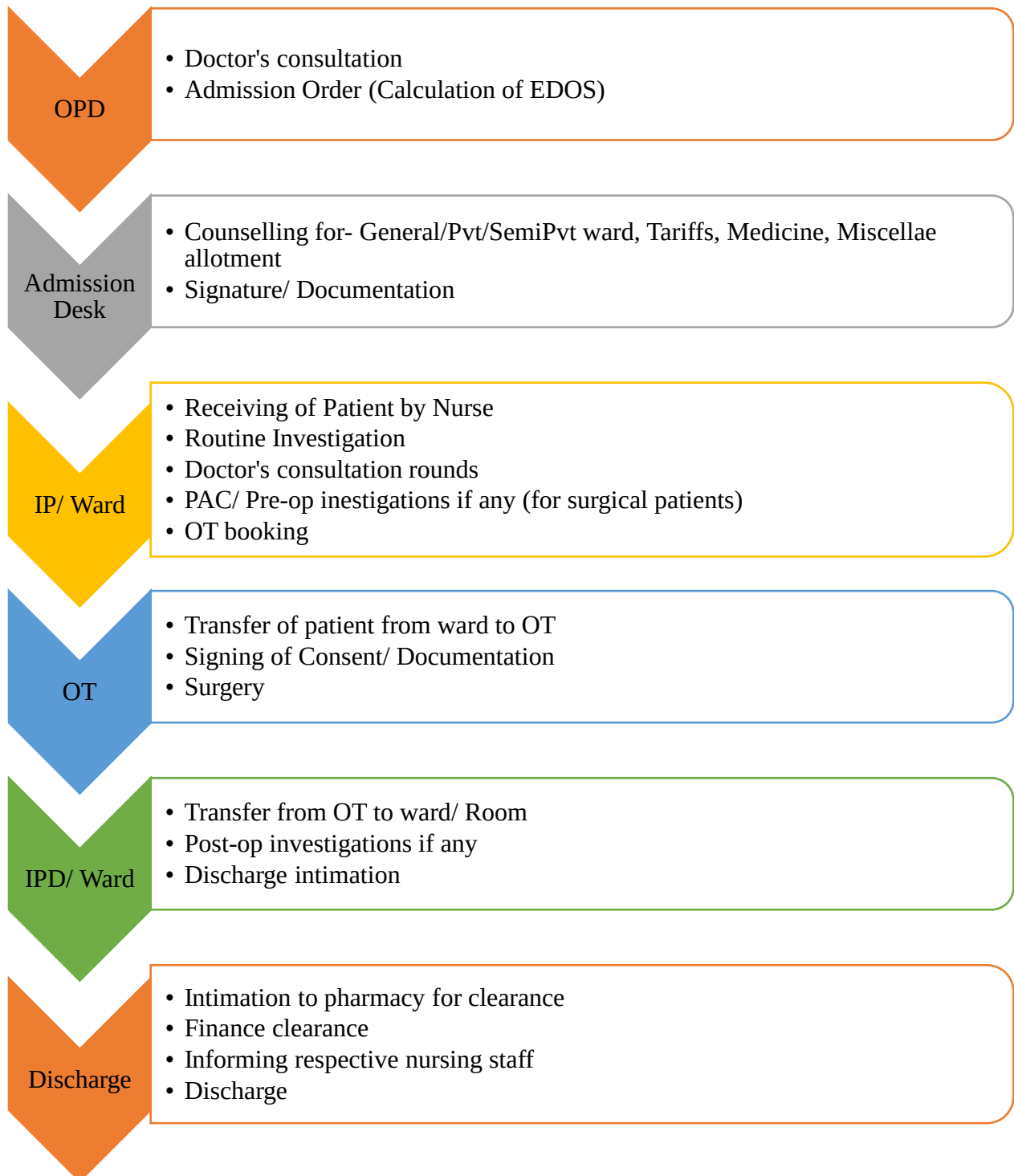
S.NO	AUTHORS	STUDY LOCATION	SAMPLING TECHNIQUES	SALIENT FEATURES
1.	Steven D Pearson, MS ^a Sharon FK leefield ^a Jane RSoukop E.FrancisCook ^a Thomas HLee (2001)	Department of Ambulatory Care and Prevention, Harvard Medical School and Harvard Pilgrim Health Care; and the Division of General Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA	Comparative study, observational	Most studies have shown that critical pathways reduce the length of stay and hospital costs, but these reports were limited by the lack of secular controls and potential selection
2.	Ruth Lewis and Nigel Edwards (2015)	Nuffield Trust,UK	Observational	Effective discharge planning and timely transfer of care can reduce length of hospital stays and reducing readmissions. Establishing discharge coordinators to process transfers and establish positive working relationships with health and social care partners

				across the week has been found to be effective in improving patient flow in case study hospitals.
3.	M.P. Quinn, A.E. Courtney, D.G. Fogarty, D. O'Reilly, C. Cardwell, P.T. McNamee (2007)	UK	Retrospective analysis	The Authors concludes that improving efficiency and productivity within NHS is an important goal. Much recent policy is directed at reducing hospital length of stay and acute admissions to optimize the use of beds.
4.	Gouri Angadi, Roy Chan (2007)	Toronto, Canada	Cross- sectional study.	One strategy to reduce waiting list is to optimize the patient length of stay. One major way of reducing waiting lists is by freeing up resources. Patients who no longer need treatment should be discharged. Hospital management and medical staff must ensure that patients receive the best possible care, howe er it is vital to discharge patients who can no longer benefit from healthcare services to provide the same high-quality care to others in need. It was concluded that by introducing new

				roles, new policies, and new low-level tools to the 7 West team, it is possible to help optimize patient length of stay.
5.	C. J. DeFrances, M. J. Hall and M. N. Podgornik (2005)	Canada	Time and motion study	Based on data collected from all the hospitals of Canada from 1995-2005 it was found that the study was conducted to identify the relation of age standardization and acute inpatients with average length of stay. From the study it was obtained that patients who came from emergency consume 61% of total hospital days and patients in the age group 60+ consumes more than 58% of total hospital days.
6.	Hyunyoung Baek , Minsu Cho (2018)	Ulsan National Institute of Science and Technology, Ulsan, South Korea	descriptive and exploratory analysis, process pattern analysis using process mining techniques, and statistical analysis	The study focuses on determining the factors which are associated with length of hospital stay, based on electronic health records, to manage hospital, stay more efficiently.
7.	Kieran Stone, Reyer Zwiggelaar, Phil Jones, Neil Mac	Department of Computer Science,	Secondary research and survey	Adopting a unified framework for the prediction of LoS could

	Parthaláin (2022)	Aberystwyth University, Ceredigion, SY23 3DB, Wales, United Kingdom		yield a more reliable estimate of the LoS; this can be used across different hospitals where patient populations will be homogeneous with similar demographics and comorbidities amongst patients.
--	-------------------	--	--	--

Process Mapping – ADT (Admission, Discharge, Transfer)



Chapter 3- Methodology and study design

3.1 Methodology-

RESEARCH QUESTION:

What are the various Variables regarding Admission and Discharge process that influence the ALOS a in Private Multi Speciality Hospital?

How, reduction in ALOS effects the revenue generation of the hospital.

STUDY DESIGN: Prospective, cross-sectional, and analytical

SETTING: Max Hospital, Patparganj, Delhi (400 bedded)

STUDY POPULATION: Patients staying for more than 4 days in hospital (in general surgery, medicine, gastronomy, orthopaedics, and pulmonology department)

DURATION OF STUDY: 1st April to 31st May.

ETHICAL CONSIDERATIONS: privacy and confidentiality has been maintained

Date Collection: Primary Data collection.

