A CROSS-SECTIONAL STUDY ON ENHANCING OPERATING THEATRE EFFICIENCY THROUGH TIME MANAGEMENT AND WORKFLOW OPTIMIZATION

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfillment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Bhalerao Sayali Anand

Under the Supervision and Guidance of

Dr. Vinod Kumar SV

2025

KIMS-KINGSWAY HOSPITALS

CERTIFICATE

This is to certify that **Dr. Sayali Anand Bhalerao** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur has successfully completed her/his internship at KIMS-Kingsway Hospital, Nagpur., during April 1st - June 14th , 2025.

Place: Nagpur

Date:

Preceptor/Head of the Organization

KIMS-Kingsway Hospital

SPANV Medisearch Lifesciences Private Limited
44, Parwana Bhawan, Kingsway, Nagpur - 440 001, Maharashtra, India.
Phone: +91 0712 6789100
CIN: U74999MH2018PTC303510

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled "**A Cross-Sectional Study on Enhancing Operating Theatre Efficiency Through Time Management and Workflow Optimization**" is a record of the research work undertaken by **Dr. Sayali Anand Bhalerao**, 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. Vinod Kumar S.V

Faculty Guide

IIHMR University, Jaipur

Date:

Dr. Sanjay Gupta

School Dean

IIHMR University, Jaipur

Date

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **"A CROSS-SECTIONAL STUDY ON ENHANCING OPERATING THEATRE EFFICIENCY THROUGH TIME MANAGEMENT AND WORKFLOW OPTIMIZATION"** 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 Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Signature: - Sayali

Dr. Sayali Anand Bhalerao

Date: - 19/06/2025

ABSTRACT

TITLE- "A Cross-Sectional Study on Enhancing Operating Theatre Efficiency Through Time Management and Workflow Optimization"

Objectives

- To determine the average turnaround time (TAT) between consecutive surgeries.
- To assess the time spent in specific OT processes such as patient preparation, induction, and cleaning.
- To identify the root causes of delays in OT workflows.
- To propose practical, evidence-based strategies for improving OT efficiency and time management.

Efficient functioning of the Operating Theatre (OT) is critical to ensuring high quality surgical care, maximizing resource utilization, and enhancing overall hospital performance. In high-volume tertiary care hospitals, delays and inefficiencies in OT workflows can significantly impact patient throughput, surgical outcomes, and operational costs. This cross-sectional study was undertaken to evaluate the turnaround time between consecutive surgeries, identify the key contributors to delays, and propose evidence-based strategies to optimize OT workflows and time management.

Conducted over a period of three months in a tertiary care hospital, the study analyzed 546 surgeries using structured observational checklists and real-time data collection. Key process intervals evaluated included patient preparation, induction-to-incision time, surgical closure to extubation, and post-operative cleaning and setup. The average total turnaround time was found to be 62 minutes. Among all intervals, the induction-to- incision phase was the most time-consuming, averaging 29 minutes. Patient preparation averaged 12 minutes, while the closure to extubation and cleaning/setup times averaged 10 and 11 minutes respectively.

Pareto analysis revealed that a limited number of factors were responsible for the majority of delays. Surgeon unavailability or late arrival was identified as the leading cause, accounting for 32.35% of delays. Cumulatively, factors such as OT occupancy, difficulty in intubation, equipment readiness, and delayed patient shifting contributed to 57.56% of total delay instances. Notably, a small subset of surgeons—particularly from orthopedics', neurosurgery, and cardiothoracic departments—were responsible for over 40% of late arrivals, with the top eight surgeons accounting for 83.12% of such instances. These findings underscore the need for targeted interventions at both individual and systemic levels.

The study highlights the importance of time-motion studies and process audits in identifying inefficiencies in surgical settings. It advocates for adopting data-driven strategies, including strict adherence to OT schedules, real-time monitoring systems, improved communication protocols, and enhanced accountability among OT personnel. Emphasizing interdisciplinary collaboration, the research proposes a framework for workflow optimization that aligns with modern healthcare goals of safety, timeliness, efficiency, and patient-centeredness.

In conclusion, optimizing OT efficiency is not only crucial for clinical excellence but also for operational sustainability. The findings of this study provide valuable insights for hospital administrators, clinicians, and policymakers to implement strategic changes that can significantly enhance OT performance and elevate the standard of surgical care.

Keywords: Turnaround Time, Operating Theatre Efficiency, Workflow Optimization, Surgical Delays, Time Management, Resource Allocation in Healthcare

Conclusion

Improving operating theatre efficiency through effective time management and streamlined workflows is an essential priority for contemporary healthcare systems. By adopting data-driven strategies, encouraging teamwork, and leveraging technological advancements, healthcare organizations can transform surgical environments into highly efficient, patient-focused spaces that ensure safe, timely, and high-quality care. This study provides a valuable starting point for future research and highlights the urgent need for healthcare leaders and professionals to embed operational excellence as a fundamental aspect of delivering surgical service.

ACKNOWLEDMENT

I extend my heartfelt gratitude to the **KIMS – Kingsway Hospital, Nagpur.,** for granting me the invaluable opportunity to pursue my dissertation internship. This experience has been profoundly enriching and has been instrumental in deepening my understanding and growth in the field of Hospital and Health Management.

I am deeply thankful to **Dr. Deepak Dongre**, Quality Head, KIMS-Kingsway Hospital, for offering me the chance to intern with such a distinguished organization also whose joyful spirit and infectious positivity made every interaction a memorable one and whose unwavering guidance, encouragement, and insightful mentorship were instrumental throughout my journey. His encouragement created a learning environment filled with warmth, energy, and genuine care.

