IDENTIFYING CAUSES OF DELAY AND TESTING OPTIMIZATION STRATEGIES FOR PREOPERATIVE PROCEDURES OF SCHEDULED SURGERIES AT JUPITER HOSPITAL, PUNE

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in

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By

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Under the Supervision and Guidance of

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Jupiter Hospital
Patient First

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29th June, 2024

Internship Letter

This is to certify that Ms. Preeti Misal has successfully completed her internship for 3 Months w. e. f. 01st April, 2024 to 29th June, 2024 in the Medical operations and Business development department at Jupiter Lifeline Hospital Ltd., Pune.

For Jupiter Lifeline Hospitals Ltd., Pune

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CERTIFICATE

This is to certify that dissertation titled **Identifying Causes of Delay and Testing Optimization Strategies For Preoperative Procedures Of Scheduled Surgeries At Jupiter Hospital, Pune** is a record of the research work undertaken by Preeti Banyamin Misal in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health 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.

Dr. Neetu Purohit
Faculty Guide
Professor, IIHMR University, Jaipur
Date: 05/07/2024

Dr. Sanjay Gupta
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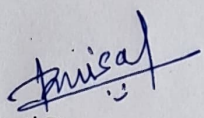
Date: 05/07/2024.

DECLARATION BY STUDENT

I hereby declare that this dissertation titled Identifying Causes Of Delay And Testing Optimization Strategies Of Preoperative Procedures Of Scheduled Surgeries At Jupiter Hospital, Pune, 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 Information derived from the published or unpublished work of others has been duly acknowledged in the text.



Preeti Banyamin Misal

Date: 05/07/2024

IIHMR-U/01/2022-24/1570

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ABSTRACT

Introduction: The operation theatre is the most crucial area in a hospital setting. Numerous factors affect the utilization of the operation theatre, including procedures starting from preoperative formalities to postoperative recovery and shifting of patients back to their respective wards. In this study context, the work consists first in defining a standard "Pathway" representing the preoperative process, defined as the sequence of all elementary steps involved between the "patient scheduled for surgery" and the "patient shifted to the operation theatre" and its specific duration. This duration includes all procedures, such as patient preparation, surgical site marking, and financial clearance for surgery. Delays can be caused by gaps in any of the above factors, and the same are noted in the study. The delays are analysed, and strategies to combat them are suggested.

Objective: This study aims to identify the causes of delays in preoperative procedures and test optimization strategies to enhance the efficiency of operation theatre (OT) utilization at Jupiter Hospital, Pune. The primary focus is on streamlining the processes from patient scheduling to transferring the patient to the OT. The goal is to reduce waiting times, enhance patient satisfaction, and improve resource utilization.

Methodology: The research is conducted at Jupiter Hospital, a 400-bed multi-specialty hospital, using a two-phase approach. In the first phase, an observational study is carried out to identify the causes of delays in preoperative procedures. Factors such as financial clearance, doctor's availability, and administrative processes are closely monitored. In the second phase, targeted strategies are developed and implemented to address these identified delays. Data are collected over two months, with 300 elective surgeries analysed in both the pre-implementation and post-implementation phases. Descriptive statistics, including mean and standard deviation, are calculated for delay times to provide an overview of the data distribution. Comparative analyses of means and proportions are performed to assess the effectiveness of the implemented strategies.

Visualization techniques, such as bar charts and line charts, are employed to display the distribution of delays across different time categories.

Key Results:

Pre-Implementation Phase: The mean delay is found to be 37 minutes with a standard deviation of 18 minutes, indicating significant variability in the preoperative delays experienced by patients.

Post-Implementation Phase: The mean delay reduces to 31 minutes with a standard deviation of 15 minutes, demonstrating an overall improvement in the efficiency of preoperative procedures. This reduction signifies a successful impact of the implemented strategies on minimizing delays.

Comparative Analysis: The comparison of means between the pre-implementation and post-implementation phases shows a statistically significant reduction in average delay times. This highlights the effectiveness of the strategies in enhancing preoperative efficiency. Additionally, the comparison of proportions reveals a decrease in the percentage of surgeries experiencing longer delays post-implementation.

Categorization of Delays: The analysis of delay distributions across specific time intervals reveals that the proportion of surgeries with delays in the 0-30 minutes category increases post-implementation, while delays in longer time intervals decrease. This shift indicates an overall improvement in timely surgery commencement.

T-tests: T-tests are carried out to determine whether the results are statistically significant. The t-test is statistically insignificant, suggesting that there may be other underlying factors affecting the average delay for the preoperative processes.

Conclusion: The implementation of targeted strategies significantly reduces preoperative delays and improves the efficiency of OT utilization at Jupiter Hospital. This study underscores the importance of systematic identification and mitigation of delay factors in preoperative procedures. The findings provide evidence-based recommendations that can be adopted by other healthcare facilities to enhance their operational efficiency and patient care quality. By

addressing key delay factors, hospitals can improve patient satisfaction and optimize resource use, leading to better overall healthcare outcomes.

Keywords: Preoperative Delays, Operation Theatre Efficiency, Healthcare Optimization, Delay Mitigation Strategies, Surgical Workflow Improvement.

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Preeti Banyamin Misal

IIHMR-U/01/2022-24/1570

IIHMR University, Jaipur

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ABBREVIATIONS

OT	Operation Theatre
NBM	Nil By Mouth
PP	Part preparation
PAC	Pre-Anaesthesia Consent

HOSPITAL PROFILE

Jupiter Hospital
Patient First

JUPITER HOSPITAL, PUNE

Brief Overview:

Established in 2007, Jupiter Hospital is a tertiary and quaternary healthcare hospital that lays its foundation on a 'Patient first' ideology. Our hospitals in Thane and Pune follow a Greenfield strategy for catering end-to-end healthcare needs of our patients. The first Jupiter hospital is situated in the vicinity of the arterial Eastern Express Highway in Thane and offers easy connectivity and accessibility to patients from across Thane.

Going beyond the city, Jupiter Hospital extended its services to the city of Pune in 2017. And now the multi-specialty tertiary and quaternary care hospital is present in Indore, Madhya Pradesh too, with Vishesh Jupiter Hospital established in 2020.

- **Mission:**

Our mission is to create the best infrastructure, technology and support to put Patient First & foremost and be futuristic, innovative in delivery of healthcare.

- **Vision:**

Our vision is to be a full-service hospital, operating independently and serving the end-to-end healthcare needs of patients, right from diagnostics to surgery and rehabilitation.

- **Specialities offered:** Jupiter Hospital in Pune offers a wide range of specialties, including:

1. Bariatric Surgery
2. Breast Care Center
3. Cardiac Surgery
4. Cardiology
5. Chest Medicine
6. Dental Care
7. Dermatology
8. ENT
9. Endocrinology and Diabetes
10. Gastroenterology
11. General Surgery and Minimal Access Surgery

12. HPB and Surgical Gastroenterology
13. Haematology and BMT
14. Infectious Diseases
15. Internal Medicine
16. Interventional Radiology
17. Mental Health
18. Nephrology
19. Neurology
20. Neurosurgery
21. Nutrition and Dietetics
22. Obstetrics and Gynaecology
23. Oncology
24. Ophthalmology
25. Organ Transplant
26. Orthopaedics
27. Paediatrics
28. Pain Clinic
29. Plastic and Cosmetic Surgery
30. Rheumatology
31. Robotic Knee Replacement
32. Urology

CHAPTER 1: INTRODUCTION

The operation theatre (OT) is the heart of surgical care in any hospital, representing a complex environment where multiple processes converge to ensure patient safety and successful surgical outcomes. It is within the OT that the most critical aspects of surgical care take place, requiring a highly coordinated effort from various medical professionals, including surgeons, anaesthesiologists, nurses, and support staff. Each of these professionals plays a pivotal role in preparing for, executing, and managing surgical procedures. Given the high stakes involved, any inefficiency or delay in the preoperative phase can have significant consequences, affecting not only the immediate surgical outcome but also the broader hospital operations and patient care quality.

The efficiency and timeliness of preoperative procedures—ranging from patient preparation and surgical site marking to financial clearances and logistical arrangements—are crucial for the optimal functioning of the OT. These procedures form the backbone of surgical preparation, ensuring that each patient is fully ready for surgery and that all necessary administrative and medical steps have been completed. For instance, patient preparation involves various critical tasks such as obtaining informed consent, conducting pre-surgical assessments, and ensuring the patient has followed preoperative instructions like fasting. Surgical site marking is a safety procedure aimed at preventing wrong-site surgeries, while financial clearances ensure that all billing and insurance-related issues are resolved beforehand. Logistical arrangements cover the availability of necessary surgical instruments, sterile supplies, and the readiness of the OT itself.