3.2 Sampling technique

Multistage Sampling procedure

- 1) Cluster Sampling
- 2) Purposive sampling

The reason behind opting multistage sampling procedure is, the whole data has been collected from various specialities of MAX Hospital, Patparganj and each speciality has been considered here as a cluster, apart from that purposive sampling is done here because in this study we have considered only the patients of Category B (Corporate and CGHS) and Category C (Cash and TPA) for specific purpose of finding out the average length of stay of specific categories patient.

3.3 Sample size:

- Total discharged patients of cash, TPA, corporate and CGHS from hospital (during 1st April to 31st May) is- 1755 (target population).
- Out of 5 specialities, each speciality considered as a cluster
- Total discharged patient of Cash, TPA, Corporate and CGHS

3.4 Tools and Techniques-

- Tools: Observation, speciality wise patient list, Computerized Patient Record System (CPRS).

Chapter 4- Observation

Description of MAX Hospital's Average length of stay calculation

4.1 The average length of stay:

The average number of days stay in hospital and its calculated as:

$$\text{ALOS} = \frac{\text{Cumulative number of days for each patient (during particular period)}}{\text{Total number of patients admitted in the hospital during the period}}$$

The ALOS and the Bed occupancy rate were calculated by taking the data of the patients admitted in the hospital from the given time period of 2 months (1st April to 31st May 2022). The data was carefully examined and then used for the calculations after which it was used for further application in the given formula to get the ALOS and Bed occupancy rate.

4.2 Percentage of Bed occupancy:

The percentage of inpatient beds occupied over a given period. Calculated as:

$$\text{Percentage of bed occupancy} = \frac{\text{Total number of patient's days for a given period}}{\text{Total number of beds in the hospital} \times \text{Time period}} \times 100$$

The number of hospital beds occupied by patients expressed as a percentage of the total beds available in the ward, specialty, area, or region. It is used to assess the demands for hospital beds and hence to gauge an appropriate balance between demands for health care and number of beds.

Bed occupancy rates have been proposed to reflect the ability of a hospital to provide safe efficient care. A hospital bed is both a scarce and expensive commodity in healthcare. Administrators running these hospitals are in a dire need of objective measures and methods for efficient management of their limited financial resources. Bed utilization rates can be of immense help in realistic and effective decision making. Normal rate of occupancy varies with the size and the type of the hospital and the other factors affecting the utilization of the

hospital facilities. It has been seen that small hospitals have a lower bed occupancy rate when compared to larger hospitals.

4.3 Optimum Rate

The optimum bed occupancy rate of the hospital should be between 75-80%. As this ensures less waiting time for the patients in the hospital for admission it also allows the emergency case to be treated in the right time. As unavailability of bed in hospital may cause serious complication for the patient and his condition by achieving optimum bed occupancy, we can resolve this problem too.

Bed turnover rate:

The time difference or the interval between the discharge of patient or the time the patient leaves the bed and the admission of another patient on the bed in the hospital.

Formula used:

$$\text{BOR} = \frac{\text{Number of discharges (separations)in the period}}{\text{Available beds}}$$

4.4 Compliances: -

Max is a super specialty hospital so mostly patients admitted here with various medical disciplines like oncology, neurosciences, obstetrics and Gynaecology, Orthopaedics, Urology etc. For some cases it is very difficult to decide a compliance regarding their length of stay but apart from those few cases hospital has a fix compliance for maximum specialities. Like-
for

- (A) General surgery (consisting of short surgeries)- length of stay is 4 days
- (B) Internal Medicine- length of stay is 5 days
- (C) Medical gastroenterology- length of stay is 4 days
- (D) Orthopaedic- length of stay for short surgeries is 3 days, otherwise it is 7 days for hip/knee replacement.
- (E) Pulmonology- length of stay is 6 to 7 days.

4.5 Types of Patients (According to mode of Payment)

According to the mode of payment all the patients who admitted in MAX Hospital Patparganj, belongs to three categories Category A (EWS), Category B (CORPORATE and CGHS) and category C (CASH AND TPA).

The major ratio admitted to the hospital included T.P.A(Third party Administration) patients then C.G.H.S (Central Government health Schemes), the last being Cash patients and being less in ratio compared to the other two modes of payment. The type of patients which are admitted to the in-patient-ward of the hospital are generally of the following category:

(A) Central Government Health Schemes (CGHs):

These are the patients which comprise the largest group of patients admitted to the in-patient department of the hospital. The people working under the central government and their family members are the beneficiary of these schemes which have Max hospital also on their panel for providing health services to its employees or retired personnel from the central government. The settlement of the bill for this category is very time consuming due to the slow functioning and long procedures of approval by the government authorities.

(B) CASH

These include the second largest group of patients admitted to the in-patient department. These patients pay the hospital fees and the hospitalization charges in the form of cash at the time of discharge in the billing section. These also include the foreign patients or commonly called as international patients,

(C) TPA

This category comprises of the least number of patients out of the three categories. These include the insurance patients who have cashless treatment or hospitalization based upon their health policy and the benefits. The billing department settles the bill of the patient with his/her insurance company during the time of the discharge.

Chapter 5- Result

Data interpretation and analysis of ALOS:

During the period of study (from 1st April to 31st May 2022)-

Total discharged patients from WARDS- 1755

Total discharged patients of General surgery- 419

Total discharged patients of Internal medicine- 528

Total discharged patients of gastroenterology- 291

Total discharged patients of orthopaedics- 351

Total discharged patients of pulmonology- 166

Total days of stay of discharged patients from wards- 7920

Total days of stay of discharged patients of General surgery- 1490

Total days of stay of discharged patients of Internal Medicine- 2557

Total days of stay of discharged patients of Gastroenterology- 1151

Total days of stay of discharged patients of Orthopaedics- 1736

Total days of stay of discharged patients of Pulmonology- 983

As ALOS –

The average number of days stay in hospital and its calculated as:

$$\text{ALOS} = \frac{\text{Cumulative number of days for each patient (during particular period)}}{\text{Total number of patients admitted in the hospital during the period}}$$

5.1 ALOS for various specialities:

S.no	Speciality	ALOS
1	General surgery	3.5
2	Internal medicine	4.8
3	Gastroenterology	3.9
4	Orthopaedics	4.9
5	Pulmonology	5.9
6	All the specialities	5.1