My sincere thanks to my university mentor, **Dr. Vinod Kumar S.V**, for his steady guidance, timely feedback, and academic support throughout this process.

The knowledge, skills, and experiences gained during this internship will remain a cornerstone of my professional journey and will continue to guide me in my future endeavors.

Sincerely,
Dr. Sayali Anand Bhalerao
MBA Hospital and Health Management, 2023-25) IIHMR University, Jaipur

List of Contents

Content	Page.no
Abstract	6
Acknowledgement	8
List of Figures	10
List of Abbreviations	11
Chapter 1: Introduction	12
1.1 Background of study	14
1.2 Objectives	14
Chapter 2: Review Of Literature	15
Chapter 3: Research Methodology	17
3.1 Research Setting	17
3.2 Study Period	17
3.3 Research Approach	17
3.4 Research Design	17
3.5 Population	18
3.6 Sample Size	18
3.7 Sampling Technique	18
3.8 Criteria for selection of sample	18
3.8.1 Inclusion Criteria	18
3.8.2 Exclusion Criteria	18
3.9 Construction of Tool	18
3.10 Description of Tool	19
3.11 Data Collection Process	19
Step–I	19
Step–II	19
Step-III	19
3.12 Data Analysis Technique	19
3.13 Operational Definitions	21
Chapter 4: Results	22
4.1 Data Analysis	23
Chapter 5: - Discussion	26
Conclusion	28
Limitations	29
Summary	30
Bibliography	31

LIST OF FIGURES

Sr no.	Title	Page Number
Figure 4.1	Bar diagram showing Mean of Turn Around Time	22
Figure 4.2	Reasons for the Delay of Surgeries	23
Figure 4.3	Surgeons' late arrival - Departmental Analysis	24

LIST OF ABBREVIATIONS

OT	Operating Theatre
TAT	Turnaround Time
WHO	World Health Organization
JIT	Just-in-Time (inventory management)
CTVS	Cardiothoracic and Vascular Surgery
PDSA	Plan-Do-Study-Act (quality-improvement cycle)
KPI	Key Performance Indicator
KIMS	Kingsway Institute of Medical Sciences (Kingsway Hospital)
OR	Operating Room
ICU	Intensive Care Unit
NIST	National Institute of Standards and Technology

CHAPTER 1: - INTRODUCTION

In the modern healthcare landscape, Operating Theatre (OTs) serve as critical hubs where complex, life-saving surgical interventions take place. The efficiency of OTs directly impacts the quality, safety, and timeliness of surgical care, making their optimal management a priority for hospitals worldwide. As the demand for surgical services rises globally, healthcare institutions are under increasing pressure to enhance operating theatre performance by minimizing delays, optimizing resource utilization, and delivering patient-centered care (1,2). Studies have consistently shown that inefficiencies in OT workflows can lead to surgical delays, increased patient waiting times, higher operational costs, and in some cases, compromised clinical outcomes (3). Despite significant advancements in surgical techniques, medical technologies, and hospital infrastructure, many institutions continue to face persistent challenges such as scheduling inefficiencies, prolonged Turnaround times, poor communication, and inadequate resource allocation (4,5).

These issues, if left unaddressed, can hinder the overall efficiency of surgical services, leading to frustration among healthcare staff, patient dissatisfaction, and potential risks to patient safety. Time management within operating theatres is a critical component of healthcare delivery that affects not only hospital throughput but also the overall patient experience (1,4). Factors such as late case starts, uncoordinated surgical teams, equipment unavailability, and delays in preoperative preparation often result in cancellations, extended working hours, and increased financial strain on healthcare systems (5,6). Studies have highlighted that these inefficiencies frequently stem from systemic issues, including inadequate planning, lack of standardized operating procedures, insufficient staff training, and limited use of digital tools for workflow management (4,7). A survey conducted by Addis et al. (2023) emphasized that "time wasted by health professionals is time not invested in patients," underscoring the importance of effective time management practices in enhancing the overall quality of care (4). Furthermore, the World Health Organization's (WHO) guidelines for safe surgery emphasize the importance of time efficiency in maintaining patient safety and surgical outcomes (8).

Efficient operating theatre management is thus not only a logistical necessity but also a vital component of a safe and patient-centered surgical care system. Addressing these challenges requires a multifaceted approach that includes workflow analysis, team engagement, and the implementation of best practices tailored to the unique needs of the surgical environment (6,7). Streamlining OT processes, from patient admission to postoperative care, can lead to significant improvements in surgical throughput and resource utilization (5).

Technological advancements, including real-time tracking systems and electronic scheduling tools, have also been recognized as essential enablers of operational efficiency (7). However, the integration of such tools must be accompanied by adequate staff training and a culture of continuous improvement to sustain long-term benefits.

Optimizing OT workflows is not solely about improving productivity; it also plays a crucial role in fostering a safe, supportive, and resilient working environment for healthcare professionals. A well-managed OT promotes teamwork, reduces staff fatigue. and fosters a culture of accountability and precision (7,8).

The intraoperative phase, as highlighted by Bowen et al. (2024), demands seamless collaboration among surgeons, anesthetists, nurses, and support staff to ensure that procedures are carried out in an organized, timely, and patient-centered manner. The WHO's Safe Surgery Saves Lives initiative further emphasizes the importance of team communication, equipment readiness, and procedural standardization in ensuring surgical safety and efficiency (8,9) This study aims to explore and evaluate effective strategies for optimizing OT time and workflow management, drawing on evidence-based practices and technological innovations. By identifying key bottlenecks and examining successful models of surgical efficiency, the research will provide actionable recommendations to enhance operational performance, improve interdisciplinary coordination, and ultimately contribute to better surgical care delivery.

