

STUDY ON TIME UTILIZATION AND SCHEDULING OF OPERATION THEATRE

**Internship Training
at
Apex Hospital Private Limited, Jaipur**

**By
Shweta Choudhary**

**Under the guidance of
Dr. S.D. Gupta**

**MBA Hospital & Health Management
2013–15**


**Institute of Health Management Research
Jaipur
2015**

Dissertation Training

at

Apex Hospitals Private Limited, Jaipur

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TO WHOMSOEVER MAY CONCERN

This is to certify that Dr. Shweta Choudhary student of MBA Hospital and Health Management from IIHMR University, Jaipur has undergone internship training at Apex Hospitals Pvt. Ltd. Jaipur, from 1st March to 30th April 2015.

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

The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.



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The certificate is awarded to

DR. SHWETA CHOUDHARY

In recognition of having successfully completed her
Internship in the department of

Quality

And has successfully completed her Project on

“A Study On Time Utilization And Scheduling Of Operation Theatre”

1ST MARCH, 2015-30TH APRIL 2015

Apex Hospitals, Jaipur

She comes across as a committed, sincere & diligent person who has a
Strong drive & zeal for learning

We wish her all the best for future endeavors


(Dr. S.L. Jain)

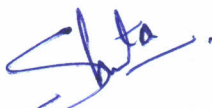
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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "A study on TIME utilization & scheduling of operation theatre" and submitted by Dr. Shweta Choudhary, (1503) under the supervision of Dr. S.D. Gupta and for award of MBA Hospital and Health Management of the university carried out during the period from 01 March to 30 April 2015 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.



Signature

Dr. Shweta Choudhary

ACKNOWLEDGEMENT

I Dr. Shweta Choudhary would like to express our sincere gratitude to **Dr S B Jhawar (Managing Director)** **Dr. Sachin jhawar (Director of Clinical and Surgical services)** and **Mrs. Sheenu Jhawar (coo)** for providing me an opportunity to undergo Internship training at Apex Hospitals Pvt. Limited Malviya Nagar Jaipur.

I am thankful to **Dr. Ruchi khanna (Quality Manager)** for her support, cooperation and motivation provided to me during summer training for constant inspiration, presence and sharing her knowledge. The task of summer training would have been never completed without her valuable suggestions, which had helped me a lot in completing project. I am blessed to work under guidance of such a wonderful and knowledgeable person.

I extend my sincere appreciation to **Dr. Aswini Kapoor, Dr. Varun Khanna** and the other hospital staff members who helped me in successful completion of summer training program in such a well encouraging organization, which had helped me in accomplishing assigned tasks and to reach myself a step head.

Lastly I would also like to thank my mentors at IHMR Jaipur **Dr. S. D. Gupta** and **Dr. Ashok Kaushik (Academics Dean)** for giving their guidance in completion of my project and giving me this opportunity to use this internship as a stepping stone in my career in Hospital management.

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LIST OF ABBREVIATIONS

AERB	Atomic Energy Regulatory Board
AIDS	Acquired Immuno Deficiency Syndrome
BMW	Bio-medical waste
CSSD	Central Sterile Supply Department
ER	Emergency
HK	House Keeping
HR	Human Recourses
ICN	Infection Control Nurse
ICU	Intensive Care Unit
MRD	Medical Records Department
NABH	National Accreditation Board for Hospital& Healthcare
OPD	Out Patient Department
OT	Operation Theatre
PPE	Personal Protective Equipments
USG	Ultrasonography

Chapter1: Introduction

1.1 Operation theatres are critical assets to all tertiary care hospitals because they contribute to almost two-thirds of hospital's total revenue. Moreover, OTs also account for about 40% of the hospital's total expenses which include manpower costs (i.e. salaries of surgeons, anesthetists, nurses, etc), capital cost, the fixed and variable operating costs of the surgical facility. It is therefore desirable to optimize the efficiency of these assets. The Private hospital business model generates earnings only when the OT is in use. Utilization is therefore a simple and adequate measure of efficiency of Operation Theatre because its ability to generate revenue (its efficiency) rises as the time for which it is used increases.