Table 5.1 ALOS for various specialty

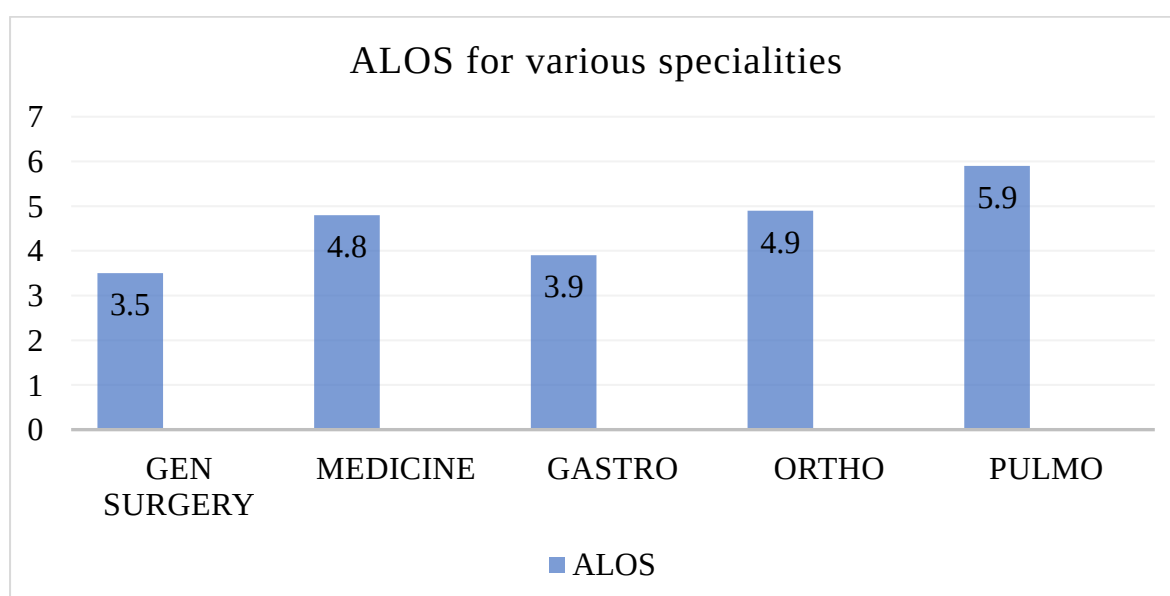


Figure: 5.1 Graphical representation of ALOS for various specialities

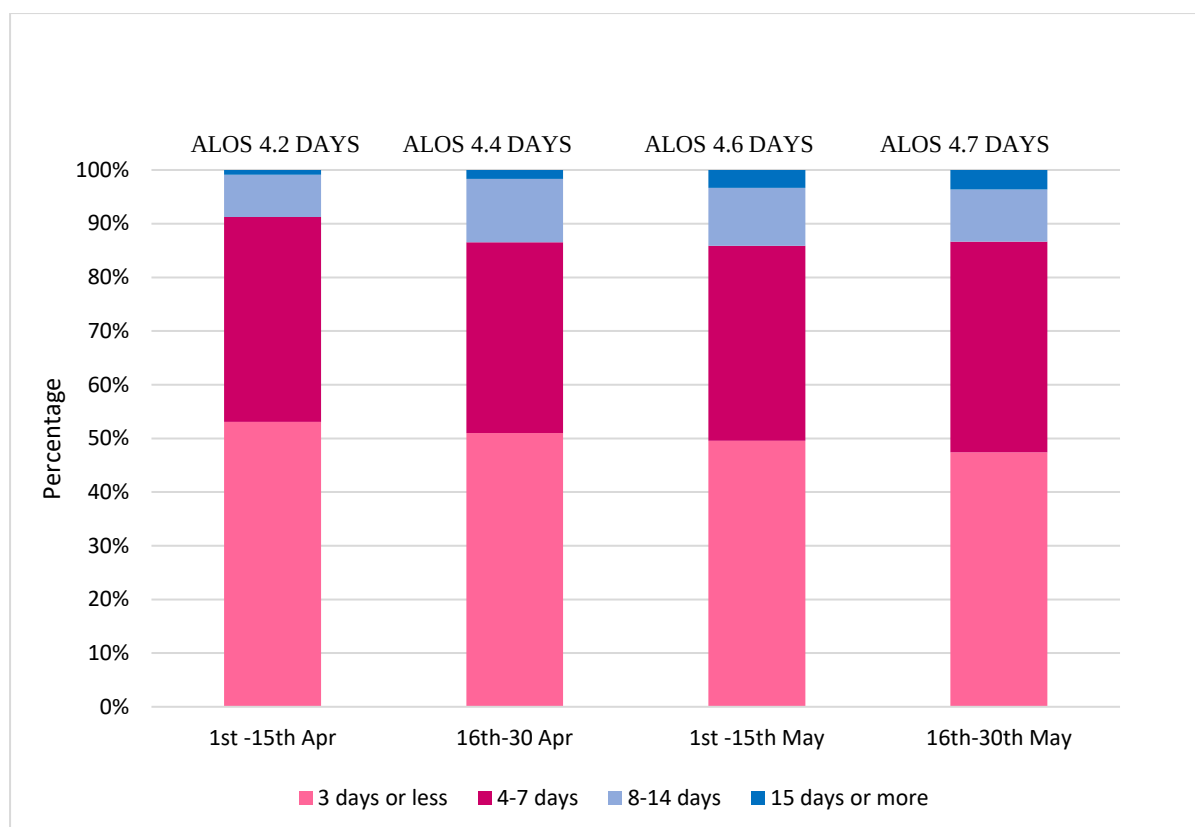


Figure 5.2 Percentage distribution of hospital inpatients by length of stay: MAX Hospital, selected month APRIL and MAY

Interpretation:

Pulmonology speciality seem to have highest average length of stay of 5.9 when compared with other specialities. When taking 15 days duration to calculate ALOS. It came out to be almost same ranging between 4.2 to 4.7. Maximum patients have stay of 3 days or less. Only a few patients have stay longer than 15 days in both months.

Consolidated ALOS according to mode of payment (Without Day care, excluding EWS)

	Total Volume	
	CTI	PSU
	APRIL	APRIL
Patparganj	617	239

Table 5.2 Total volume of CTI and PSU patients in month of April

ALOS	
CTI	
APRIL	MAY
3.9	4.4

Table 5.3 ALOS in CTI patients

ALOS	
PSU	
APRIL	MAY
4.9	4.6

Table 5.4 ALOS in PSU patients

ALOS	
Total	
APRIL	MAY
4.2	4.5

Table 5.5 Total ALOS in April and May

Interpretation:

As mentioned in the table the length of stay for all specialities of patients is higher than the protocol, this is because of many patients stay usually exceed against the protocol. Out of all the departments pulmonology has the highest average length of stay in both months (April and May). Total ALOS is slightly higher (4.5) in May as compared to April (4.2).

This can be explained in a better way by following graphs.

5.2 Stay pattern of various specialities:

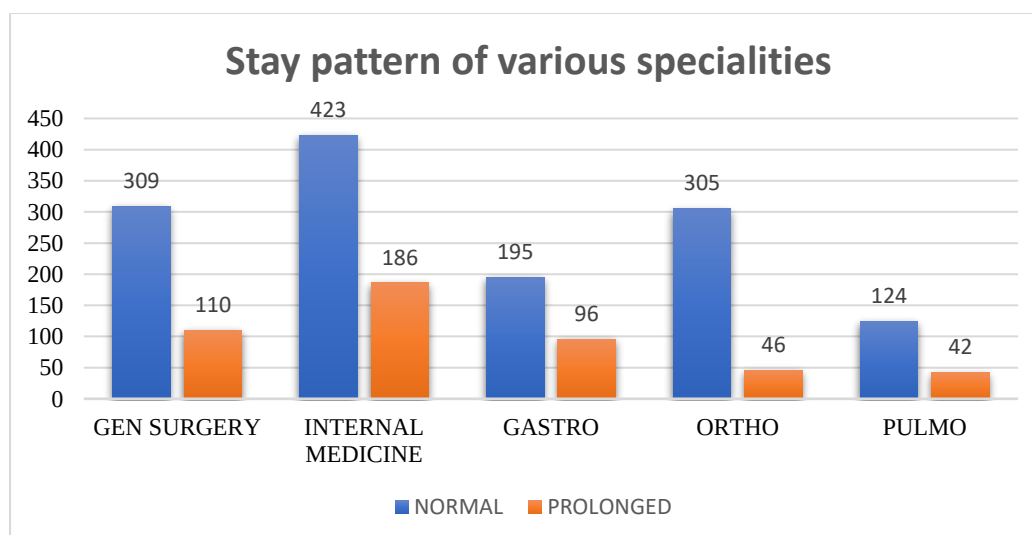


Figure 5.3 Stay pattern of various specialty

Stay pattern of various categories in percentage:

Stay Pattern of Gen surgery patients in percentage

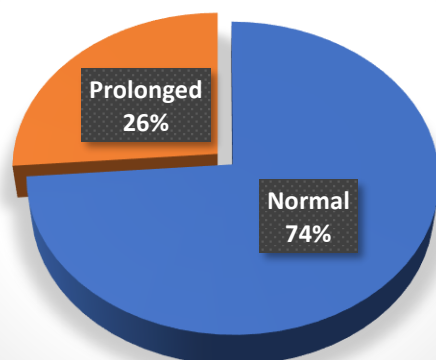


Figure 5.4

Pattern of Internal Medicine patients stay in percentage

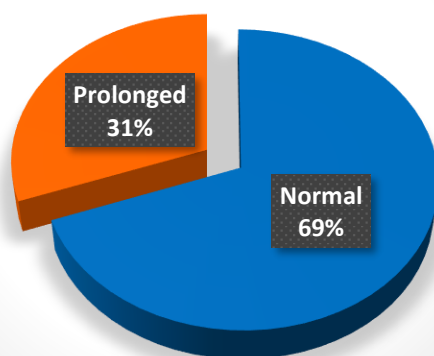


Figure 5.5

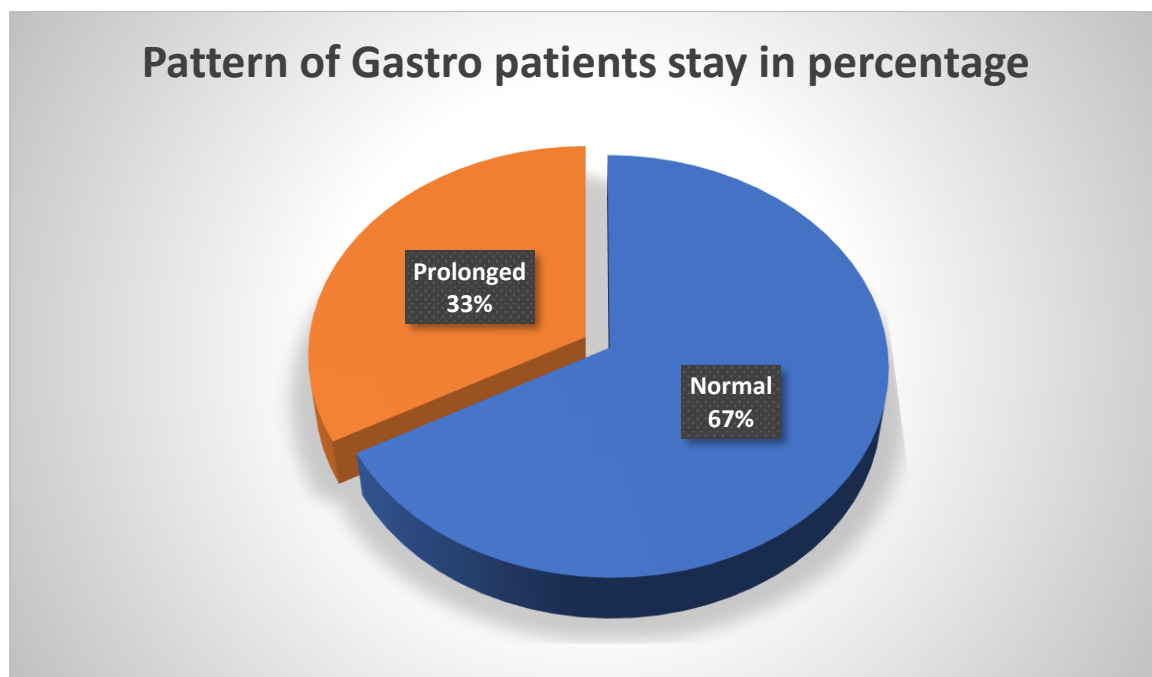


Figure 5.6

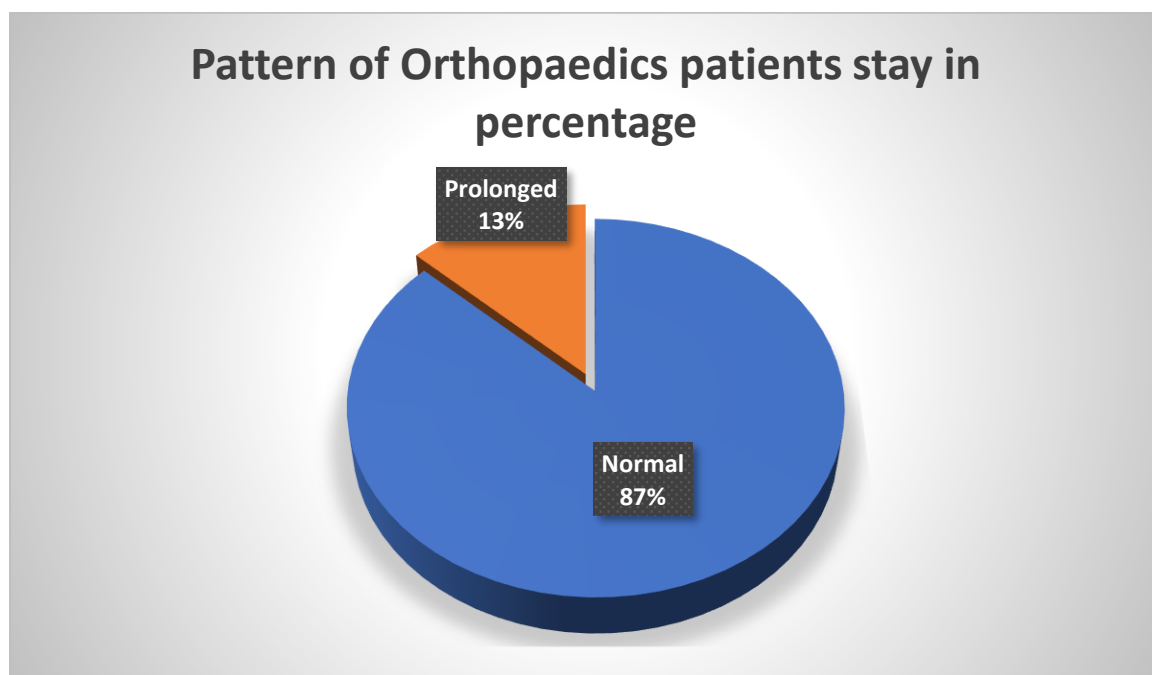


Figure 5.7

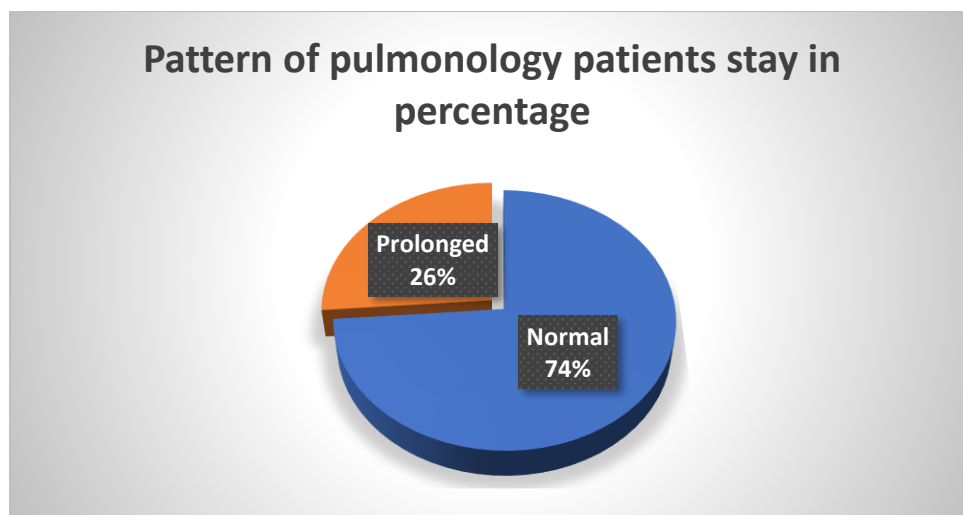


Figure 5.8

Interpretation: It can be observed that Gastroenterology department has the highest prolonged stay of 33%. Out of 196 patients 95 patients had prolonged stay more than 4 days. Whereas Orthopaedic department has least prolonged stay patients i.e., 11%. Out of 305 patients only 46 patients had prolonged stay of more than 7 days.