1.1 BACKGROUND OF THE STUDY: -

The operation theatre (OT) is a critical, high-demand area where efficient time utilization directly impacts surgical volume, patient care quality, and hospital performance. In high-volume and tertiary care centers, limited OT capacity makes time management vital. Turnaround Time (TAT)—the interval between surgeries—is a key yet often overlooked performance metric. While necessary for cleaning and preparation, prolonged or inconsistent TAT signals operational inefficiencies caused by poor coordination, equipment delays, or workflow disruptions.

Optimizing TAT enhances surgical scheduling, staff productivity, and patient satisfaction. It is also a key indicator in quality improvement and accreditation efforts. This study analyses average TAT in selected OTs, identifies bottlenecks, and proposes data-driven strategies to improve efficiency and standardize best practices.

1.2 OBJECTIVES: -

- To determine the average turnaround time between consecutive surgical procedures in the Operation Theatre.
- To assess the contributing factors and justifications for time consumed in specific OT processes.
- To Identify and analyze the underlying causes of avoidable delays in surgical scheduling and turnaround.
- To Propose evidence-based recommendations for enhancing efficiency and workflow of the Operation Theatre.

CHAPTER 2: - REVIEW OF LITERATURE

Building on the foundational studies in operating theatre (OT) efficiency, recent literature has also delved deeper into specific interventions and their measurable impacts. One of the key findings is the role of scheduling and its alignment with actual surgical times. Research has shown that inaccurate scheduling, particularly in terms of estimated procedure durations, often leads to either excessive downtime or rushed procedures, which can negatively affect both team performance and patient outcomes (10).

The impact of team dynamics on OT efficiency has also been extensively studied. The effectiveness of interdisciplinary communication, particularly in high-stakes environments like the operating room, is essential for maintaining a smooth workflow. Studies have demonstrated that poor communication among surgical team members can lead to delays, errors, and even patient harm (11).

Additionally, research has highlighted the value of real-time data analytics in enhancing workflow optimization. The implementation of technologies such as surgical dashboards or automated tracking systems allows OT teams to monitor progress continuously, providing critical information on patient status, procedure timelines, and equipment availability. This instantaneous feedback loop enables staff to adjust their actions proactively, ensuring that resources are used efficiently and procedures run on time (Ghaferi et al., 2015). The integration of such systems into the OT setting has proven effective in reducing both surgical delays and the overall length of hospital stays, contributing to improved operational efficiency and patient satisfaction (12).

Another critical aspect discussed in the literature is the concept of "just-in-time" (JIT) inventory management, which aims to minimize the storage of unused materials while ensuring that necessary surgical instruments and supplies are readily available when needed. Several studies have demonstrated that JIT systems, when combined with well-designed logistics and inventory management processes, reduce waste and improve overall OT efficiency.

However, implementing such systems requires a high level of coordination and collaboration among hospital departments, including procurement, sterilization, and surgical teams, to ensure that stock levels are accurately maintained and materials are available as required (13).

The financial implications of OT inefficiency have also been a significant area of investigation. Delays in surgery can have substantial economic consequences, not only in terms of direct costs associated with overtime and rescheduling but also in the indirect costs related to reduced patient throughput and increased operational complexity. A study by Kossow et al. (2020) found that inefficiencies in the OT, such as prolonged turnaround times and missed case opportunities, can result in significant financial losses for healthcare institutions. This underscores the importance of optimizing OT workflows as a means of improving not only clinical outcomes but also hospital financial health (14).

Effective time management strategies in surgical environments are associated with reduced delays and improved staff satisfaction. A study by Macario (2010) emphasized the importance of starting the first case on time, noting that delays at the beginning of the day often leads to a cumulative backlog. The use of time-tracking tools and time-conscious leadership can positively influence OT productivity (15).

CHAPTER 3: - RESEARCH METHODOLOGY

This chapter details the methodology utilized in the study, encompassing the research context, design, and approach, as well as the target population, sampling strategy, data collection methods, processes, analysis procedures, and definitions of key terms.

3.1 RESEARCH SETTING

The study was conducted in KIMS Kingsway Hospital and Research Centre, (Nagpur), Which is a 320 bedded super specialty. The hospital is a tertiary care teaching hospital in Central India and has been a pioneer in the field of medical education and healthcare.

3.2 STUDY PERIOD:

April 2025 - June 2025

3.3 RESEARCH APPROACH:

A cross-sectional based study approach was adopted.

3.4 RESEARCH DESIGN:

This research was conducted using a cross-sectional observational study design to systematically assess the average turnover time between consecutive surgical procedures and to identify key factors contributing to inefficiencies in Operation Theatre (OT) performance. The study employed a quantitative methodology, drawing upon real-time observational data collected from OT operations over a defined period. This approach enabled a detailed evaluation of modifiable operational processes—such as cleaning protocols, staff coordination, patient preparation, and equipment availability—that influenced turnover time.

No experimental interventions were introduced during the course of the study. Instead, the focus remained on objectively analyzing existing workflows and operational patterns to uncover correlations and trends that could inform process improvements. The findings aimed to provide evidence-based insights into how specific workflow elements impacted OT utilization, thereby supporting recommendations for enhancing efficiency in surgical service delivery.

3.5 POPULATION:

The study is conducted in the Operation Theatres of KIMS-Kingsway Hospital-Nagpur, a tertiary care hospital. The study population includes OT personnel involved in surgical procedures, including surgeons, anesthetists, nursing staff, OT technicians, and housekeeping staff. Data is collected from multiple surgical departments to provide a comprehensive view of OT functioning.