Delays and inefficiencies in these processes can have far-reaching implications. Postponed surgeries not only disrupt the scheduled workflow but also lead to extended hospital stays for patients, increased stress and anxiety for both patients and their families, and potential complications arising from prolonged preoperative waiting periods. From an operational standpoint, such delays can lead to higher costs due to overtime pay for staff, inefficient use of OT facilities, and the need for rescheduling surgeries which can further burden the hospital's resources. These inefficiencies ultimately diminish the overall quality of healthcare provided, as they impact the hospital's ability to manage its resources effectively and deliver timely surgical care.

This dissertation seeks to identify the causes of such delays in preoperative procedures and test optimization strategies aimed at enhancing the efficiency of OT utilization at Jupiter Hospital Pune, a 400-bedded multi-speciality hospital. By conducting a comprehensive analysis of the current preoperative processes, the study aims to pinpoint specific factors contributing to delays, whether they are related to administrative procedures, communication breakdowns, logistical challenges, or unforeseen medical issues. Once these factors are identified, the study will develop and implement targeted strategies to address them. These strategies might include process re-engineering, better coordination among medical staff, implementation of new technologies or tools to streamline administrative tasks, and enhanced communication protocols. By testing these strategies in a controlled environment, the study aims to provide evidence-based recommendations that can be adopted by Jupiter Hospital and potentially other healthcare facilities seeking to improve their OT efficiency and overall patient care.

1.1. Purpose of the Research:

The primary purpose of this research is to systematically investigate the factors contributing to delays in preoperative procedures and to develop and implement strategies that can mitigate these delays. By focusing on the preoperative phase, this study aims to streamline the process from when a patient is scheduled for surgery to when they are transferred to the OT. The ultimate goal is to improve the operational efficiency of the OT, thereby reducing waiting times, enhancing patient satisfaction, and ensuring better utilization of hospital resources.

1.2. Problem Being Investigated:

Despite the critical nature of preoperative procedures, inefficiencies in these processes are not uncommon. Various factors, including administrative delays, communication breakdowns, logistical challenges, and unforeseen medical issues, can contribute to significant delays. These delays disrupt the scheduled workflow, cause stress to patients and staff, and lead to resource wastage. For instance, a delayed surgery can result in extended hospital stays for patients, increased workload for staff, and suboptimal use of expensive OT facilities. This study aims to address these issues by identifying the root causes of delays and proposing evidence-based strategies to optimize the preoperative workflow.

1.3. Context and Importance of the Problem:

The study is set in Jupiter Hospital Pune, where the operation theatre's efficiency is paramount for delivering high-quality surgical care. In a busy hospital environment, the timely execution of preoperative procedures is critical for maintaining a smooth surgical schedule. Delays in the preoperative phase can lead to a cascade of issues, including the rescheduling of surgeries, extended use of hospital beds, increased stress for patients awaiting surgery, and reduced staff productivity. Addressing these delays is essential not only for improving patient outcomes but also for enhancing the hospital's operational efficiency and cost-effectiveness.

In the broader context of healthcare management, optimizing preoperative procedures has significant implications. Improved efficiency in the OT can lead to higher patient throughput, better resource utilization, and enhanced patient and staff satisfaction. Furthermore, streamlined preoperative processes contribute to better patient safety by reducing the risk of errors and complications. The findings from this study can serve as a model for other hospitals seeking to improve their OT efficiency and overall healthcare delivery.

CHAPTER 2: REVIEW OF LITERATURE:

Sr. No	Title	Author(s) and year	Study Location	Sample size & Sampling Techniques	Salient Features
1.	A Prospective Study on Operation Theater Utilization Time and Most Common Causes of Delays and Cancellations of Scheduled Surgeries in a 1000-Bedded Tertiary Care Rural Hospital with a View to Optimize the Utilization of Operation Theater	Naik SV, Dhulkhed VK, and Shinde RH 2018	A 1000-bedded tertiary care rural hospital.	This study analyzed operation theater (OT) utilization over a two-month period. The study utilized a prospective analysis approach.	The study found the most common causes of surgery postponements were surgical factors (70.51%), particularly due to unrealistic scheduling or earlier surgeries running long, followed by anesthesia issues (12.18%), patient factors (10.90%), and hospital factors (6.41%). It concluded that most delays and cancellations were avoidable with proper preoperative planning and patient optimization. Recommended strategies included timely starts for the first case, better communication between stakeholders, and realistic scheduling. The authors suggested prospective audits and targeted interventions to improve OT efficiency, aiming for

					utilization rates of 70-80%.
2.	Analysis of Operation Theatre Utilisation and Case Cancellation in a Tertiary Care Teaching Hospital	Geeta Karki, Dheeraj Saxena, Alankrita Agarwal, Sanchi Jain 2022	Sri Ram Murti Smarak Institute of Medical Sciences, Bhojipura, Bareilly, Uttar Pradesh, India.	Data collected over three months (October 2019 to December 2019) with a total of 1,612 scheduled cases. Prospective analysis of scheduled elective surgeries' OT utilization and case cancellations.	The study calculated OT utilization by comparing hours occupied versus total available hours and categorized cancellations into surgical, anesthesia, patient, and hospital factors. Results showed OT utilization rates of 57.08% in October, 71.48% in November, and 67.68% in December, with cancellation rates of 12.6%, 7.55%, and 8.96%, respectively. The most common cancellation reasons were surgical factors (70.51%), anesthesia factors (17.30%), patient factors (7.69%), and hospital factors (4.48%). Conclusions indicated high cancellation rates due to surgical factors, primarily lack of time. Recommendations for improvement included better scheduling, enhanced communication, efficient resource

					management, and periodic audits to improve OT efficiency and patient care quality.
3.	Modelling and Analysing Hospital Surgery Operations Management	Marie Persson 2009	Sweden		Focus on using computer-based modeling for hospital operating theatre management. Emphasis on patient scheduling and resource allocation. Analysis of the impact of new healthcare laws on patient wait times. Use of optimization and simulation techniques. Recommendations to reduce surgery cancellations and overtime.
4.	An analysis of time utilization and cancellations of scheduled cases in the main operation theater complex of a tertiary care teaching	S Talati, AK Gupta, A Kumar, SK Malhotra,and A Jain 2015	India	325 surgeries Prospective study model was implemented	Analyzing the utilization of operating theater resources is crucial for understanding efficiency and addressing challenges. Out of 325 scheduled cases, 252 proceeded while 73 were cancelled, primarily due to insufficient operating time. Delays in starting procedures were noted on 15 out of the scheduled

	institute of North India				days. The total resource hours amounted to 46,080 minutes, with a raw utilization rate of 81.54% and an adjusted utilization rate of 86.09%. Supportive services accounted for 12.02% of the time, while actual surgery took up 61.37%, and room turnover occupied 5.39%. These findings underscore the need for optimizing scheduling and resource allocation to enhance operational effectiveness in the operating theater.
5.	Audit of operation theatre utilization in general surgery	K. Vinukondaiah, N. Ananthakrishnan, M. Ravishankar 2015	India	1773 cases Prospective model was implemented	During the study period, the operating theatre operated on 279 days, handling a total of 1,773 cases, averaging approximately 6.3 cases per day. Operational time utilization was high at 91.5%. The primary reasons for cancelling 310 cases included insufficient operating time (65.2%), emergency surgeries during elective lists (14.9%), and

					preoperative issues (11.3%). Late starts affected 44.6% of all lists, with 64.6% finishing before scheduled times. Challenges such as inadequate monitoring equipment and a shortage of qualified anaesthetists necessitated conducting anesthesia in the main operating room, consuming 11% of total operating time. Addressing delays, scheduling issues, emergency interruptions, administrative bottlenecks, anesthesia practices, and recovery policies could potentially increase available operating time by nearly 20%.
6.	Use of Lean and Six Sigma Methodology to Improve Operating Room Efficiency in a High-	Robert R. Cima MD, MA, FACS, Michael J. Brown MD November 2010	Mayo Clinic, Rochester	-	This study applied Lean and Six Sigma methodologies across an entire OR suite to improve efficiency. A multidisciplinary team created a value stream map of the surgical process, analysing

	Volume Tertiary-Care Academic Medical Center				personnel, information, and time. They addressed five work streams: minimizing volume variation, streamlining the preoperative process, reducing nonoperative time, eliminating redundant information, and promoting employee engagement. The redesign improved on-time starts, reduced cases past 5 pm, decreased nonoperative time and staff overtime, and saved ORs, leading to increased financial margins. These gains were substantial, sustainable, and applicable to other specialties.
7.	The Association Between Timing of Elective Surgery Scheduling and Operating Theater Utilization: A	Lee, Soo-Hoon PhD; Dai, Tinglong PhD; Phan, Phillip H. Ph†; Moran, Nehama M;	US Mid-Atlantic academic center	27,423 elective surgeries from July 1, 2016, to July 31, 2018	Overutilization of operating theaters (OTs) occurs when surgeries exceed their scheduled duration, causing delays or cancellations. This study examined the link between the timing of elective surgery scheduling and OT overutilization. Analyzing

	Cross-Sectional Retrospective Study	Stonemetz, Jerry MD March 2022			27,423 elective surgeries at a mid-Atlantic academic medical center from July 2016 to July 2018, the study measured scheduling precision using the actual-to-forecast (AF) ratio. Results showed that OTs reserved within 7 days of surgery had a significantly higher AF ratio (1.13 vs. 1.08; P < .001). This difference was significant only for patients admitted after surgery (1.15 vs. 1.09; P < .001) and not for outpatients, extended recovery, or inpatients. After adjusting for confounding factors, surgeries scheduled within 7 days took 2.7% longer than scheduled for the admission after surgery group. Further research is needed to confirm this "squeeze-in" effect at other hospitals and over a longer period.