5.3 Pattern of prolonged stay according to mode of payment

On the following step this project tries to analyse the pattern of prolonged stay according to mode of payment.

Department wise Consolidated ALOS (Without Day care, excluding EWS)

	ALOS	
	CTI	
DEPARTMENT NAME	APRIL	MAY
General Surgery	3.4	3.2
Internal Medicine	4.2	4.6
Medical Gastroenterology	3.3	4.3
Orthopaedics	4.5	4.7
Pulmonology	4.5	4.3

Table: 5.6 Department wise Consolidated ALOS in CTI patients

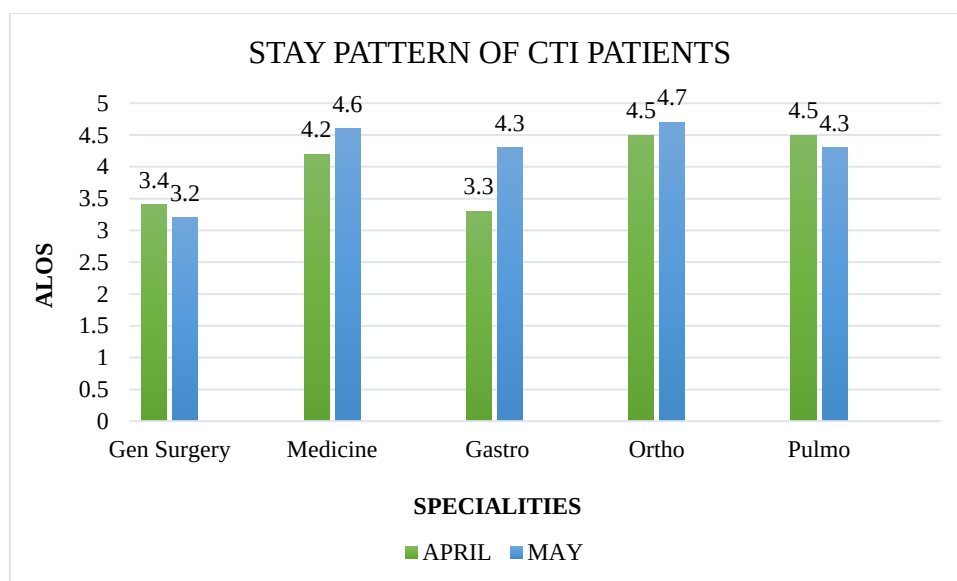


Figure: 5.9 Stay pattern of CTI patients.

ALOS		
DEPARTMENT NAME	PSU	
	APRIL	MAY
General Surgery	2.7	3.7
Internal Medicine	6.0	5.8
Medical Gastroenterology	2.7	4.1
Orthopaedics	4.9	6.8
Pulmonology	10.1	6.1

Table: 5.7 Department wise consolidated ALOS in PSU patients

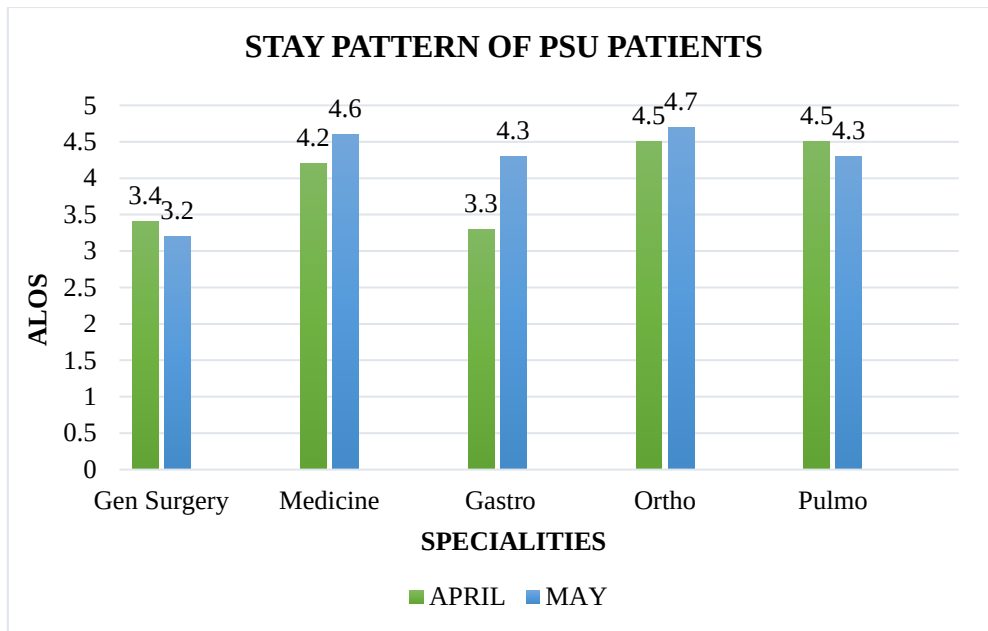


Figure: 5.10 Stay pattern of PSU patients

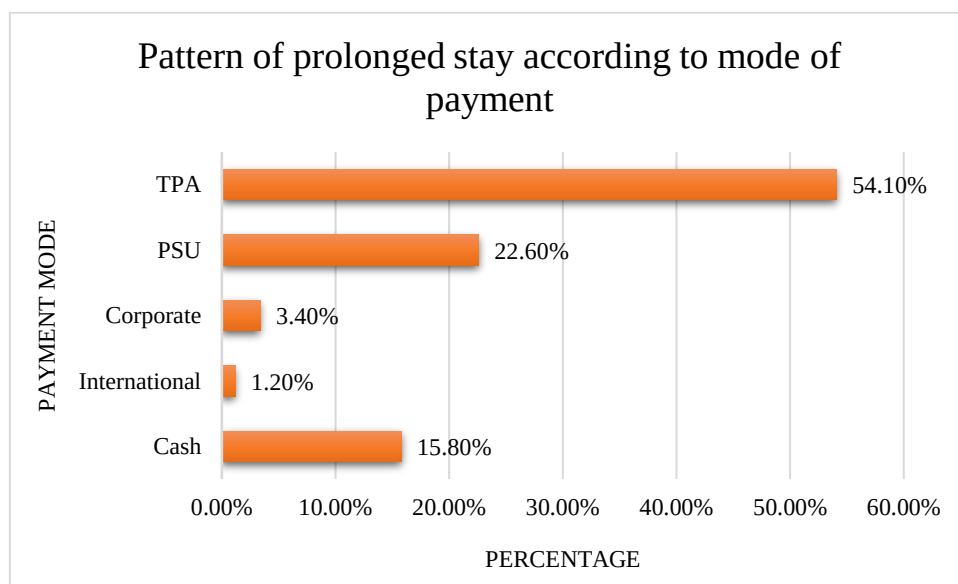


Figure 5.11 Pattern of prolonged stay according to mode of payment

SPECIALTY	TOTAL	PROLONGED STAY	
		CTI	PSU
GEN SURGERY	96	75%	25%
INTERNAL MEDICINE	182	67%	33%
GASTROENTROLOGY	86	71%	29%
ORTHOPAEDICS	17	64%	36%
PULMONOLOGY	37	40.5%	59.5%