3.6 SAMPLE SIZE:

A total of **546 surgical cases** were observed during the study period.

3.7 SAMPLING TECHNIQUE:

Purposive sampling was used to select surgeries across different departments during regular OT hours. Cases were included based on availability of complete time documentation and cooperation of OT staff for observational data collection

3.8 CRITERIA FOR SELECTION OF SAMPLE:

3.8.1 Inclusion Criteria: Surgeries conducted during routine OT hours within the selected departments including emergency surgeries during routine OT hours.
Cases with complete documentation of surgery start and end times.
Staff members are directly involved in the turnover process between surgeries.
3.8.2 Exclusion criteria: Incomplete or missing time documentation for surgical procedures.
Canceled or postponed surgeries that did not proceed to completion.

3.9 CONSTRUCTION OF TOOL:

Data collection tools include:

- Structured observation checklists to record exact time intervals between surgical procedures.
- Turnaround time recording sheets documenting the end of one surgery to the start of the next.
- Semi-structured interviews with OT staff to gather insights on reasons for delays and workflow issues.
- Secondary data from OT logs, scheduling records, and hospital management systems.

3.10 DESCRIPTION OF TOOL:

3.11 DATA COLLECTION PROCESS: –

Step-I = The investigator procured permission from respective authorities to conduct the study.

Step-II = Investigator introduced herself to the participants and talks about her aim, objectives and obtains written informed consent from all the study subjects.

Step-III = Conducted survey using structured Performa.

3.12 DATA ANALYSIS TECHNIQUE: -

In this cross-sectional study, a blend of descriptive statistical methods and thematic analysis was employed to assess the efficiency of operating theatres.

Quantitative Data Analysis Technique

The quantitative analysis in this study was meticulously structured to evaluate the operational performance of the Operating Theatre (OT), with a central focus on **Turnaround Time (TAT)**—defined as the interval between the end of one surgery and the start of the next. This metric serves as a critical performance indicator in surgical settings, reflecting not only time management but also the overall coordination and resource utilization within the OT environment.

The study employed a **descriptive quantitative research approach**, drawing data from multiple sources including **structured observation checklists**, **time-tracking forms**, **operation theatre logs**, and **hospital information systems**. These tools captured detailed temporal data across several stages of the surgical process.

Key Quantitative Variables

The analysis encompassed several time-related variables that were essential to understanding and improving OT efficiency:

- **Delays in starting the first surgical case** each day
- **Start and end times of surgeries** across various specialties
- **Interval measurements** for specific OT phases:
    - Patient Preparation Time
    - Induction to Incision Time
    - Closure to Extubation Time
    - Cleaning and Setup Duration
- **Total Turnaround Time (TAT)**
- **Total number of procedures performed** during the study period
- **Frequency and causes of delays** such as surgeon unavailability, equipment issues, or patient-related factors.

Each of these variables was systematically recorded, cleaned, and categorized before analysis to ensure accuracy and consistency. Cases with incomplete or inconsistent documentation were excluded based on defined criteria to maintain the integrity of the dataset.

Percentage analysis was performed to calculate the relative contribution of each component (e.g., patient preparation, anesthesia induction, cleaning) to the overall TAT. This enabled the identification of disproportionately time-consuming phases and helped pinpoint specific areas for intervention.

Graphical and Visual Representation

To effectively communicate the findings and highlight trends, multiple **visual tools** were used:

- **Bar charts** depicted the mean time taken for each step in the surgical workflow, helping to identify high-duration components of TAT.
- **Pie charts** were used to illustrate the proportional contribution of each component to the overall TAT, providing a visual breakdown of resource utilization.
- A **Pareto chart** (80/20 principle) was generated to show the most frequent and impactful causes of surgical delays. This tool helped prioritize issues based on their contribution to overall inefficiency, thus guiding improvement efforts.

These visualizations allowed both researchers and hospital stakeholders to quickly grasp critical inefficiencies and supported data-driven decision-making.

Comparative and Departmental Analysis

To add further depth, **comparative analyses** were conducted between different departments, surgery types, and days of the week. This allowed the identification of performance variations across units and timeframes. In particular, Operation Theatres with structured time management practices—such as pre-operative briefings, checklist compliance, and early patient preparation—were compared against those lacking such protocols.

These comparisons revealed patterns of delay and best practices that could be adopted hospital-wide. For example, departments that adhered to standardized workflows demonstrated lower average TATs and more consistent start times.

Significance of the Analysis

The data-driven approach adopted in this quantitative analysis not only offered an objective assessment of current OT practices but also served as a foundation for **evidence-based recommendations**. By quantifying delays and evaluating their root causes, this analysis laid the groundwork for implementing strategic interventions aimed at:

- Streamlining surgical scheduling
- Enhancing interdisciplinary coordination
- Reducing idle time between procedures
- Optimizing staff allocation and equipment readiness

In conclusion, the **quantitative data analysis** provided a clear, measurable picture of the existing gaps in OT efficiency and helped identify targeted solutions. The use of descriptive statistics combined with comparative visual analytics offered a comprehensive understanding of workflow dynamics, ultimately supporting the goal of improving patient outcomes and operational performance in high-volume surgical settings.

3.13 OPERATIONAL DEFINITIONS:

• **Turnaround Time (TAT):**

The time interval between the completion of one surgical case (patient exit) and the start of the next. It includes cleaning, instrument setup, patient shifting, anesthesia preparation, and documentation time.

• **Operational Delay:**

Any non-clinically justified extension in turnover time caused by process inefficiencies, including delays in cleaning, poor scheduling, staff non-availability, or lack of readiness of instruments and consumables.