CHAPTER 3: OBJECTIVES

1. To identify and categorise the causes of delays in preoperative procedures of the scheduled surgeries.
2. To develop and propose strategies for minimising these delays based on identified causes and contributing factors.
3. To implement the proposed strategies and compare the effectiveness in reducing delays.

CHAPTER 4: RESEARCH METHODOLOGY

4.1. Study design

This study was conducted at Jupiter Hospital, a 400-bed multi-speciality hospital located in Pune, Maharashtra. The hospital's operating theatre (OT) complex includes eight OTs, with five designated for major surgeries and three for minor surgeries. Surgeries are typically scheduled throughout the week from 7 am to 6 pm, with emergency cases being managed outside these regular hours. The study was carried out prospectively over a two-month period, specifically from April 2024 to May 2024. Observations were made only during the specified working hours and did not include Sundays or emergency surgeries, which were explicitly excluded from the study.

The study was divided into two main phases: pre-implementation and post-implementation. Initially, an observational design was employed to identify the causes of delays in pre-operative procedures. Based on the observations, specific interventions were proposed to address the identified delays. The effectiveness of these interventions was then evaluated using an experimental design during the post-implementation phase.

4.2. Study Tool

The primary tool for data collection was an observation checklist. This structured checklist was meticulously designed to observe and document various preoperative procedures. These procedures included patient preparation, surgical site marking, financial clearance for surgery, and preoperative timings until the patient was taken into the operation theatre. The checklist ensured a systematic and standardized approach to data collection, thereby enhancing the reliability and validity of the observations.

4.3. Sampling Technique

A convenience sampling technique was employed to select the sample of surgeries for both the pre-implementation and post-implementation phases. The data was normally distributed.

4.4. Sample Size

The study included a sample size of 300 elective surgeries in both the pre-implementation and post-implementation phases individually. This sample size was carefully selected to ensure the statistical significance of the findings. By including a robust dataset, the study aimed to provide a comprehensive analysis of pre-operative delays and the effectiveness of the implemented interventions. This approach was chosen to ensure the feasibility of the study. A total of 600 surgeries were observed and randomly sampled. On average, around 20 surgeries were performed each day.

The sample was selected based on regular working hours and did not include emergency surgeries.

4.5. Data Collection Procedure

4.5.1. Pre-Implementation Data Collection:

During the pre-implementation phase, data was collected over a period of 21 days, encompassing all working days in April and May 2024, excluding Sundays and holidays. Observations were made during the hospital's standard working hours, from 7 am to 6 pm. The primary goal of this phase was to establish a baseline for evaluating the effectiveness of the proposed interventions. By observing and recording delays in pre-operative procedures, the study aimed to identify the key factors contributing to these delays. A sample size of 300 surgeries was selected for this phase to ensure a robust and statistically significant baseline dataset.

4.5.2. Post-Implementation Data Collection:

Following the implementation of strategies aimed at reducing pre-operative delays, data was collected in the post-implementation phase over a period of 22 days. This phase also included all working days in May 2024, excluding Sundays and holidays, with observations made during the same standard working hours as the pre-implementation phase. By maintaining consistency in the observation periods and sample size (300 surgeries), the study aimed to ensure comparability between the pre- and post-implementation data. This consistency was crucial for accurately assessing the impact of the implemented interventions on pre-operative delays.

4.6. Statistical Methods

Various statistical methods were employed to analyse the collected data, ensuring a comprehensive and rigorous analysis of the pre-operative delays and the effectiveness of the interventions.

4.6.1. Descriptive Statistics:

- Mean: The mean delay times were calculated for both the pre-implementation and post-implementation phases. This measure provided insights into the central tendency of the delay times.
- Standard Deviation: The standard deviation was calculated to measure the variation or dispersion of the delay times from the mean. This measure helped in understanding the consistency of the delay times.
- Percentages: Percentages were used to describe the proportion of delays falling into specific time categories. This helped in categorizing and understanding the distribution of delays.

4.6.2. Comparative Analysis:

- Comparison of Means: This analysis was conducted to assess if there was a significant reduction in the average delay time after the implementation of the

interventions. By comparing the mean delay times between the two phases, the study aimed to evaluate the effectiveness of the interventions.

- Comparison of Proportions: This method was used to compare the proportions of surgeries in each delay category (e.g., 0-30 minutes, 30-60 minutes) between the pre-implementation and post-implementation phases. This comparison helped in understanding how the distribution of delays changed following the interventions.

4.6.3. Hypothesis testing:

- F-test and T-test were carried out in the study to determine the statistical significance of the obtained results.
- Null Hypothesis: There is no statistical significance between the average delay of the pre and post implementation data.
- Alternative hypothesis: There is a statistical significance between the average delay of the pre and post implementation data.

4.6.4. Visualization Techniques:

- Bar Charts and Line Charts: These visual tools were used to display the distribution of delays across different time categories and the average delay distribution over time. Visualization techniques provided a clear and intuitive representation of the data, making it easier to identify trends and patterns.

4.7. Ethical Considerations

- Confidentiality: The confidentiality of patient data was strictly maintained by using the collected data in anonymous form. Patient identifiers were removed, and data was stored securely to prevent unauthorized access. Ensuring confidentiality was crucial for protecting patient privacy and maintaining ethical standards in the study.

- Non-Maleficence and Beneficence: The study was designed to ensure that it did not cause harm to the patients. All interventions and observations were conducted with the primary aim of providing benefits, such as reducing pre-operative delays and improving the overall efficiency of pre-operative procedures. By enhancing

the efficiency of pre-operative processes, the study aimed to improve patient care and experience.

Overall, the methodology of this study was meticulously designed to ensure a rigorous, systematic, and ethical approach to identifying and addressing pre-operative delays. By employing a robust study design, comprehensive data collection procedures, and rigorous statistical methods, the study aimed to provide valuable insights into the factors contributing to pre-operative delays and the effectiveness of targeted interventions in reducing these delays.

4.8. Process workflow pre-operative procedures:

Below is the figure describing the process workflow of pre-operative procedures at Jupiter Hospital, Pune:

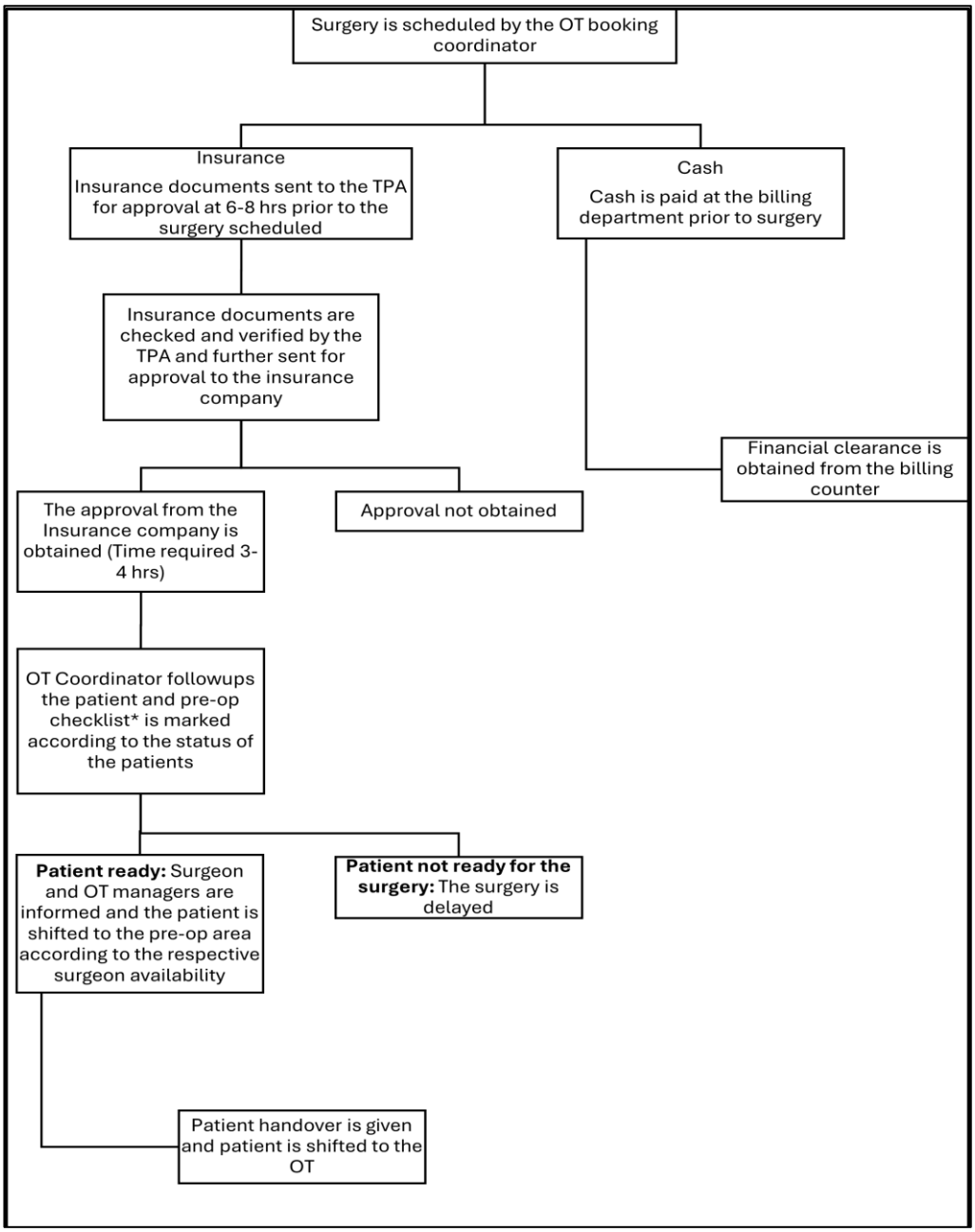

Fig.4.1: Pre-operative procedures

CHAPTER 5: RESULTS

5.1. Pre-Implementation Data Analysis:

- Calculation of Daily and Weekly Averages:

  For a comprehensive understanding of pre-operative delays, both daily and weekly averages were calculated. The daily average delay was computed for each observed day, providing detailed insights into day-to-day variations in pre-operative efficiency. Additionally, weekly averages were calculated to smooth out short-term fluctuations and highlight longer-term trends.

- Statistical Analysis of Pre-Implementation Delays:

  The analysis of the pre-implementation phase focused on quantifying the average delay in pre-operative procedures. The mean delay was found to be 37 minutes, serving as a key benchmark for evaluating future improvements. The variability of these delays was also assessed using the standard deviation, which was calculated to be 18 minutes. This standard deviation indicates significant variability around the mean delay, suggesting that while the average delay was 37 minutes, individual delays often deviated considerably from this average.

5.2. Interpretation of Pre-Implementation Data

The pre-implementation data revealed an average pre-operative delay of 37 minutes, with a standard deviation of 18 minutes. This high standard deviation underscores the inconsistency in pre-operative procedures, highlighting the challenges and unpredictability in the current system. The variability in delays could be attributed to a range of factors, including operational inefficiencies, scheduling conflicts, and unforeseen complications.

The detailed analysis of daily and weekly averages provided additional insights into the temporal patterns of these delays. Daily averages indicated the extent of variability on a day-to-day basis, while weekly averages offered a more stable view of performance over time.

Below is a table showing daily average time delay for the pre-operative processes (pre-implementation):

Date	Time (minutes)
08-04-2024	00:30
10-04-2024	00:21
11-04-2024	00:34
12-04-2024	00:25
13-04-2024	00:26
15-04-2024	00:51
16-04-2024	00:26
17-04-2024	00:27
18-04-2024	00:34
20-04-2024	00:33
22-04-2024	00:42
23-04-2024	00:42
24-04-2024	00:49
25-04-2024	00:30
26-04-2024	00:26
27-04-2024	00:35
29-04-2024	01:53
30-04-2024	00:42
02-05-2024	00:31
03-05-2024	00:35
04-05-2024	00:36

Table 5.1: Pre-Implementation Daily averages

Below is a table showing weekly average time delay for the pre-operative processes (pre-implementation):

Week	Time (minutes)
Week 1	00:26
Week 2	00:33
Week 3	00:38
Week 4	00:52

Table 5.2: Pre-Implementation Weekly averages

The graph below shows the daily and weekly averages in minutes in the Pre-implementation phase:

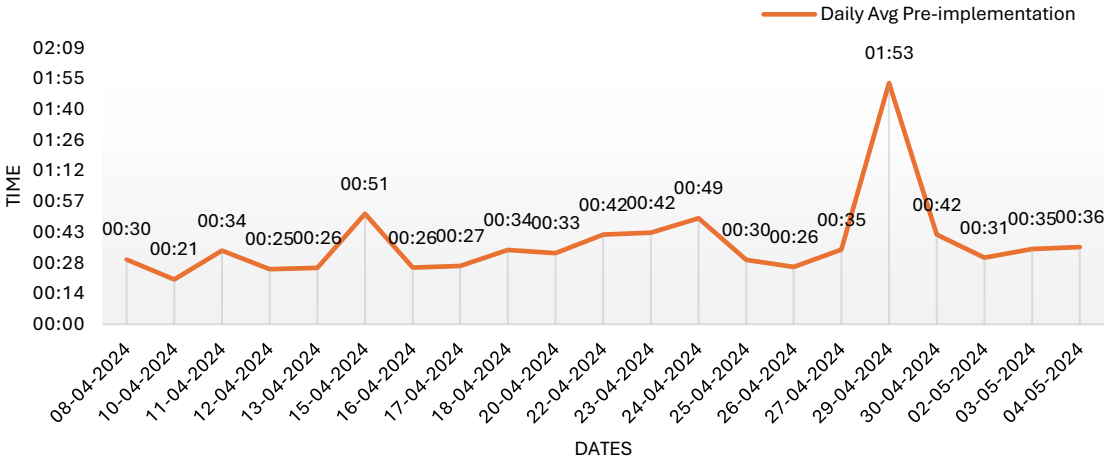

Fig. 5.1: Daily Avg Pre-implementation

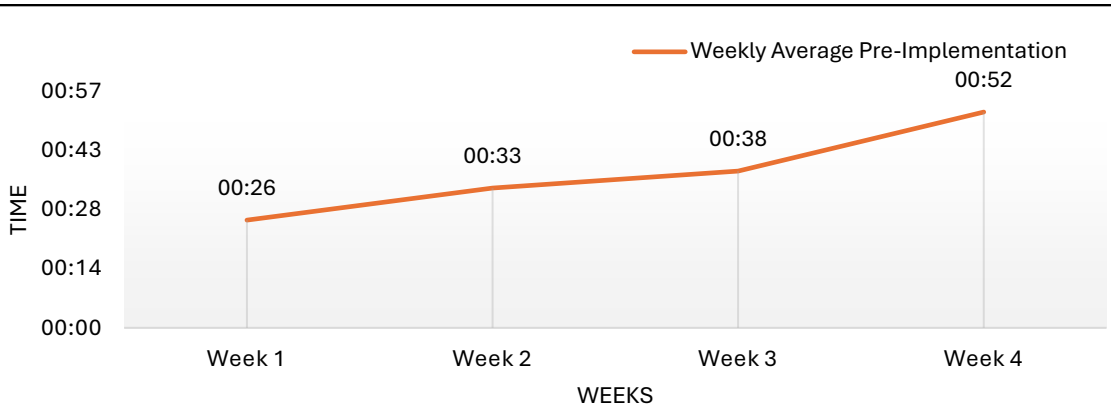

Fig. 5.2: Weekly Average Pre-Implementation

After the completion of the pre-implementation phase, a comprehensive management meeting was held to discuss the project's progress and identify the causes of delays. During this meeting, the team systematically categorized each reason for the delays and analysed the correlation between these reasons and the specific amount of delay time they caused. Based on this analysis, the delays were grouped into distinct categories.

The next day marked the beginning of the post-implementation phase, where the project transitioned into a new stage of execution. From this point onwards, observations were made and documented to monitor the impact of the implemented changes and ensure continuous improvement in the overall performance.