Improving efficiency of OT major undertaking due to the inherent complexity of the processes involved. This complexity can be attributed to several factors. First, determination of a schedule of patient arrival times that balance patient waiting with resource utilization (e.g. OR, surgeons, nurses, etc.) is a complex problem which includes decisions such as sequencing of patient arrivals, allocation of patients to ORs, and matching of patients with surgical teams. Second, ORs are usually part of a surgical suite where they share common resources required in both reception of arriving patients and post-surgery recovery of patients. In the disposal of post-operative patients, Intensive Care Beds are a vital resource which is unfortunately prone to much utilization uncertainty due to their multiple users, and this uncertainty is exacerbated in hospitals with Emergency Departments. Therefore managing the patient traffic through a surgical suite requires a holistic approach with account of both

upstream and downstream resource requirements. Third, there is significant uncertainty in several activities involved in the delivery of surgical care, such as the uncertainty related to arrival times of patients, OR personnel availability, duration of the surgical procedure, etc. Inevitably, this makes advanced planning of OR utilization very difficult.

This study investigated the efficiency of an operating theatre complex by measuring utilization levels and to identify areas, if any, where improvements are feasible. Operation Theatre complex is an important profit making unit of clinical hospital operations. The OT Complex includes mainly three areas apart from other supporting areas-Operation rooms/ theatres, Pre-operative recovery area and post-operative recovery area. The concept of Zoning is followed in construction of OT Complex. The numbers of operation-rooms depend upon the size & type of hospital. Operation Rooms are located in central part of hospital building from ground floor to various floors of hospital. This special unit is capital intensive part of hospital as heavy investment is required to build it and to purchase the fixed and movable equipment. Heavy fixed and variable cost is incurred on run this unit. So, it makes utilization of this unit mandatory not only to increase revenues but also to curtail the cost and keep it within control. Utilization studies are conducted by hospitals especially by secondary and tertiary care hospitals in order to achieve two purposes-to increase revenue and to reduce costs in order to optimize profits/ save losses.

BRIEF DESCRIPTION OF OT COMPLEX UNDER STUDY-

The Complex is located on the second floor and study of its process flow was essential to have a broader picture of OT-utilization and the various factors contributing to scheduling errors. The hospital has earmarked OTs for Orthopaedic, Urology, General surgery cases and catheter lab for cardiac patients to reduce expenses. The complex has centralized 4 OT Suites (with one Hybrid OT) and is adjoining SICU and is connected with CSSD through Lift and the Labs through Pneumatic Shoot. The OT Complex has four Zones- i) Protective zone- comprises of Waiting room for patient and relatives, Changing rooms for all medical and paramedical staff with toilets & Reception ii) Clean Zone-includes Recovery Room (pre and post-op recovery), Trolley bay, Pharmacy, Doctor's room, Nurse's room, Pantry iii) Sterile zone-includes Operating room, Equipment room, Clean Utility room, Neonatal Bassinet, Drugs/Instrument trolley areas, Refrigerator containing injections, iv) Disposal Zone with Dirty utility room (connected through lift with CSSD), disposal Corridor. The Equipment in ORs include Operating table in the center of the room can be raised, lowered, and tilted in any direction, Operating room lights are over the table to provide bright light, without shadows, during surgery, Anaesthesia machine is at the head of the operating table, Anaesthesia cart is next to the anaesthesia machine, An Electronic monitor (which records the heart rate and respiratory rate by adhesive patches) is placed on patient's chest, the Pulse oximeter machine attaches to the patient's finger with an elastic band aid. It measures the amount of oxygen contained in the blood, an automated blood pressure measuring machine that automatically inflates the blood pressure cuff