• **Semi-Structured Interview**

A qualitative method of data collection involving guided conversations with OT staff to explore their experiences, justifications, and perceived barriers related to OT.

CHAPTER 4: - RESULT

This study, which analyzed 546 surgical cases, provides an in-depth assessment of operating theatre (OT) turnaround times and the major factors contributing to delays. The **"Total Turnaround Time"** bar chart illustrates that **Patient Preparation Time** averages 12 minutes, while **Induction Start to Incision** is the most time-intensive phase at 29 minutes. Postoperative phases, including **Closure to Extubation** and **Cleaning and Setup**, take 10 and 11 minutes, respectively, leading to an average **Total Turnaround Time** of 62 minutes. The Pareto analysis shows that most delays arise from a small set of key factors. The top cause is surgeons arriving late (77 delays, 32.35%), followed by the operating theatre being occupied for another procedure (60 delays, cumulative 57.56%), then difficulty in intubation (20), add-on cases (13), unavailability of staff (10), and both extubation difficulties and late patient arrivals (9 each). Together, these seven factors account for over 80% of all delays, as marked by the red line on the chart. A second Pareto chart focuses on surgeon lateness, revealing that Orthopaedic Surgery had the highest count (13 delays), followed by Neurosurgery (10) and Cardiothoracic and Vascular Surgery (9). These three alone make up over 40% of all late arrivals. When the top eight surgeons are included, the cumulative percentage reaches 83.12%, while the remaining 11 surgeons each contributed just one delay, gradually bringing the total to 100%. This pattern highlights how a small group of surgeons disproportionately drives overall delays.

4.1 DATA ANALYSIS

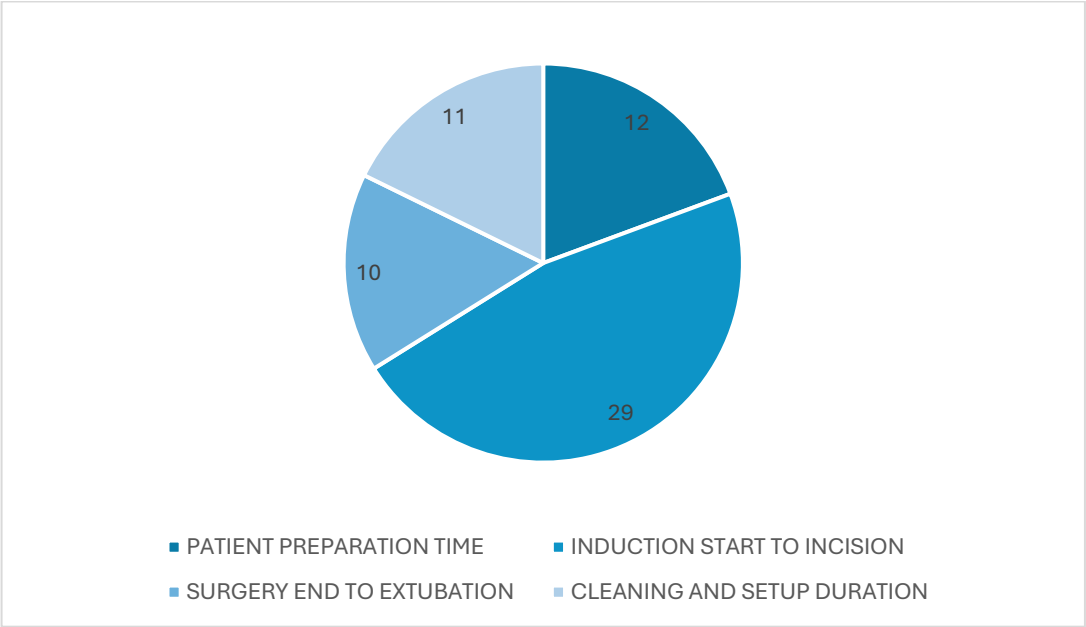

Fig 4.1: Pie diagram showing Mean of Turn Around Time

As Shown in fig 1. in the form of a pie diagram.

The Pie Diagram shows "Total Turnaround Time" provides a detailed breakdown of the key time components involved in the operating theatre (OT) turnaround process. The Patient Preparation Time is 12 minutes. The interval from Induction Start to Incision represents the longest segment, with an average duration of 29 minutes. Following the surgical procedure, the Closure to Extubation Time is 10 minutes. The Cleaning and Setup Duration accounts for 11 minutes.

Overall, the Total Turnaround Time, defined as the interval from the exit of one patient to the entry of the next, averages 62 minutes.