Table 5.8 Pattern of prolong stay

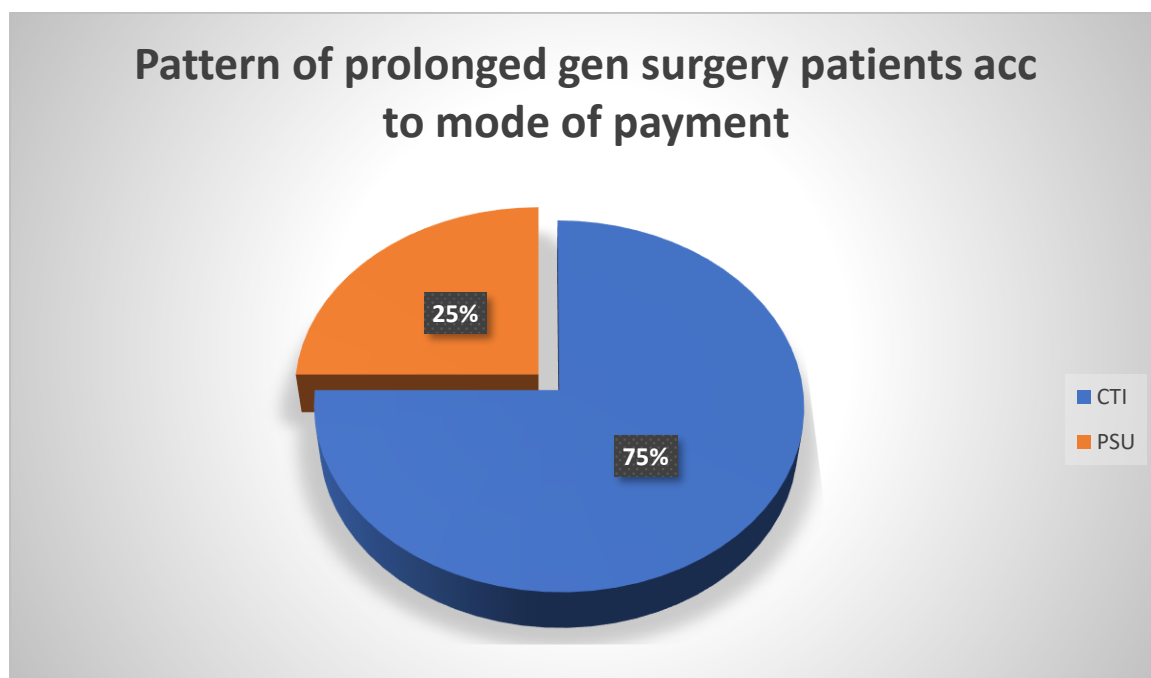


Figure 5.12

Pattern of prolonged Internal Medicine patients acc to mode of payment

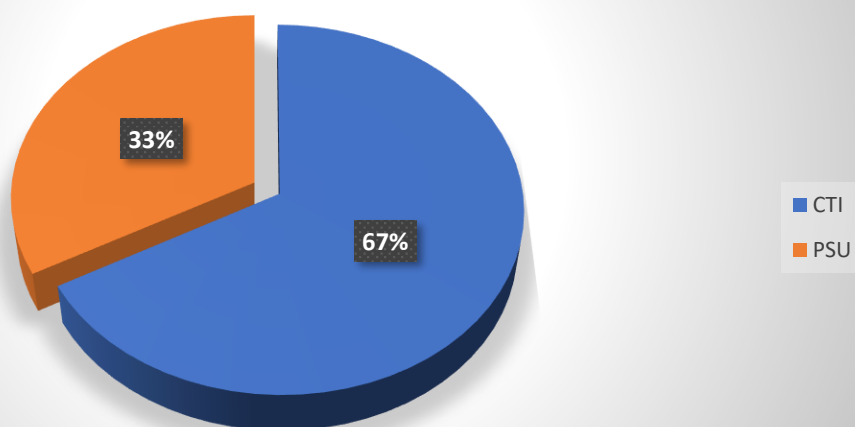


Figure 5.13

Pattern of prolonged Gastro patients acc to mode of payment

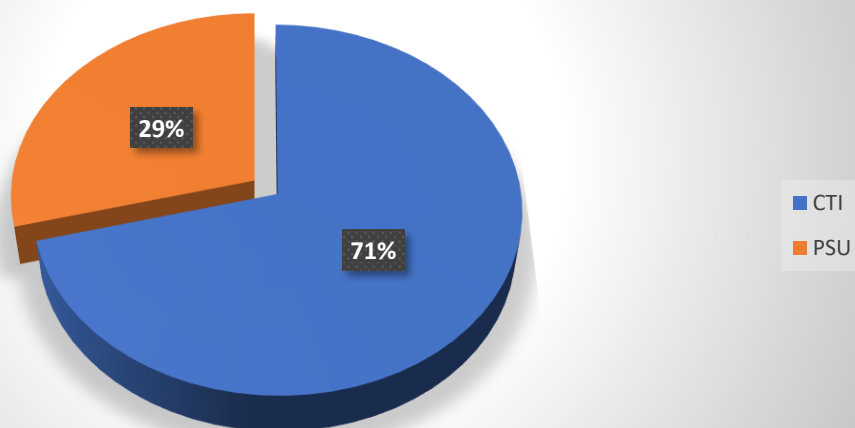


Figure 5.14

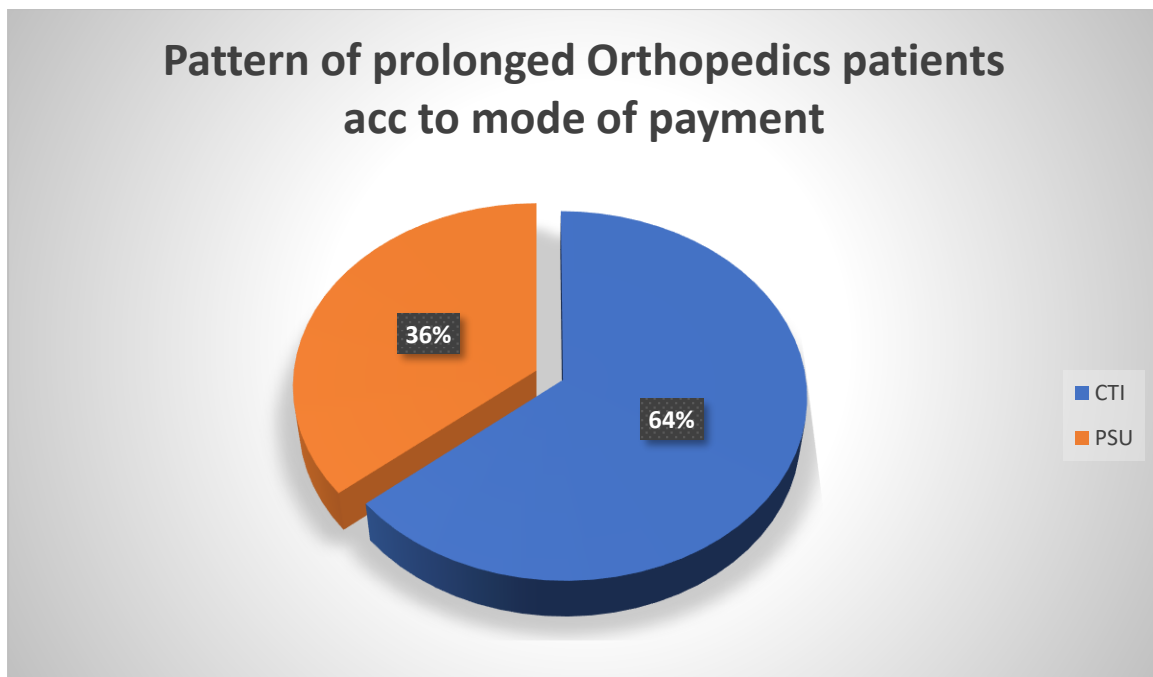


Figure 5.15

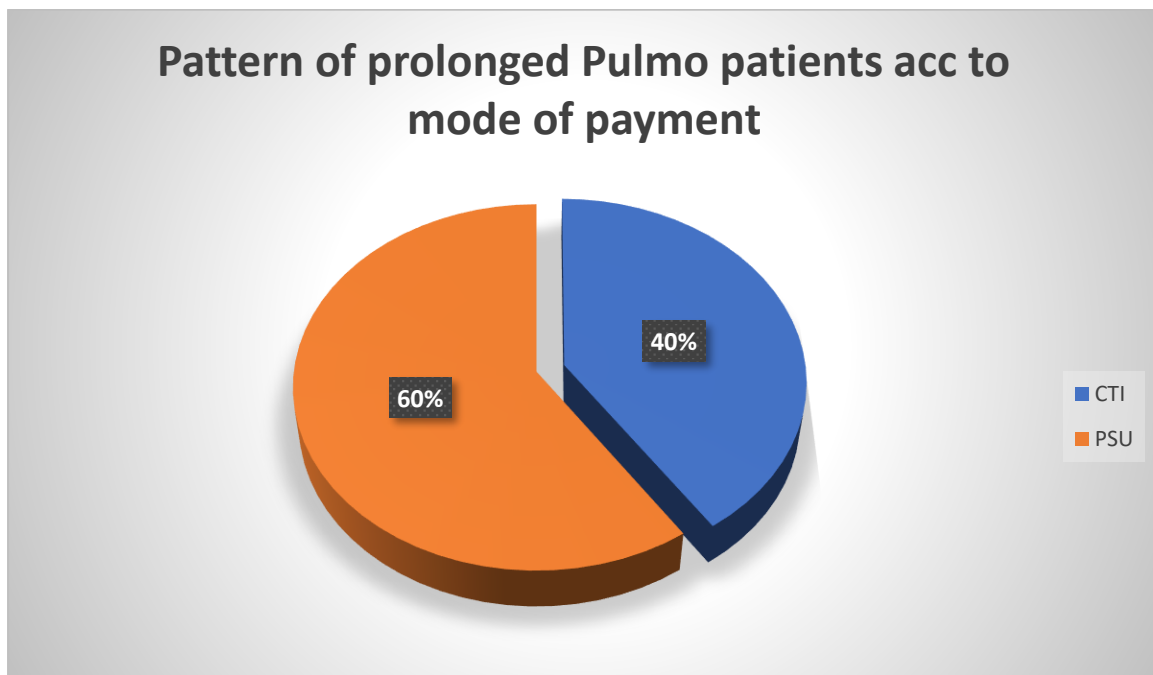


Figure 5.16

Interpretation: In both months TPA patients were the highest i.e., 54%. In all the specialities mode of payment for prolonged stay patients has been CTI except in pulmonology. 40% payment was of CTI.

5.4 Observations during the study of ALOS

During the study period in the hospital, there were various clinical and non-clinical reasons which can be attributed to the prolonged stay of patients in the hospital. This Fish Bone Analysis depicts contributing factors for prolonged stay of patients.