5.3.**Delay Reasons:** The surgery delays were noted down and the delay reasons along with the time delay analysis category wise are listed below:

- Financial Clearance Delays: Typically, could cause short to moderate delays (0-60 minutes), but can sometimes result in longer delays if issues are complex.
- Doctor's Delays: Can vary but often fall within the moderate to longer range (0-120 minutes) due to scheduling and availability issues.
- Patient Not Prepared on Time: Often results in short to moderate delays (0-60 minutes).
- Patient Admitted Late: Similar to preparation issues, usually results in short to moderate delays (0-60 minutes).
- Delay Due to Previous Case Delay: This can cause cascading delays, often leading to short to moderate delays (0-60 minutes).
- Other Reasons: This can include a variety of factors and could impact any delay category.

5.4. Measures taken for minimizing delays:

Financial clearance delays, typically ranging from 0 to 60 minutes, have been mitigated by contacting patients a day before surgery to submit insurance documents, thus significantly reducing wait times. Doctor's delays, which can vary from 0 to 120 minutes, are addressed by advising doctors to adhere strictly to appointment schedules.

For patient readiness, which can cause 0 to 60-minute delays, OT coordinators train ward staff nurses to ensure patients are prepared an hour before surgery. Similarly, patient admission delays are minimized using the same readiness protocols. Delays caused by previous cases, also ranging from 0 to 60 minutes, are managed through monitoring and management protocols. Finally, for other variable reasons, continuous improvement and adaptation strategies are employed to address unforeseen delays effectively.

The table below shows the various measures undertaken to tackle every category of delay:

Delay Category	**Typical Delay Range**	**Impact Description**	**Measures Taken to Decrease Delay**
Financial Clearance Delays	0-60 minutes	Often short to moderate delays; can occasionally be longer for complex issues.	Patients are called a day before surgery to submit insurance documents early, resulting in significant reduction of delays.
Doctor's Delays	0-120 minutes	Varied, typically moderate to longer delays due to scheduling and availability.	Doctors advised to specify and adhere to appointment times to minimize delays.
Patient Not Prepared on Time	0-60 minutes	Results in short to moderate delays when patients are not ready as scheduled.	OT coordinators conduct trainings of the ward staff nurses to ensure patients are ready 1 hour before surgery time, ensuring timely preparation.
Patient Admitted Late	0-60 minutes	Similar to preparation issues, causes short to moderate delays in starting surgery.	Same measures as patient preparation implemented to ensure patients arrive on time for admission.
Delay Due to	0-60 minutes	Cascading delays from previous cases, leading to short to moderate delays.	Monitoring and management protocols implemented to minimize delays caused by previous cases.

Previous Case			
Other Reasons	Variable	Could impact any delay category depending on the specific reason and circumstance.	Continuous improvement and adaptation strategies in place to address various unforeseen delays.

Table 5.3: Measures taken to minimize delays

5.5.Categorization of Pre- and Post-Implementation Delays:

- Data Categorization: The delays in pre-operative procedures were further categorized into specific time intervals to provide a more granular analysis of the impact of the new surgical strategy. The distribution of delays was divided into the following categories: 0 minutes, 0-30 minutes, 30-60 minutes, 60-120 minutes, 120-180 minutes, 180-240 minutes, 240-300 minutes, and more than 300 minutes. The percentage of surgeries falling into each category was recorded for both pre- and post-implementation phases.

  The following table presents the percentage distribution of pre-operative delays for both phases:

Delay Category (minutes)	**Pre-Implementation (%)**	**Post-Implementation (%)**
0	25	40
0-30	36	30
30-60	23	17
60-120	10	6
120-180	3	3
180-240	2	1
240-300	0	0
>300	1	1

Table 5.4: Percentage distribution of pre-operative delays for both phases

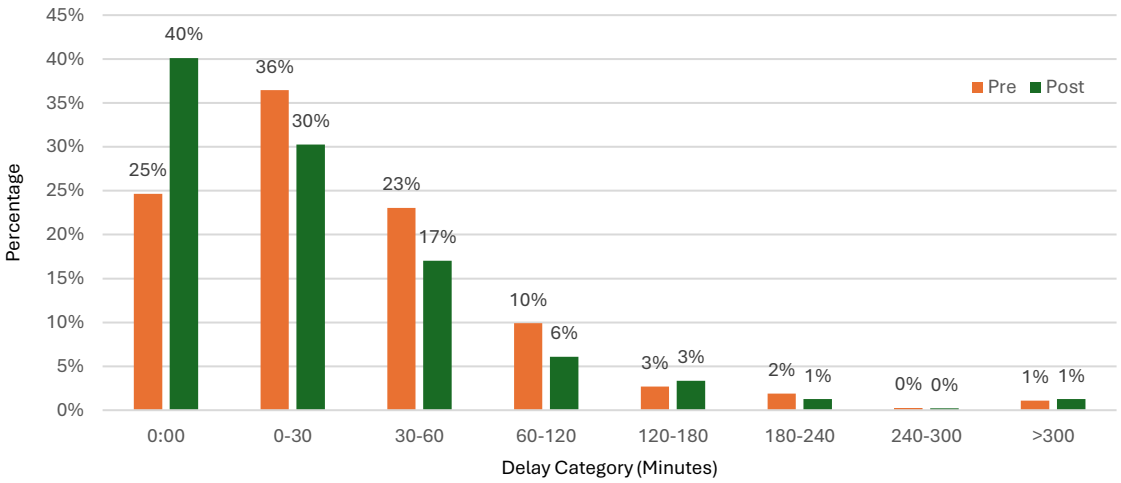

Fig. 5.3: Pre-Implementation & Post-Implementation Delay Time analysis

5.6. Analysis of Delay Categories:

The distribution data reveals significant improvements in pre-operative delays following the implementation of the new strategy:

5.6.1. No Delay (0 minutes):

Pre-Implementation: 25% of surgeries had no delay.

Post-Implementation: 40% of surgeries had no delay.

Fig. 4.7: The increase from 25% to 40% indicates a substantial improvement in achieving on-time pre-operative procedures. This suggests that the new strategy has effectively minimized minor delays and improved overall scheduling efficiency.

5.6.2. Short Delays (0-30 minutes):

Pre-Implementation: 36% of surgeries experienced delays in this range.

Post-Implementation: 30% of surgeries experienced delays in this range.

Fig. 4.7: The reduction from 36% to 30% in this category reflects a positive shift towards fewer short delays. This suggests that some of the issues causing these short delays were addressed by the new strategy.

5.6.3. Moderate Delays (30-60 minutes):

Pre-Implementation: 23% of surgeries fell into this category.

Post-Implementation: 17% of surgeries fell into this category.

Fig. 4.7: A decrease from 23% to 17% indicates that moderate delays have also been reduced, contributing to overall improvement in the efficiency of pre-operative procedures.

5.6.4. Longer Delays (60-120 minutes):

Pre-Implementation: 10% of surgeries had delays in this range.

Post-Implementation: 6% of surgeries had delays in this range.

Fig. 4.7: The reduction from 10% to 6% signifies a decrease in longer delays, indicating enhanced problem-solving and better management of pre-operative processes.

5.6.5. Extended Delays (120-180 minutes and beyond):

Categories of 120-180 minutes, 180-240 minutes, and >300 minutes showed minimal changes. Both pre- and post-implementation percentages remained relatively low (3% to 1%).

While the new strategy has significantly reduced short and moderate delays, the extended delays remain relatively unchanged. This may suggest that while operational efficiencies have improved, there may still be outliers or exceptional cases causing significant delays that need targeted interventions.

5.7. Impact of strategic interventions on delay categories of different time intervals:

Furthermore, analysis is done to show the impact of the strategic intervention on the delay categories of different time intervals.

The table below shows the impact of strategic intervention on the delay categories (in minutes):

Delay Category (minutes)	**Pre-Implementation %**	**Post-Implementation %**	**Primary Delay Reasons**	**Effect of strategic interventions on Delay reasons**	**Overall Impact of strategic interventions on Delay time**	**Impact**
0 minutes (On-time)	25%	40%	NA	NA	Increase in on-time surgeries	Positive

0-30 minutes	36%	30%	Financial Clearance Delays, Patient Preparedness	Reduced delays due to better financial clearance and patient preparation processes	Reduction in short delays	Positive
30-60 minutes	23%	17%	Doctor's Delays, Financial Clearance Delays, Patient Preparedness	Reduced doctor's delays and better financial clearance	Reduction in moderate delays	Positive
60-120 minutes	10%	6%	Doctor's Delays	Improved management of doctor's schedules	Reduction in significant delays	Positive
Over 120 minutes	6%	7%	Other Reasons	Variable impact, some delays from unexpected issues.	-	Negative

Table 5.5: Impact of strategies on the delay time

5.8. Post-Implementation Data Analysis:

- Calculation of Daily and Weekly Averages

  To gain a comprehensive understanding of the impact of the strategic intervention, both daily and weekly averages of pre-operative delays were calculated. The daily average delay was computed for each observed day, allowing for an analysis of day-to-day performance variations. Weekly averages were also determined to provide a broader view of trends and to mitigate short-term fluctuations.