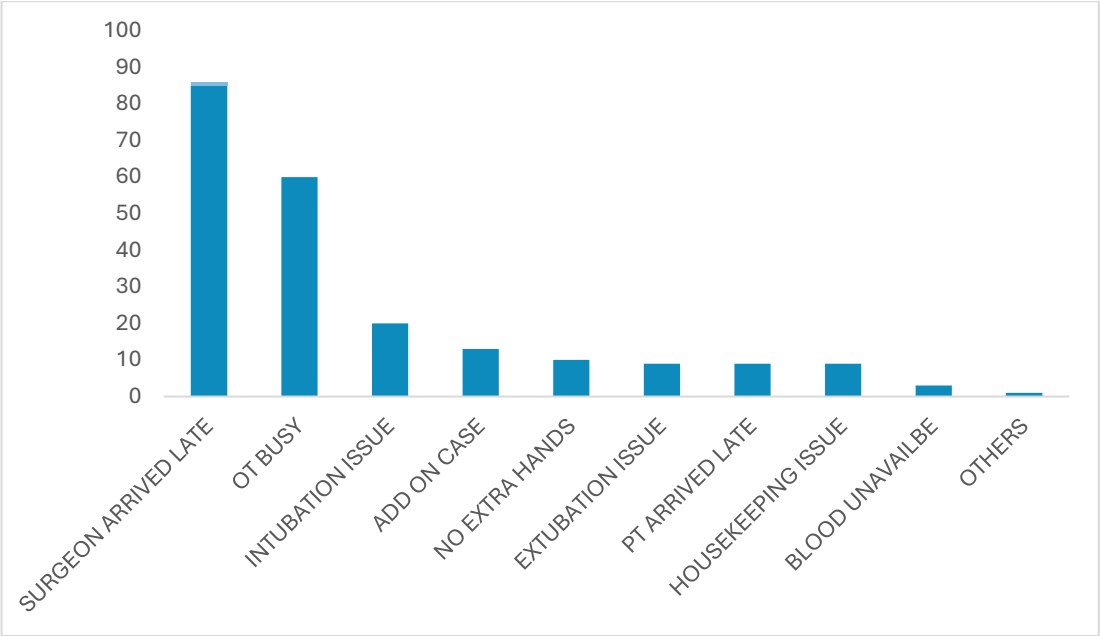

Figure 4.2: Reasons for the Delay of Surgeries

As Shown in fig 2. in the form of a bar diagram.

The above diagram clearly shows that most surgical delays are caused by a handful of dominant factors. The leading cause was surgeons arriving late, responsible for 77 delays or 32.35% of the total. The next major reason was the operating theatre being occupied with another procedure, contributing to 60 delays and raising the cumulative percentage to 57.56%. Difficulty in intubation accounted for 20 delays, pushing the cumulative total to 71.43%. Other key factors included add-on cases (13), absence of extra hands (10), and both difficulty in extubation and patients arriving late (9 each). Together, these seven main causes made up over 80% of all delays, which is highlighted by the red vertical line at the 80% mark on the chart. The rest of the delays came from numerous less frequent causes, each appearing only once.

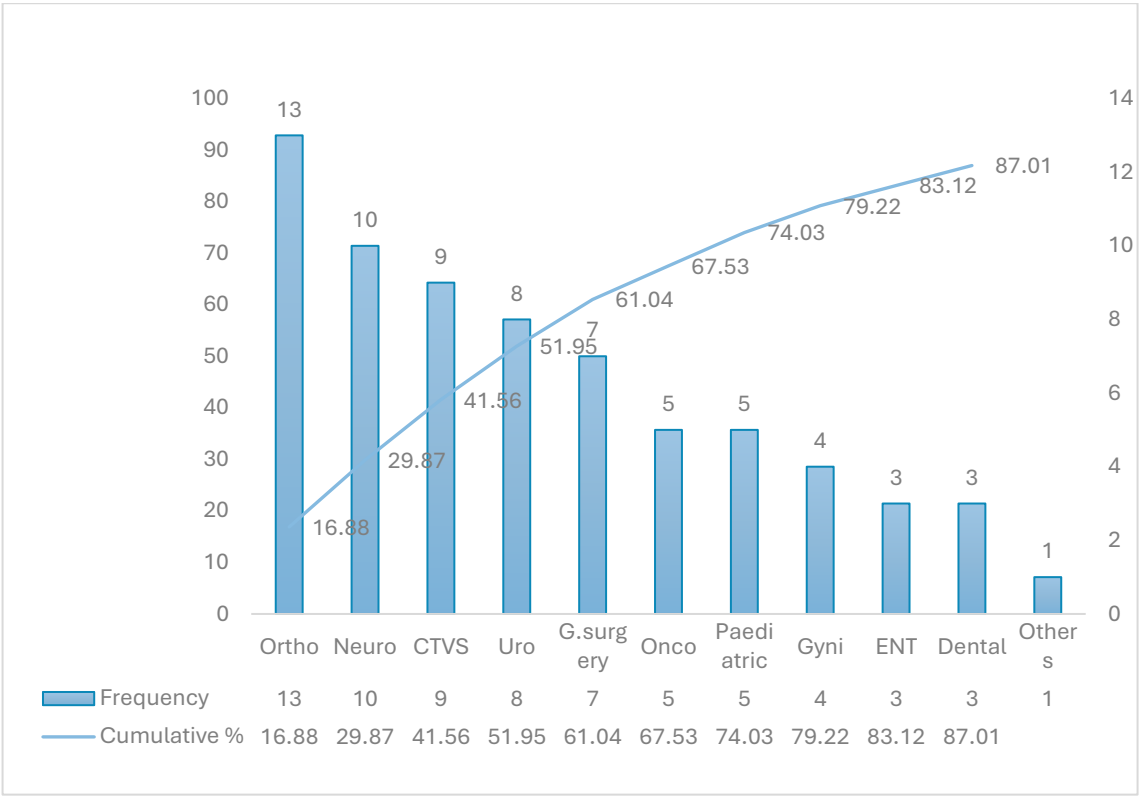

Figure 4.3 Surgeon's late arrival - Departmental Analysis

As Shown in fig 3. in the form of a pareto chart.