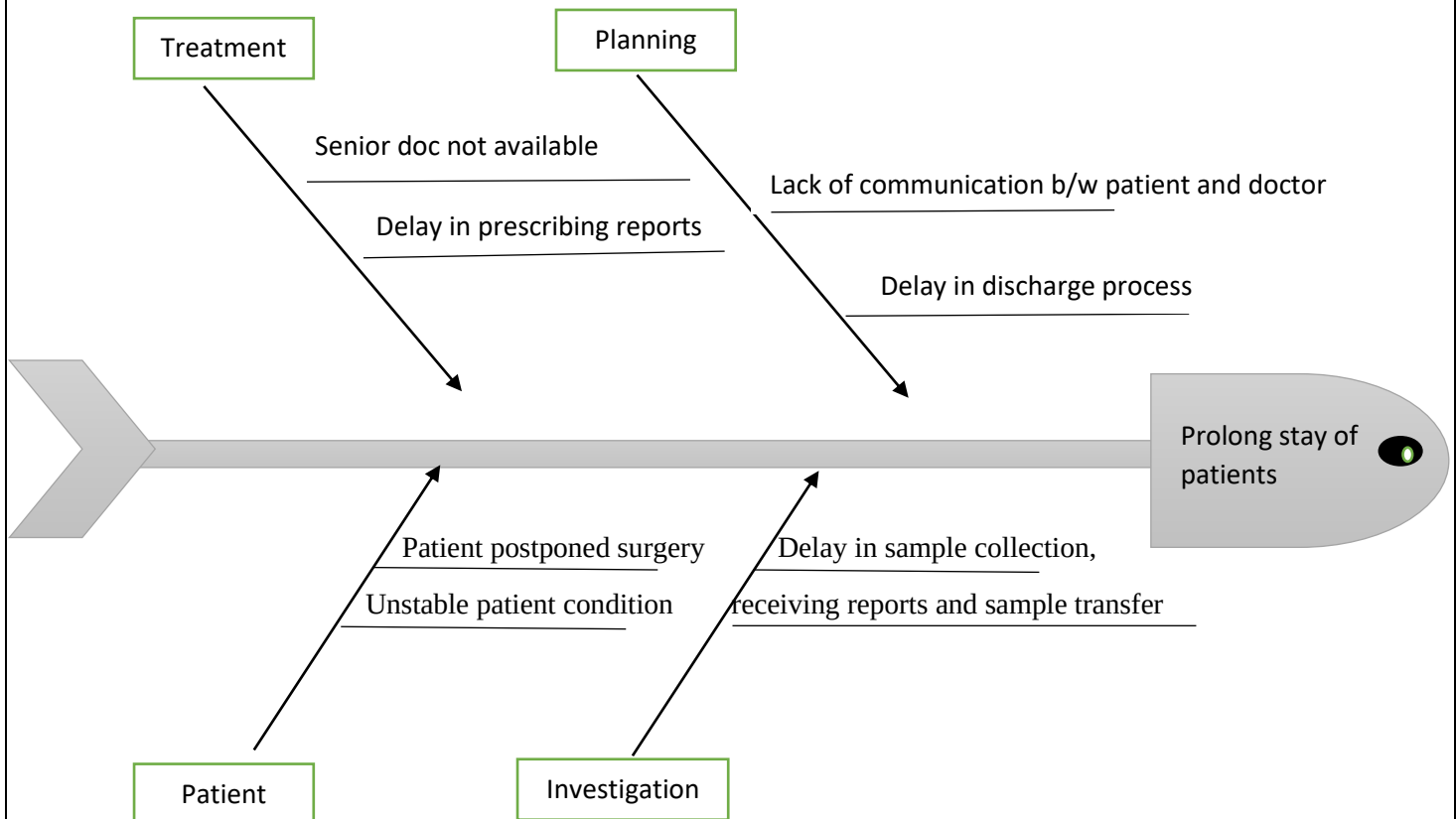


Figure 5.17 Fish bone analysis of factors for prolonged stay of patients

Chapter 6- DISCUSSION:

6.1 Factors resulting in Prolonged Stay:

The major factors causing prolonged stay of patients in MAX Hospital, Patparganj can be broadly classified into four sub-categories, which are

TREATMENT

- Delay in Doctor's consultation
- Delay in prescribing reports

INVESTIGATIONS

- Delay in receiving reports
- Delay in Sample Collection and Transfer to the Lab
- PAC for surgery patients delayed.

MANAGEMENT

- Delay due to Discharge Process
- Nursing Shift Exchanges

PATIENT

- Unstable Patient Condition
- Postponing of Surgery/Procedures.
- Prolonged ICU stay patients.