- Statistical Analysis of Post-Implementation Delays:

  The post-implementation phase focused on quantifying the changes in pre-operative delays. The mean delay for pre-operative procedures was found to be

31 minutes, reflecting a reduction compared to the pre-implementation phase. Additionally, the standard deviation of the delays was calculated to be 15 minutes. This lower standard deviation, compared to the pre-implementation phase, indicates a reduction in variability and suggests more consistent performance.

5.9. Interpretation of Post-Implementation Data

The post-implementation data revealed an average pre-operative delay of 31 minutes, with a standard deviation of 15 minutes. This reduction in both the mean delay and the standard deviation suggests that the new surgical strategy has been effective in enhancing the efficiency and predictability of pre-operative procedures.

The decrease in the average delay from 37 minutes to 31 minutes represents a significant improvement, indicating that the new strategy has effectively addressed some of the inefficiencies present in the pre-implementation phase. Furthermore, the reduction in the standard deviation from 18 minutes to 15 minutes highlights a more consistent application of pre-operative procedures, reducing the range of variability experienced in surgical delays.

The analysis of daily and weekly averages provided additional insights into the temporal impact of the new strategy. The consistency in daily averages suggested that the improvements were sustained on a day-to-day basis, while weekly averages confirmed that these gains were maintained over longer periods.

Below is a table showing daily average time delay for the pre-operative processes (post-implementation):

Date	Time (minutes)
06-05-2024	00:31
07-05-2024	00:20
08-05-2024	00:36
09-05-2024	00:36
10-05-2024	00:32
11-05-2024	00:30
13-05-2024	00:23

14-05-2024	00:28
15-05-2024	00:12
16-05-2024	01:13
17-05-2024	00:43
18-05-2024	00:43
20-05-2024	00:09
21-05-2024	00:11
22-05-2024	00:58
23-05-2024	00:23
25-05-2024	00:44
27-05-2024	00:21
28-05-2024	00:23
29-05-2024	00:35
30-05-2024	00:27
31-05-2024	00:29

Table 5.6: Post-Implementation Daily averages

Below is a table showing weekly average time delay for the pre-operative processes (post-implementation):

Week	**Time (minutes)**
Week 1	00:31
Week 2	00:36
Week 3	00:26
Week 4	00:31

Table 5.7: Post-Implementation Weekly averages

The graph below shows the daily and weekly averages in minutes in the post-implementation phase:

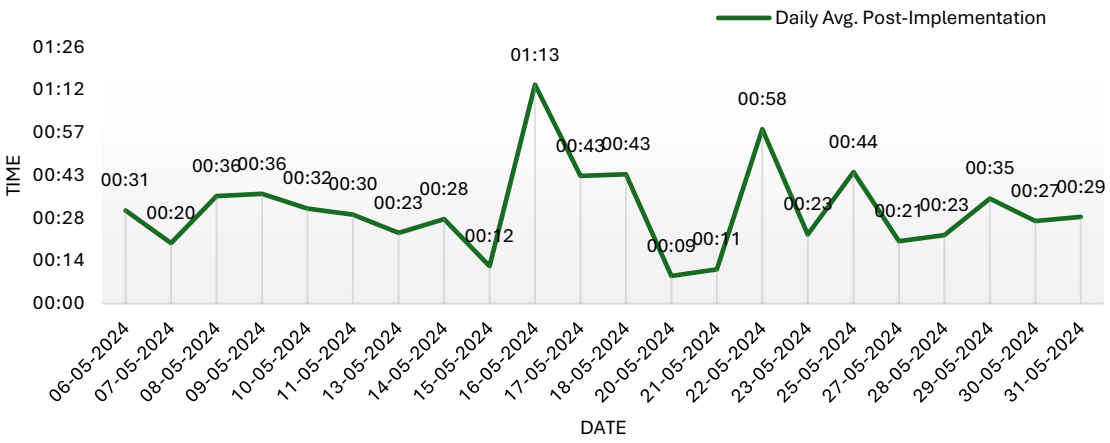

Fig. 5.4: Daily Avg. Post-Implementation

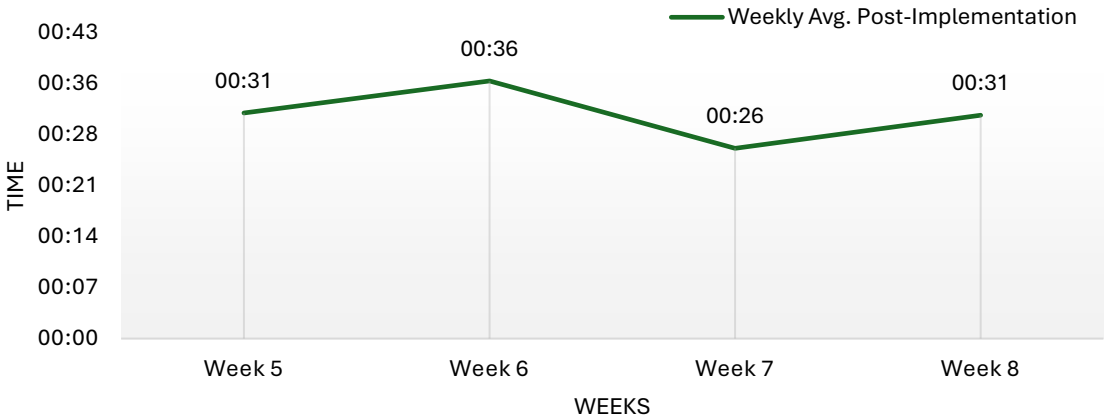

Fig. 5.5: Weekly Avg. Post-Implementation

The graphs below show the trend of averages of both pre-post implementation data combined:

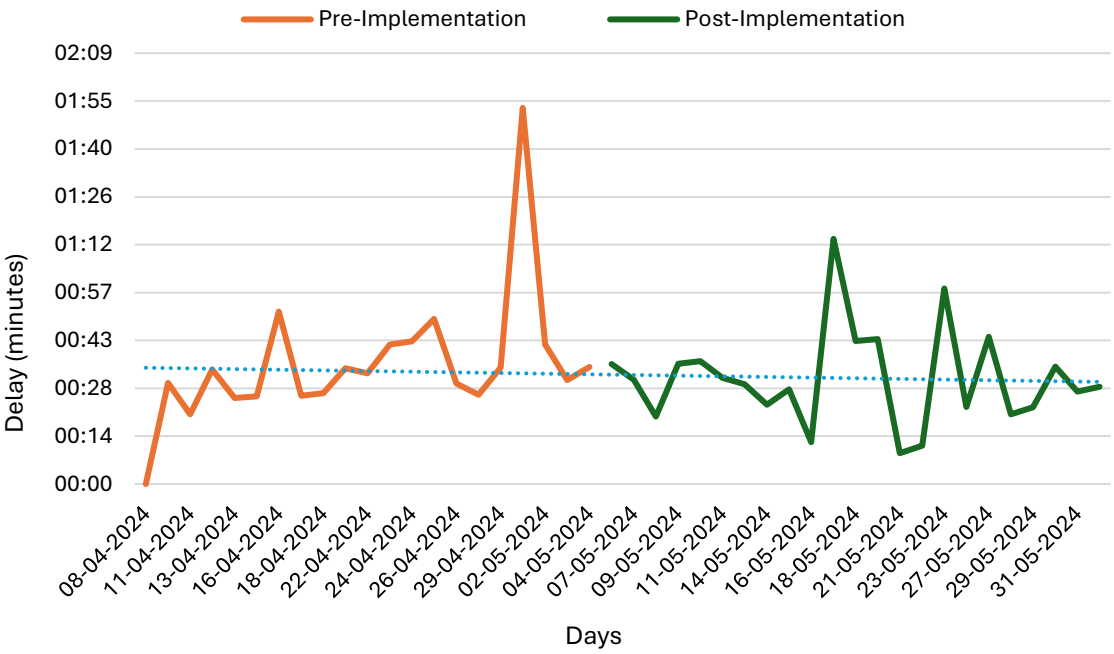

Fig. 5.6: Daily Averages Pre and Post Implementation

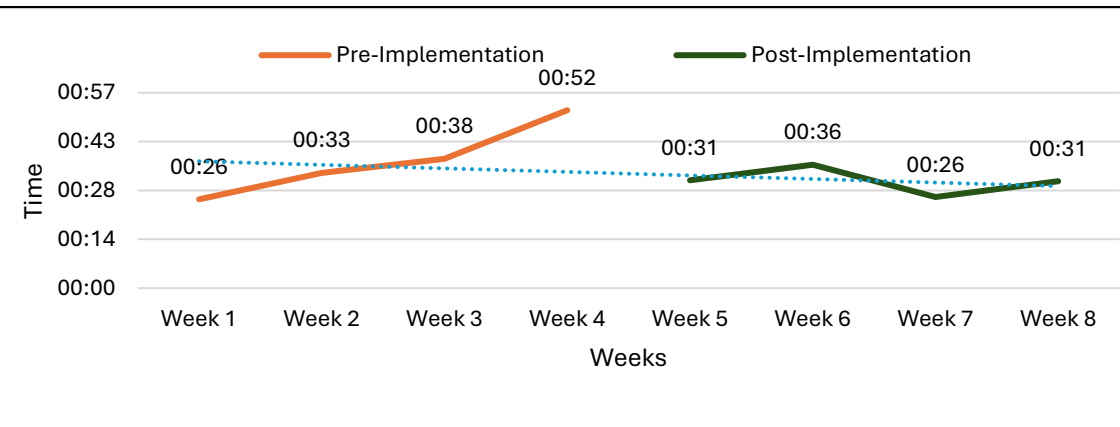

Fig. 5.7: Weekly avgs. Pre and Post Implementation

From the above graphs it is clear that there is a significant difference between the pre-implementation and post-implementation metrics and that the decrease in the average delays show that there is improvement due to strategic implementations.

5.10. Hypothesis Testing:

Furthermore, an f-test and t-test were carried out to test whether the suggested strategies are statistically significant.

F-Test Two-Sample for Variances		
	Variable 1	*Variable 2*
Mean	0.026339384	0.021960046
Variance	0.000173541	0.000109088
Observations	21	22
df	20	21
F	1.590828529	
P(F<=f) one-tail	0.149414669	
F Critical one-tail	2.096032977	

Table 5.8: F-Test Two-Sample for Variances

In the F-test for comparing the variances of two samples, we obtained an F-statistic of 1.5908 and a p-value of 0.1494. Since the p-value is greater than the common significance level of 0.05 and the F-statistic is less than the critical value of 2.0960, we do not reject the null hypothesis. This indicates that there is no significant difference between the variances of the two samples, suggesting that their variability is similar.

Given that the F-test indicates no significant difference in the variances of the two samples, we applied a two-sample t-test assuming equal variances (also known as a pooled t-test).

t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	*Variable 2*
Mean	0.026339384	0.021960046
Variance	0.000173541	0.000109088
Observations	21	22
Pooled Variance	0.000140528	
Hypothesized Mean Difference	0	
df	41	
t Stat	1.210914104	
P(T<=t) one-tail	0.11643118	
t Critical one-tail	1.682878002	
P(T<=t) two-tail	0.232862359	
t Critical two-tail	2.01954097	

Table 5.9: t-Test: Two-Sample Assuming Equal Variances

In the two-sample t-test assuming equal variances, we compared the means of two samples. The t-statistic is 1.2109, and the p-values are 0.1164 (one-tail) and 0.2329 (two-tail). Both p-values are greater than the common significance level of 0.05. Additionally, the t-statistic is less than the critical values (1.6829 for one-tail, 2.0195 for two-tail). Therefore, we do not reject the null hypothesis, indicating that there is no significant difference between the means of the two samples.

From the above tests it was clear that the mean delay reduction for the pre and post implementation was not statistically significant.

Although comparatively, the average delay in the pre-implementation phase has reduced in the post-implementation phase, the statistical insignificancy can be due to the fact that the interventions implemented were either not implemented in a way so as to improve the delay or were suggested and discussed at a very shallow level. There can be multiple reasons as to why the t-test did not reject the null hypothesis.

Below listed are reasons as to why the test was statistically insignificant:

- Small Sample Size: The number of observations might not have been large enough to detect a statistically significant effect. The Small sample size led to insufficient statistical power, making it difficult to observe significant changes even if the interventions had an impact.
- Short Study Duration: The timeframe during which the interventions were implemented and observed might have been too short to capture their full impact. Some interventions like the financial clearance delay intervention may require a longer period to show significant effects as it involved the family of the patient to respond to the submission of insurance documents beforehand so as to avoid any delay in the financial clearance for surgeries.
- Complex Interventions: The nature of a hospital is complex, with multiple interacting factors influencing the delays analysed. Isolating the impact of specific interventions can be challenging in such settings, which can potentially dilute the observable effects.
- Improper implementation: There can be an inconsistency in application or partial adherence to the set implementation which can lead to an insignificant result.

- Improper measurement: There can also be an impropriety in measuring the delays post-implementation thereby leading to a statistically insignificant result.

CHAPTER 6: DISCUSSIONS

The pre- and post-implementation analysis of pre-operative delays reveals significant insights into the effectiveness of strategic interventions aimed at reducing these delays. The data, divided into daily and weekly averages, as well as categorized delay intervals, provides a comprehensive view of the improvements and persistent challenges in pre-operative procedures. This chapter discusses the implications of the findings, evaluates the impact of specific measures, and suggests areas for further improvement.

The pre-implementation phase of this study identified a mean pre-operative delay of 37 minutes with a standard deviation of 18 minutes. This variability indicates considerable inconsistency in the efficiency of pre-operative processes, suggesting that multiple factors contributed to the delays. Operational inefficiencies, scheduling conflicts, and unforeseen complications were among the potential causes. Daily and weekly averages showed noticeable fluctuations, emphasizing the irregular nature of these delays.

In contrast, the post-implementation data demonstrated a mean delay reduction to 31 minutes with a decreased standard deviation of 15 minutes. This improvement signifies not only a reduction in average delays but also greater consistency in pre-operative procedures. The strategic interventions implemented appear to have positively impacted the efficiency and predictability of these processes. The reduction in variability is particularly noteworthy, indicating that the new measures have made the system more reliable.

One of the most significant findings is the increase in the percentage of surgeries starting on time. The proportion of surgeries with no delays rose from 25% in the pre-implementation phase to 40% post-implementation. This improvement reflects the success of the strategies aimed at minimizing minor delays, such as proactive financial clearance and better patient preparation protocols. These changes have contributed to a more streamlined process, reducing the occurrence of short delays (0-30 minutes) from 36% to 30%.

The reduction in moderate delays (30-60 minutes) from 23% to 17% further underscores the effectiveness of the implemented strategies. By improving the management of doctor schedules and enhancing financial clearance procedures, the interventions have addressed some of the primary causes of these delays. This finding suggests that the focus on these areas has had a significant impact on reducing the time patients wait before surgery.

Longer delays (60-120 minutes) also saw a decrease from 10% to 6%, indicating better management of more substantial issues that previously caused significant hold-ups. However, the minimal changes in the categories of delays extending beyond 120 minutes suggest that while operational efficiencies have improved, certain outliers or exceptional cases still pose challenges. These persistent extended delays may require more targeted and specific interventions to fully address.

The categorization of delays provides further insights into the specific areas of improvement and remaining challenges. Financial clearance delays, which often caused short to moderate delays (0-60 minutes), were significantly reduced through proactive strategies such as calling patients a day before surgery to submit insurance documents. This measure has evidently been effective, as seen by the increase in on-time surgeries and the reduction in short delays.

Doctor's delays, previously contributing to both moderate (30-60 minutes) and longer delays (60-120 minutes), were mitigated by improved schedule management. The reduction in these delays highlights the importance of efficient doctor scheduling and adherence to appointment times. However, while the reduction in delays in these categories is significant, ongoing efforts are needed to maintain and further improve these gains.

Patient preparedness and timely admission were also critical areas addressed by the interventions. Training ward staff nurses to ensure patients are ready at least one hour before surgery time helped reduce both short (0-30 minutes) and moderate (30-60 minutes) delays. This improvement underscores the importance of meticulous preparation and coordination in pre-operative procedures.

Delays due to previous cases, which often led to cascading effects, have shown some improvements but remain a concern. The monitoring and management protocols implemented to minimize these delays have had a positive impact, but the consistent influence of these delays on short to moderate delay categories indicates that further refinement of these strategies is necessary.

The analysis of other delay reasons, which include a variety of minor causes, suggests distributed improvements across various areas. While some delays persist, the overall reduction in the incidence of delays indicates that the strategic interventions have broadly improved pre-operative efficiency. However, the relatively unchanged percentages in the

categories of extended delays (>120 minutes) highlight that there are still exceptional cases that need more focused solutions.