on patient's arm, an Electro-cautery machine uses high frequency electrical signals to cauterize or seal off blood vessels and may also be used to cut through tissue with a minimal amount of bleeding. If surgery requires, a Heart-lung machine, or other specialized equipment, may be brought into the room. Other equipment include C-Arm machine, sterile instruments to be used during surgery are arranged on a stainless steel table. There is one hybrid operative room. The staff includes Surgeon – consulting surgeon and assistant surgeon, Anesthetist, 2 –Technicians, 2 – Nurses, 1-circulatory nurse and 1- scrub nurse. The Operation and Communication is done through HIS and Phones. The hospital follows clear-cut Policies and Procedures in OT Complex. The procedure followed in OT Complex is as follows- i) Admission – Patient comes to the OPD first and if asked by the surgeon gets admitted to the ward .OT-booking is done by the surgeon or the patient may directly get come to OT from emergency ii) Scheduling – Scheduling of the operations is being done by the OT-Controller iii) Pre-anesthetic check-up is being done whether the patient is stable to be anaesthetized and surgery to be performed or not iv) Movement of the patient from the ward to the pre-op OT Recover area v) Consent Form- for the type of anesthesia to be given and the surgery to be performed and any other procedure such as Blood Transfusion is being required vi) Movement of the within the OT-Complex. vii) Proper Hygiene practices are being followed the staff wears Head cap ,face-mask, sterile OT-Attire to prevent any chances of infection viii) Records- All records, the entire clinical events history is being maintained in Hospital Information System of the hospital.

Pulse oximeter machine attaches to the patient's finger with an elastic band aid. It measures the amount of oxygen contained in the blood, an automated blood pressure measuring machine that automatically inflates the blood pressure cuff on patient's arm, an Electro-cautery machine uses high frequency electrical signals to cauterize or seal off blood vessels and may also be used to cut through tissue with a minimal amount of bleeding. If surgery requires, a Heart-lung machine, or other specialized equipment, may be brought into the room. Other equipment include C-Arm machine, sterile instruments to be used during surgery are arranged on a stainless steel table. There is one hybrid operative room. The staff includes Surgeon – consulting surgeon and assistant surgeon, Anesthetist, 2 –Technicians, 2 – Nurses, 1-circulatory nurse and 1- scrub nurse. The Operation and Communication is done through HIS and Phones. The hospital follows clear-cut Policies and Procedures in OT Complex. The procedure followed in OT Complex is as follows- i) Admission – Patient comes to the OPD first and if asked by the surgeon gets admitted to the ward .OT-booking is done by the surgeon or the patient may directly get come to OT from emergency ii) Scheduling – Scheduling of the operations is being done by the OT-Controller iii) Pre-anesthetic check-up is being done whether the patient is stable to be anaesthetized and surgery to be performed or not iv) Movement of the patient from the ward to the pre-op OT Recover area v) Consent Form- for the type of anesthesia to be given and the surgery to be performed and any other procedure such as Blood Transfusion is being required vi) Movement of the within the OT-Complex. vii) Proper Hygiene practices are being followed the staff wears Head cap ,face-mask, sterile OT-Attire to prevent any chances of

infection viii) Records- All records, the entire clinical events history is being maintained in Hospital Information System of the hospital.

1.2 Aim of the Study:

To perform a thorough and step-by-step assessment of operating rooms (OR) time utilization, with a view to assess the efficacy of our practice and to identify areas of further improvement.

1.3 Objectives of study:

- To examine the time utilization & scheduling of operation theatre.
- To identify the bottle necks, if any, in proper and efficient utilization of Operation Theatre time.
- To suggest remedial measures for improving the Operation Theatre time Utilization.

Chapter 2: Literature Review

2.1. Introduction:

Operating theatre management is a very sensitive issue and a complicated one. Many studies endeavored in assessing efficiency of operating theatres and many formulas were structured to guide in concluding or measuring performance. Most of operating theatre studies explored issues related to time management, schedule and workflow, while only few tackled inventory management from a business point of view. Other studies stressed safety related issues like foreign bodies, surgical counts, time out practices, and others. In addition many discussed the leadership management and the related scope of practices and the important role managers play to streamline performance and confirm adhering to policies and practices. Exploring literature guided me to the different concepts that were studied and allowed me to discover the varied strategies utilised to enhance efficiency and to contribute to cost management of an area of high cost and utilisation. In addition these studies provided me with the essential data fields required to assess and integrate in the operating theatre documentation in order to measure the confounding factors that contribute to quantify efficiency.