TREATMENT

a) Delay in Doctor's consultation:

It has been observed that discharges are not confirmed on time as the respective episode doctor does not consult the patient on time. So, the nursing staff and the other administrators do not receive the discharge order on time. So, all related steps get delayed. Senior doctors are engaged performing surgeries and their team and other junior doctors/consultants must assess them.

b) Delay in Prescribing Reports:

In few cases it was observed that doctor's attendance during Doctor's Consultation results in delaying of pre-op and post op investigations further prolonging stay of patients.

MANAGEMENT

c) Delay due to discharge Process:

Billing clearance is the biggest barrier in making the discharge process smooth. A patient seeks for the comfort in getting the billing clearance done. Patient usually does not want to leave before the lunch hours. Even if they get the clearance done they won't return the clearance slip back to the nursing team. As a result, nursing team cannot discharge the patient in the minimum assigned time for the discharge. In case of TPA patients there are several protocols to be followed by the attendant and the TPA Department, that takes time to get the authorization of bill from the TPA Company. Delay in discharge summary is another major reason for delays in discharge process. It was observed that while preparing the discharge summary the general assistants must wait for the doctors to make any corrections, modifications, addition in the discharge summary as they can only complete the discharge summary once it has been approved by the consultant.

d) Nursing shift exchanges:

Delay may occur in carrying forward the discharge process on behalf of nurses as she may be busy with the doctor during the doctor round as the nurse may have different doctors for different patients and they may have difference in their patient's rounds.

Nurses are busy with patients especially during the morning hours with the treatment plan of the patients as given by doctors whether there is change in medicines or to continue the same medicines.

Change in the shift of nurses takes place at 14:00 and 20:00 hrs. Currently the patients of TPA are in middle of the discharge process. So, the next nurse on duty must take the process further. It may delay the process only by few minutes, but it is possible.

INVESTIGATION

e) Delay in receiving reports:

First reason is lack of performing staff. Then again if consulting doctor does not give a base framework of reports to be made, other people can't give a final layout. So, reports are

usually not prepared on time. Patient, attendant have to wait for the reports at the time of discharge resulting in the increased TAT.

f) Delay in Sample Collection and transfer to the Lab:

Sometimes the investigation sample is not collected on time hence the whole process of investigation and reporting gets delayed thereby increasing the TAT.

PATIENT

g) Unstable patient's condition

In few cases the patient is not completely fit clinically for discharge, thereby prolonging the stay in the hospital.

h) Postponing of surgery

It has been observed that, at times the patient is reluctant in undergoing surgery that is scheduled previously due to various personal and religious reasons.

6.2 Causes behind delayed discharge

Sample size taken for pilot study is 170. All these patients got delayed discharge due to various reasons such as:

- 1) Delay due to finance clearance
- 2) Delay due to reports
- 3) Delay due to doctors
- 4) Delay due to summary preparation

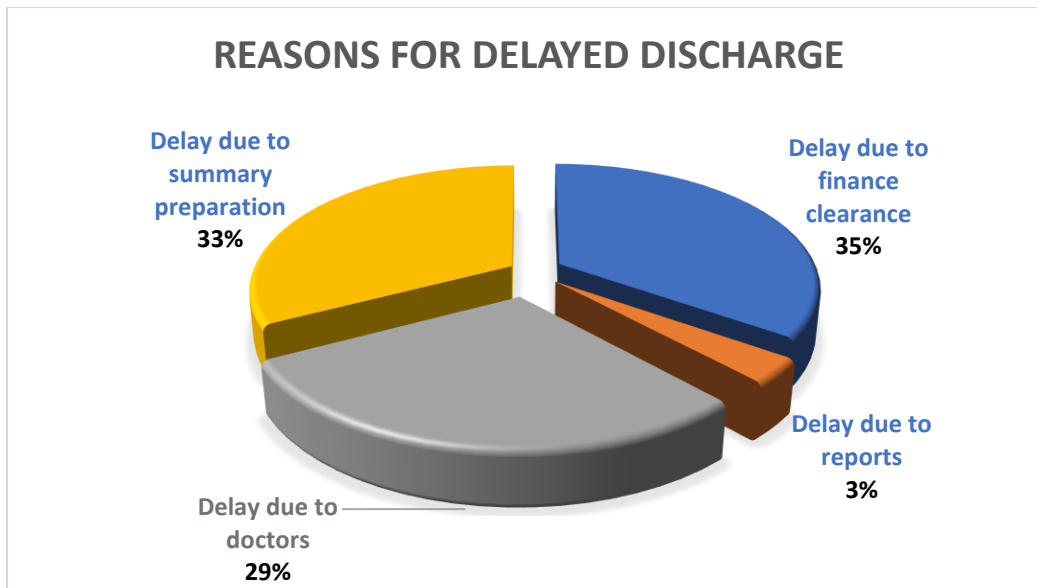


Figure: 5.18 Reasons for delayed discharge

All these reasons delayed discharge led to high bed occupancy and low bed turnover rate which ultimately results in high length of stay.

Chapter-7 Recommendations:

The average Length of Patient's stay mainly depends on disease profile of the patient as the non-surgical patient required to be admitted no longer days for close observation along with intensive care unit patients. But apart from clinical reasons there are some non-clinical reasons, found during the study, which helps to decrease ALOS.

Suggestions which can be used for decreasing ALOS in MAX Hospital:

- **Investigation:**

Pre-procedure investigations are very crucial event for all the procedures. During the study it has been found that the investigations play a major part of pre-procedure reasons for high length of stay in all type of cases, by doing investigations in OPD or in Day Care level we can decrease length of stay.

- **TPA Clearance:**

During the study it has been seen that in case of TPA patients there are a number of protocols to be followed by the attendant and the TPA department that it takes time in getting the pre-authorization of bill from TPA Company.

There is a possible solution for this problem which has been already implemented in few hospitals of south and till now is running successfully. What they did there?

They establish a tie up with all TPA's that they will send them all the necessary paper one day prior to discharge and TPA company will complete all the formalities by the same day after that a very small charges are left for discharge date like-room rent or consult fees and as they have all necessary paper so they won't find any problems to approve that small amount on the discharge date by 11:00 AM morning. Communication between both concern teams should be effective. Timely updates regarding the approval should be provided to the hospital. Relationship managers of TPA department in concern hospital should be active. By implementing this solution MAX Hospital can also discharge all the TPA patients within the protocol.

- **Availability of doctor**

In a few cases it has been seen that patients stay exceed just because of unavailability of doctor. In pilot study delay due to doctor came out to be 29.2%, hence consultant doctor should made sure to do wards rounds timely.

Chapter-8 Limitations and strength of study

- Shortcomings of current Average length of stay research

Major limitations of the study are that whole of the long stay patients' populations could not include in it as MAX Hospital is a super specialty hospital consisting of 24+ specialities so tracking all patient specialty wise is difficult.

There are patients who are kept in isolation because of COVID-19 so it was difficult to collect data from that area.

The reason given for prolonged stay may contain some ambiguity as there was limited access to patients and their relatives to get information about their reasons completely and accurately.

- Strengths of the study

The length of stay (LOS) is an important indicator of the efficiency of hospital management. Reduction in the number of inpatient days results in decreased risk of infection and medication side effects, improvement in the quality of treatment, and increased hospital profit with more efficient bed management.

Quick resolution to problem can be identified.

ALOS within 4 days can lead to good revenue generation in the hospital.

Timely churning is possible.

This study also helped me to understand proper process flow of admission and discharge process.

Chapter-9 Conclusion

MAX Hospital, Patparganj is continuously facing the problem of prolonged length of stay of patients and high bed occupancy rate which should be optimum, which is mainly due to high length of stay.

Reasons for high length of stay are mentioned in the chapter. This also further leads to low bed turnover rate; higher bed occupancy presents in the hospital and unnecessary long waiting hours by the patients for admission to the in-patient department.

Hospital can easily deal with this problem by implementing few interventions on which some of them are mentioned in the study.

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