The Pareto chart (Figure 2) shows the frequency and cumulative percentage of late arrivals among 20 surgeons. Orthopaedic Surgery had the highest number of late arrivals (13), followed by Neurosurgery (10) and Cardiothoracic and Vascular Surgery (CTVS) (9). Together, these three specialties accounted for over 40% of all late arrivals. As the list continues, the number of late arrivals gradually decreases, with Oncosurgery and Paediatric CTVS each contributing 5, and Paediatric Surgery adding 4. By the time General Surgery, with 3 late arrivals, is included, the cumulative percentage reaches 83.12%, highlighting how a small group of surgeon's accounts for most instances of lateness. The remaining 11 surgeons each had just one late arrival, progressively raising the cumulative percentage to 100%. A vertical red line on the chart marks the 80% cumulative point, emphasizing the significant impact of a small number of surgeons on overall lateness.

CHAPTER 5: - DISCUSSION

This study aimed to assess the operational efficiency of operating theatre by focusing on issues related to time utilization and workflow management. A primary concern identified was the consistent delay in initiating the first surgical case each day, with average delays ranging between 30 and 35 minutes. These early disruptions were found to have a compounding impact, creating scheduling bottlenecks, increasing the risk of surgical cancellations, and adding undue pressure on both clinical and support staff.
Crucially, these delays were not attributed to the complexity of surgical procedures, but rather to procedural inefficiencies such as incomplete patient preparation, breakdowns in communication, and a lack of clearly defined responsibilities within the surgical team.

In addition to delayed start times, the study observed inefficiencies during the turnover period between operations, which averaged around 28 minutes. This phase was often extended due to disorganized workflows, inconsistent cleaning protocols, and delays in moving patients in and out of the OT. These procedural gaps result in under use of available surgical slots and decreased overall productivity. Implementing streamlined, standardized turnover procedures—with assigned responsibilities and better interdepartmental coordination—could significantly enhance operational flow and maximize the use of existing theatre capacity.

The data also highlighted the benefits of adopting structured approaches to time and workflow management. Hospitals that engaged in daily team briefings, used digital scheduling systems, and followed predefined workflow models generally experienced fewer delays and a smoother surgical process. These practices improved clarity among team members, facilitated proactive problem-solving, and fostered a culture of shared accountability. The results align with previous research advocating lean management principles and the adoption of real-time coordination technologies in hospital operations. When effectively applied, these methods promote more agile, efficient, and responsive surgical services.

Despite the valuable insights gained, this study has its limitations. Being cross-sectional, it provides only a snapshot of current practices and does not capture how changes over time might influence outcomes. Additionally, institutional variability in policies, staffing patterns, and resource levels may restrict the broader applicability of the findings. There is also the potential for observational and reporting biases.

Nevertheless, the study brings to light several actionable opportunities to improve OT efficiency through targeted interventions. Future research should aim to implement and evaluate these strategies over time, using longitudinal and experimental designs to determine their long-term effectiveness and impact on clinical outcomes, operational costs, and staff satisfaction.

CONCLUSION

Optimizing operating theatre efficiency through strategic time management and the refinement of workflows represents a vital priority for today's healthcare systems.

By adopting evidence-based, data-driven methodologies, fostering cohesive teamwork across all surgical disciplines, and capitalizing on the latest technological innovations, healthcare organizations can significantly improve the functionality of surgical environments. This transformation enables the delivery of care that is not only efficient but also patient-centered, ensuring that surgical procedures are conducted safely, punctually, and with the highest standards of quality. The findings of this study lay a critical groundwork for ongoing and future research, while simultaneously emphasizing the urgent responsibility of healthcare leaders and clinical professionals to embed operational excellence as an integral and sustained component of surgical service delivery, thereby advancing both organizational performance and patient outcomes.

LIMITATIONS

- The cross-sectional design limits the ability to determine causal relationships between time management, workflow optimization, and theatre efficiency.
- Results may not be generalizable beyond the specific hospitals or surgical specialties included in the study.
- Data accuracy may be affected by incomplete or inconsistent recording of operating times and workflow observations.
- The study does not assess the long-term sustainability or impact of the efficiency improvements implemented

SUMMARY

This study, designed as a cross-sectional analysis, was conducted in a tertiary care hospital to assess ways to improve operating theatre efficiency by focusing on time management and optimizing workflow processes. The research included 546 participants, comprising patients undergoing surgery, their relatives, and healthcare workers involved in surgical care. Over three months, data collection was performed through a semi-structured questionnaire and interviews, targeting critical aspects like scheduling methods, turnaround intervals between surgeries, coordination among staff, and availability of necessary equipment. The purpose was to identify workflow bottlenecks and delays, understand their effects on theatre productivity, and develop focused interventions to enhance operational efficiency. Both quantitative and qualitative analyses revealed key areas requiring improvement, particularly in managing time effectively, facilitating clear communication, and maximizing resource utilization. The study highlights the essential role of collaborative, multidisciplinary efforts in boosting operating theatre functionality and improving patient outcomes in high-level hospital settings.

RECOMMENDATIONS

To improve operating theatre efficiency, it is essential to adopt a multifaceted approach that includes implementing robust scheduling systems to optimize surgical case allocation and minimize downtime. Providing ongoing training in time management and workflow optimization for all operating theatre personnel will enhance coordination and reduce avoidable delays. Streamlining processes through workflow analysis and removing bottlenecks, along with fostering clear and consistent communication among surgical teams, anaesthetists, nursing staff, and support personnel, is crucial. Utilizing real-time tracking technologies can aid in monitoring theatre utilization and resource availability, allowing for prompt adjustments. Standardizing operating procedures and checklists will ensure consistency and minimize errors. Furthermore, adequate allocation and maintenance of equipment and human resources must be prioritized to prevent disruptions. Engaging patients and their families through education can help reduce last-minute cancellations and improve preparation. Finally, instituting regular performance reviews and feedback mechanisms will support continuous improvement, contributing to better theatre efficiency and enhanced patient care outcomes in tertiary care settings.