2.2. Operating Theatre Business management elements:

Many studies elaborated on operating theatre management however, most of that literature selected one of the very contributing factors and elaborated on. When I explored the different articles and tried to plot down, from each article, the

domain of concentration I realised that many aspects need to be tackled including leadership provision and development, operational issues as schedule and related parameters, human resources requirement, material supply, instruments availability, financial perspectives, data management, documentation and essential records, information systems, and finally satisfaction of surgeons and other staff. As I clustered these domains I finally came to the conclusion that I will be able to target the operating theatre business management by specifying certain domains. The operating theatre business management will be reviewed in relation to the four domains; scheduling and standardising practice, supply management, patient safety, and documentation and data management.

2.3. Scheduling and standardising practice:

Operating Theatre scheduling is a major contributing factor to enhance the efficiency of operating theatres. Accurate and real time scheduling assist in predicting staffing needs, ensuring availability of required equipment and supplies and thus contribute to a smooth running operating theatre (Malhorta, 2006). An accurate schedule must list realistically the starting and ending time of each surgery. In addition, conflicts of schedules shall be resolved by the operating theatre manager (Malhorta, 2006). Schedules need to be rearranged according to agreed-on principles among all surgeons, on condition that guidelines are developed to define elective versus non-elective cases (Park et al, 2009). Many surgeons schedule their surgeries as emergency case thus staff might need to extend duty hours, other operations might need to be postponed thus result in corrupting the whole day plan. In addition some surgeons might

accuse that the case was not an emergency. Accordingly literature does not question or challenge the level of urgency however recommend classifying surgeries as elective, where patient condition will not be affected as a result of delaying the surgery for a minimum of forty-eight hours, and nonelective.

Under the concept of creating a realistic operating schedule, Malhorta (2006) reflected on the importance of having a real time based schedule which is essential to predict human and resource needs. The real time schedule requires accurately specifying the starting and ending time of surgeries with as much as possible accurate surgery duration. This real time requires timely updating as the day goes on. In addition, literature reflected the importance of defining the start time of each surgery and the impact of providing a precise duration to avoid confusion, allow proper allocation and distribution of surgeries and standardise data collection (Dexter et al, 2005). Moreover, the importance of developing policies to streamline scheduling procedures was highly stressed. The procedure requires setting certain guidelines of what cases are to be scheduled as first day case, what is an elective case versus non elective. Dexter et al. (2004) listed four important steps to assist in scheduling urgent cases and the related process to follow. Of these steps he included patient medical condition, evaluating patient waiting time, impact on OT efficiency and patient safety. Within these definitions it is essential to secure the surgeons agreement and commitment to abide by these guidelines and accordingly to abide by the scheduling process. This will reflect caring for all the surgeons similarly (Dexter et al, 2002). This is important from the surgeons' perspective, their surgery is the ultimate goal and the most important to perform (Calms et al, 1992). An approach to decrease the first case

delay along with an accurate recording and booking time with no “to-follow” schedule (Malhorta, 2006) should be put in place. It was categorically rejected, as per literature, to have a “To Follow” designation of surgery (Malhorta, 2006; Macario, 2010). Managing all these factors besides decreasing staff scheduling variation and ensuring adequate housekeeping services contributed in many studies to decrease the prolonged operating theatre turn-over time (McIntosh et al, 2006).