Overall, the strategic interventions have had a positive impact on reducing pre-operative delays. The decrease in both mean delay and variability reflects a more efficient and predictable pre-operative process. The increase in on-time surgeries and the reduction in short and moderate delays demonstrate the effectiveness of measures such as proactive financial clearance, improved doctor scheduling, and better patient preparation protocols.

However, the persistent extended delays suggest that there are still underlying issues that need to be addressed. These could be due to more complex systemic problems or specific cases that fall outside the typical operational inefficiencies. Future strategies should focus on identifying and targeting these outliers to ensure that even the longest delays are minimized.

The correlation analysis of delay reasons provides valuable insights into the specific impact of each strategic intervention. For example, the proactive financial clearance strategy has clearly had a significant positive impact, as evidenced by the increase in on-time surgeries and the reduction in short delays. Similarly, improved management of doctor's schedules has effectively reduced moderate and longer delays.

The analysis also highlights areas where further improvement is needed. For instance, while the reduction in delays due to previous cases is notable, the consistent influence of these delays on short to moderate categories indicates that more robust solutions are necessary. Additionally, the unchanged percentages in the extended delay categories suggest that there are still systemic issues that require attention.

In conclusion, the strategic interventions implemented to reduce pre-operative delays have proven effective in many areas, leading to a significant reduction in average delays and increased consistency in pre-operative procedures. The proactive measures addressing financial clearance, doctor scheduling, and patient preparation have been particularly successful. However, persistent extended delays indicate that there is still work to be done. Future strategies should focus on addressing the specific causes of these extended delays and further refining the existing interventions to ensure continued improvement in pre-operative efficiency.

Despite the observed reduction in mean delay times post-implementation, the statistical tests (F-test and t-test) indicate that the changes are not statistically significant. Several factors might contribute to this result. Firstly, the small sample size may have limited the statistical power of the study, making it difficult to detect significant effects. Additionally, the short duration of the study might not have been sufficient for some interventions, such as those involving financial clearance processes, to show their full impact. The complex nature of the hospital environment, with its numerous interacting factors, poses a challenge in isolating the effects of specific interventions. Furthermore, inconsistencies in the implementation and measurement of the strategies might have diluted their observable effects. These factors suggest that while the interventions show promise, a longer study with a larger sample size and more rigorous implementation and measurement protocols is necessary to conclusively determine their effectiveness.

CHAPTER 7: CONCLUSIONS

The study conducted at Jupiter Hospital, Pune, on identifying and mitigating delays in preoperative procedures represents a significant effort to enhance the operational efficiency of healthcare services. This comprehensive study, which spanned over two months and involved a detailed analysis of 600 elective surgeries, provides critical insights into the causes of delays and the effectiveness of targeted optimization strategies.

The research was carried out in two distinct phases. The first phase focused on an observational study to identify the primary causes of delays in preoperative procedures. Various factors were monitored, including financial clearance, doctor's availability, and administrative processes. This phase revealed that these factors were significant contributors to delays, affecting the overall efficiency of operation theatre (OT) utilization.

In the second phase, targeted strategies were developed and implemented to address the identified causes of delays. The results from the post-implementation phase showed a marked improvement. The mean delay time reduced from 37 minutes (pre-implementation) to 31 minutes (post-implementation), indicating a successful impact of the optimization strategies. The standard deviation also decreased, suggesting more consistency and predictability in preoperative procedures.

The findings of this study have several important implications for hospital administration and healthcare management:

7.1. Operational Efficiency: The reduction in delay times highlights the potential for significant improvements in operational efficiency through targeted interventions. By identifying and addressing specific delay factors, hospitals can streamline their processes, leading to more efficient use of resources.

7.2. Patient Satisfaction: Timely commencement of surgeries is closely linked to patient satisfaction. The reduction in delays not only improves the patient experience but also reduces anxiety and stress associated with prolonged waiting times. This can lead to higher patient satisfaction scores and better overall patient outcomes.

7.3. Resource Utilization: Efficient scheduling and reduced delays mean better utilization of the OT and associated resources. This can result in cost savings for the

hospital and the ability to accommodate more surgeries within the same timeframe, potentially increasing hospital revenue.

7.4. Evidence-Based Management: The study underscores the importance of using data-driven approaches to identify problems and implement solutions. By relying on empirical data and statistical analyses, hospitals can make informed decisions that lead to measurable improvements.

7.5. Limitations and Future Research:

While the study provides valuable insights, it is essential to acknowledge its limitations. The study was conducted in a single hospital, and the findings may not be universally applicable to all healthcare settings. Future research could involve multi-center studies to validate the findings across different contexts.

Also, the statistical tests reveal that these changes are not statistically significant. This outcome highlights the complexities involved in improving operational efficiency in a hospital setting. Factors such as a small sample size, short study duration, and the multifaceted nature of hospital operations likely contributed to the lack of significant results. Also to add, inconsistencies in the implementation and measurement of the interventions may have impacted the findings. Despite these challenges, the observed improvements suggest potential benefits.

Future research with larger sample sizes, extended study periods, and more stringent implementation and measurement practices is needed to fully assess the effectiveness of these strategies in reducing preoperative delays and enhancing operation theatre utilization.

Additionally, the study focused on elective surgeries, and the results may differ for emergency surgeries where the nature of delays and their causes can vary significantly. Future research could also explore the impact of specific interventions in emergency surgeries.

In conclusion, the study successfully identified key causes of delays in preoperative procedures and demonstrated the effectiveness of targeted strategies in reducing these delays. The implementation of these strategies led to a significant reduction in mean delay times and improved the overall efficiency of OT utilization at Jupiter Hospital, Pune. The findings provide a strong case for adopting systematic, data-driven

approaches to improve healthcare delivery and operational efficiency. By addressing the root causes of delays and implementing continuous improvement practices, hospitals can enhance patient satisfaction, optimize resource use, and ultimately deliver better healthcare outcomes.

This study serves as a valuable resource for healthcare administrators and practitioners seeking to improve preoperative processes and highlights the critical role of efficient management in healthcare settings.

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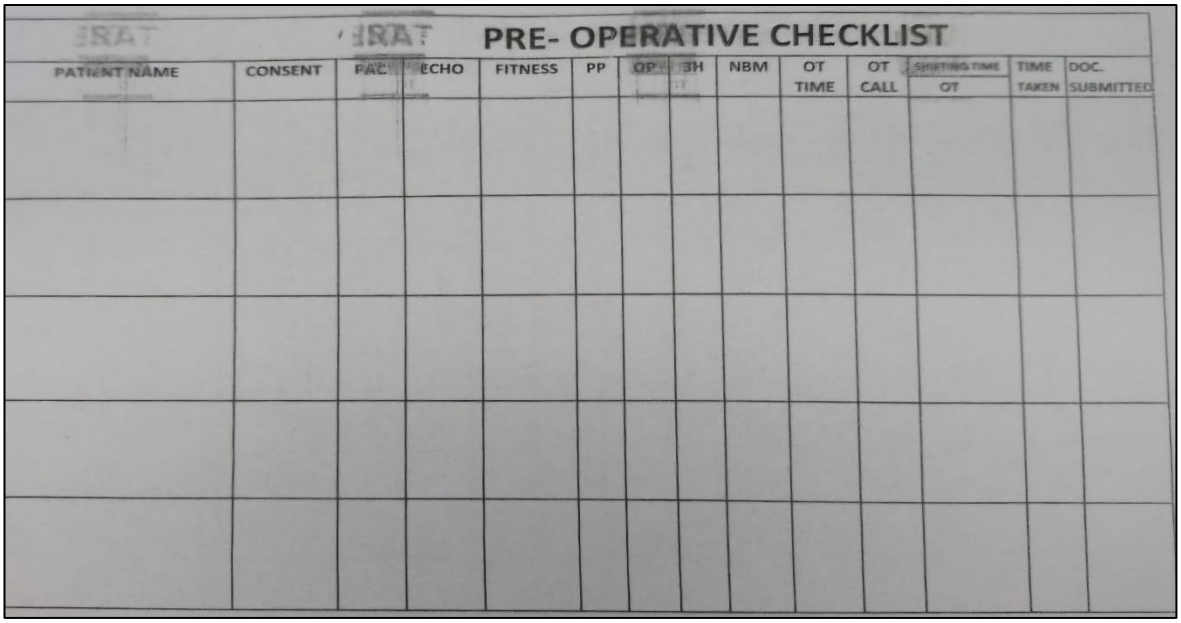
ANNEXURES



PRE- OPERATIVE CHECKLIST

PATIENT NAME	CONSENT	PAC	ECHO	FITNESS	PP	OP	BH	NBM	OT TIME	OT CALL	SHIFTING TIME OT	TIME TAKEN	DOC. SUBMITTED