- **Implement a centralized, automated OT scheduling system** to avoid overlaps and ensure optimal utilization of available theatre slots.

- **Establish daily OT huddles or morning briefings** with surgical, anesthesia, and nursing teams to review schedules, highlight critical cases, and set expectations.

- **Monitor and enforce punctuality of surgical teams**, especially those repeatedly reported late. Introduce penalty or performance-based incentives.

- **Track key performance indicators** such as first-case start time, turnaround intervals, and OT utilization rates to guide quality improvement efforts.

- **Assign clear roles and responsibilities** to OT team members during turnover and preparation phases to avoid confusion or duplication of tasks.

- **Track each component of turnaround time (e.g., patient prep, induction, setup)** with time stamps and conduct root cause analysis of delays weekly.

- **Prepare the next patient in parallel** during the previous surgery's closure phase to minimize idle time.

- **Use audit findings to implement Plan-Do-Study-Act (PDSA) cycles** for continuous quality improvement in OT performance.

- **Ensure adequate staffing and cross-training** of OT support personnel to manage peak loads effectively

BIBLIOGRAPHY

1. Addis BA, Gelaw YM, Eyowas FA, Bogale TW, Aynalem ZB, Guadie HA. "Time wasted by health professionals is time not invested in patients": time management practice and associated factors among health professionals at public hospitals in Bahir Dar, Ethiopia: a multicenter mixed method study. Front Public Health. 2023 Jul 21; 11:1159275.

2. A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population | New England Journal of Medicine [Internet]. [cited 2025 May 16]. Available from: https://www.nejm.org/doi/full/10.1056/NEJMsa0810119

3. Addis BA, Gelaw YM, Eyowas FA, Bogale TW, Aynalem ZB, Guadie HA. "Time wasted by health professionals is time not invested in patients": time management practice and associated factors among health professionals at public hospitals in Bahir Dar, Ethiopia: a multicenter mixed method study. Front Public Health. 2023 Jul 21; 11:1159275.

4. Al Harbi S, Aljohani B, Elmasry L, Baldovino FL, Raviz KB, Altowairqi L, et al. Streamlining patient flow and enhancing operational efficiency through case management implementation. BMJ Open Qual. 2024 Feb 28;13(1): e002484.

5. Bowen C, Draper L, Moore H, Bowen C, Draper L, Moore H. 31.3 Intraoperative Phase - Fundamentals of Nursing | OpenStax [Internet]. OpenStax; 2024 [cited 2025 May 16]. Available from: https://openstax.org/books/fundamentals-nursing/pages/31-3-intraoperative-phase

6. Bowen C, Draper L, Moore H, Bowen C, Draper L, Moore H. 31.3 Intraoperative Phase - Fundamentals of Nursing | OpenStax [Internet]. OpenStax; 2024 [cited 2025 May 16]. Available from: https://openstax.org/books/fundamentals-nursing/pages/31-3-intraoperative-phase

7. Cain C, Haque S. Organizational Workflow and Its Impact on Work Quality. In: Hughes RG, editor. Patient Safety and Quality: An Evidence-Based Handbook for Nurses [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 [cited 2025 May 7]. (Advances in Patient Safety). Available from: http://www.ncbi.nlm.nih.gov/books/NBK2638/

8. Costabella F, Patel KB, Adepoju AV, Singh P, Attia Hussein Mahmoud H, Zafar A, et al. Healthcare Cost and Outcomes Associated with Surgical Site Infection and Patient Outcomes in Low- and Middle-Income Countries. Cureus. 15(7): e42493.

9. Deng J, Tian H, Guo Y, Ma T, Sun Y, Zhang S, et al. A retrospective and prospective assessment of the zero-markup drug reform in China from the perspective of policy diffusion. The International Journal of Health Planning and Management. 2018;33(4):e918–29.

10. Ghaferi AA, Birkmeyer JD, Dimick JB. Complications, Failure to Rescue, and Mortality With Major Inpatient Surgery in Medicare Patients. Annals of Surgery. 2009 Dec;250(6):1029.

11. Garman AN, Standish MP, Wainio JA. Bridging worldviews: Toward a common model of leadership across the health professions. Health Care Management Review. 2020 Dec;45(4):E45.

12. Guerriero F, Guido R. Operational research in the management of the operating theatre: a survey. Health Care Manag Sci. 2011 Mar;14(1):89–114. Operational research in the management of the operating theatre: a survey - PubMed

13. Macario A. What does one minute of operating room time cost? Journal of Clinical Anesthesia. 2010 Jun 1;22(4):233–6

14. Ruter D, Chen W, Garza R, Eiferman D, Skoracki R. Mesoappendix as potential donor site for vascularized lymph node transfer: anatomic study. Journal of Surgical Research. 2018 Oct 1;230:143–7.

15. Stouffer K, Pease M, Tang C, Zimmerman T, Pillitteri V, Lightman S, et al. Guide to Operational Technology (OT) security [Internet]. Gaithersburg, MD: National Institute of Standards and Technology (U.S.); 2023 Sep [cited 2025 May 7] p. NIST SP 800-82r3. Report No.: NIST SP 800-82r3. Available from: https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-82r3.pdf

16. Young M, Smith MA. Standards and Evaluation of Healthcare Quality, Safety, and Person-Centered Care. In: StatPearls [Internet] [Internet]. StatPearls Publishing; 2025 [cited 2025 May 16]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK576432/

17. WHO Patient Safety, World Health Organization. WHO guidelines for safe surgery 2009: safe surgery saves lives. Safe surgery saves lives. 2009;(WHO/IER/PSP/2008.08-1E):124.