The turn over time describes the time delay between the first and the second surgery and measured by calculating the time the first case leaves an operating theatre on that day schedule to the time the second patient enters that same theatre and the impact of this delay on the suspension of all consecutive surgeries which will result in stretching the schedule time and extending the operating theatre working hours. Macario (2010) scored the value of turn over time in his study so that it reflects poor performance if it is more than forty minutes and for good performance it shall be less than twenty five minutes. In addition Macario (2010) & Shafer (2006) discussed elaborately the impact of cost reduction as a result of reducing the turn-over time. Yet, Macario (2010) defined the prolonged turn over time to be more than sixty minutes and this shall not be counted within the regular turn over time. Exploring the block time impact on operating theatre utilisation was studied through many case scenarios to provide actual examples and evidences that utilisation of operating theatre should not be used to plan additional block time (Wachtel et al, 2008). In addition he introduced the concepts of tactical versus operational and strategic planning in allocating OT times. Wachtel et al. (2008) elaborated on allocating OT time based on

operational plans that is staffing hours rather on tactical plans and he emphasised that strategic decisions requires years of planning before implementation. In this context he provided examples on each type of planning. He concluded that tactical planning to increase the total block time will increase OT capacity however might alter the clinical care provided while operational planning doesn't affect the numbers or types of surgeries performed and these can be change or revised as needed. As we have explored, different studies considered many parameters, and the important is that these parameters are analysed to allow identifying a scientific mean to measure the improvement of operating theatre efficiency.

In many studies it was significantly stressed that looking into few parameters alone is not enough and might trap and mask the analysis and consequently mislead the manager and lead to lose the expected outcomes (Dexter et al, 2002). From the perspective of evaluating operating theatre efficiency it is very important to study other human resource factors and not to solely evaluate operating hours and schedule parameters.

Considering the allocated operating theatre time versus the allocated workload hours is not enough and we need to understand that studying these alone will provide insufficient information and will not guide us to a good decision (McIntosh et al, 2006).

Macario (2010) described and listed a scoring system for measuring OT efficiency that consisted of eight objective criteria and elaborated that the

eight criterions shall be studied and correlated together since they are related to each other in spite of having some more important than others. Calms & Shusterich (1992) described the operating theatre management and highlighted the need for a very strong coordination between human and material resources; in addition to the fact that the performance of the operating theatre is measured differently from different perspectives. Nurses understand efficiency as the competency in the clinical skills and the care they provide to patients with maximum safety measures taken; while managers focusing on disposable supply cost and percentage compliance with policies, availability of instruments and others (Macario, 2010). Thus it is important to look into operating theatre performance from the different perspectives.

Many studies highlighted importance of the leadership abilities of the operating theatre manager and the ability to resolve the interpersonal conflicts within the surgical team more over to be able to make quick and effective decisions on the last minute changes required in the day of schedule (Plaster, 2003). Besides, others stressed the importance of having an operating theatre manager with defined scope of activities, ample authority, interested in leading and have good managerial skills. Many studies recommend that the operating theatre manager should be an executive senior level that has adequate knowledge with operating theatre setting, experienced in administration and business management. It was reported that in seventy-one per cent of the respondents to the survey conducted by the American Association of Clinical Directors (AACD) operating theatre managers were anaesthetists (O'Neil et al, 2007). From a nursing perspective, the head nurse plays a very important and essential role in vitalising the environment,

resolving or escalating the problems and able to act as a flexible coordinator. It was clearly emphasised that the head Nurse's managerial skills should be developed during the process and coaching done to lead into the expected role so as to ensure involvement and commitment (Calms et al, 1992).

Many studies evaluated the role of the head nurse and examined the communication patterns with staff, surgeons, and other health care workers, in addition, to other care areas. The head nurse is considered an important catalyst that plans, organises, and oversees staff to provide adequate patient care in addition provides leadership in clinical problem solving (Macario, 2010). The head nurse is the one to ensure that records are in adherence to standards, maintains clinical skill and knowledge necessary to set standards and work in clinical areas of nursing specialties. The head nurse is responsible to ensure implementation of policies and procedures, and to keep the schedule board and the sequence of operations in order. The important role of the head nurse was described in relation to any information system planned to be implemented since the head nurse will be the one to maintain the data as accurate as possible (Stanton, 2010).

Plaster et al. (2003) listed an analysis of the components disrupting the coordination, the root causes of the disruption and the methods of coping with the limitations or disruptions contributing to the communication process. Other studies identified the importance of adequate information flow among all stakeholders and proper coordination of information in a timely manner (Stanton, 2010; Gibbs et al, 2005). The importance of this is related to the complexity of

operations and the dynamic environment of operating theatres. Plasters et al. (2003) summarised the essential components influencing OT management as being theatre availability, patient condition, and equipments availability moreover emphasised the importance of being able to manage last hour changed and day of surgery modifications (Malhorta, 2006).

The studies accentuated the importance of educating the team to ensure success of change and emphasised on establishing a continuous education program that will provide the staff with amplified sense of security regarding their practice. In addition there should be proper identification of adequate staff numbers required and stressed the importance of setting suitable recruitment strategies as an essential component in managing OT knowing that labour cost far exceeds supply cost in health care system (Epstein et al, 2009).

2.4. Supply management:

Although inventory turnover is one of the most important factors to study, very minimal amplifications were found to elaborate on supply management from a business perspective (Park et al, 2009; O'Neil et al, 2007). Inventory management is so crucial. The supply turnover is overestimated especially when expense is greater than the actual utilisation as a result of having many items expired and wasted (Park et al, 2009). One aspect to reduce this waste is collecting accurate information on inventory utilisation so as to prevent duplication of supplies at many locations and to ensure adequate and efficient utilisation of these supplies within the expiry time (McIntosh et al, 2006). Park

and Dickerson (2009) described the supplies budget as fifty six per cent of the peri-operative service expenses in one of the locations studied.

They described the lack of coordination in operating theatre between what is used to what is kept on hand and favoured the automation of inventory expressed the effect and the volume of the supply expense and the impact on the expense budget of operating theatre while Malhorta (2006) stressed the importance of decreasing inventory, standardising equipments, and reducing wastage of supplies. In addition describing the differences in processes of flow of supplies others explored the use of a hybrid system where the request of instruments is picked by the CSSD and accordingly delivered to OT through a ready to use case-cart and consecutively ensuring delivery of instruments on time, decreasing the cost of stocking and restocking, and reducing the need for frequent supply request.

Plasters et al. (2003) elaborated on predicting the required equipments and supplies based on historical data or through contacting the surgeon and linked this to the important role of the head nurse and anaesthetist. Yet most studies agreed and stressed on reducing the inventory turn-over which is approximated as the ratio of total cost of supply and the cost of the average inventory on hand in addition to reduce the supply cost less than the actual utilisation by preventing accumulation and wastage and reducing inventory on hand. In addition, many studies recommended standardising brands and anaesthesia items in an attempt to reduce peri-operative material cost (Epstein et al, 2009).

In addition, having surgeons aligned to eliminate unnecessary variation in clinical practice and reduce the number of types of items used for the same clinical indication. Over and above these recommended that no more than twenty per cent of the inventory be located in the operating and sub-sterile theatres with the rest being stored in the main store area. Epstein and Dexter (2009), and in many studies, elaborated on the importance of introducing technology as a mean to link supply dispensing to surgical schedule. These studies expanded on the considerable savings achieved through automation (Park et al, 2009). However other studies did not confirm the need for sophisticated electronic systems in spite reassured that the use of an operating theatre patient scheduling information system if communicated with the Hospital Material Management Information System will be more than enough to ensure adequate supply management (Voigt, 2000).

Accordingly, automation will help in assisting and providing support but more essential is to have strategic planning, structured initiatives, and process modification in place. Reducing the supply quantities stocked in the operating theatre is an essential step to decrease the opportunity costs where the money spent for stocking non-moving items can be invested in other short term profit generating projects. Others stated that few OT managers while focusing on negotiating less expensive purchase prices will achieve more cost effective and cost reductions better than linking to a sophisticated information system (Epstein et al, 2009).

In general studies stressed on involving and engaging the operating theatre managers and staff who actually use the material in making decisions regarding the required quantities. The Lean principles of visual management were described as a frame work for supply management and the elimination of the eight wastes as to help in achieving savings in cost and improving workflow which is essential for operating theatre supply management. Those were listed and elaborated from the context of operating theatre functions. The five S's of visual management were described to include: sorting, setting in order , shining, standardising, and finally sustaining while the eight wastes were listed as unnecessary inventory, overproduction, processing step, transporting of products, inappropriate processing, excess motion, defects, and underutilised personnel (Macario, 2010).

2.5. Patient Safety:

Dexter et al. (2002) highlighted safety to be the building block for operating theatre efficiency. Studies elaborated on patient safety in relation to many aspects and highlighted the international awareness in this direction through developing patient safety goals and operating theatre standards that are compulsory for any health care institution to guard and implement (JCIA, 4th ed.). Within that direction, the quality indicators can be selected to measure safe practice and quality of care provided inside the operating theatre (Watson, 2006). Many international bodies considered patient safety a major concern in today's health care industry and shall take the first priority thus they recommended changes to the work environment (Gibbs et al, 2005).

Each member of the operating team has a role and a responsibility however all shall pool into a common goal which is to provide safe, efficient and effective functionality. Staff and surgeons' satisfaction studies are described to be good tools to assess the operating theatre work environment. These surveys help securing the staff perspectives and provide good feedback and provide theatre for improvement.

These issues are identified by end users or front liners. The Lean principles, on the other hand, highlighted safety so as to prevent epidemiological risks through the shine component. Few examples of these issues that might relate to patient safety that was repeatedly discussed in literature are retaining foreign bodies (Butler et al, 2003). This problem is related to the lack of adequate communication among the team members, inconsistency in practice, and absence of standardised processes (Christian, 2006). Some studies emphasised the lack of communication between OT and other departments as laboratory and radiology will result in delaying operative procedures, prolonging anaesthesia times and accordingly increasing the risk for the patients (Macario, 2010). Others highlighted the importance of conducting "Time out" as an opportunity for everyone in the team to exchange and confirm information and to ensure performing the right surgery on the right patient at the right site (Macario, 2010). Different studies targeting patient safety correlated the importance of safety practices to the increased numbers of incidents and high morbidity cases reported as a result of surgical malpractices.

2.6. Documentation and data management:

Many studies emphasised that operating theatre management shall be data driven because of the complexity of the processes inside the operating theatre. Data should be accurate, relevant, timely, and reflective. Inaccurate data is misleading and can result in masking many major problems that will reflect on efficiency, safety, satisfaction and operations (Malhorta, 2006).

The indicators selected to measure the operating theatre efficiency shall be data based that reflect the current actual practice and at the same time, can be used in benchmarking and quality improvement processes. It was highly emphasised that data shall be reported on timely manner so as to allow anticipation of problems and provide enough time to improve status.

Accordingly it is important to find the tools appropriate to capture this data and the systems to track it in an easy way. Information system plays a big role in enabling report generation however accurate specification of all functions and fields shall be specified before investing in information systems. Most studies recommended many parameters to be tracked include: on time start, turnover, actual case time versus scheduled, cancellation rate and reason, elective cases, theatre utilisation, staff utilisation, and staff overtime.

2.7. Summary:

Effective management of operating theatres requires essential establishment of processes, structuring policies, developing teams, setting monitoring grids and enhancing effective communication. All should be cost effective to maximise profit and to ensure patient safety. Thus operating theatre management requires coordination of human and material resources with input of multi-disciplinary stakeholders with good intentions, collaboration and commitment. In addition to all mentioned it is essential for the success of any change is following a structured model that guide implementation. The operating theatre field is a complicated one since many factors contribute to its efficiency, however efforts can always lead to improvement which might vary from one setting to another based on selected objectives and outcomes to achieve. Many statistical formulas are available to assist in developing mechanisms to measure this efficiency, however to succeed it is essential to develop guidelines, set policies and formulate procedures and to ensure following these. Since operating theatres account for major part in the budget of any health care institution, it is worth investing in that area to ensure efficiency and cost management.

Operating theatre business management is an adventure that one cannot live unless he steps into that forest with all its risks, benefits, pleasures and pains.

CHAPTER 3: Methodology

This is a Cross-sectional, prospective and analytical study. The Primary data shall be collected on routine basis from OT and recovery area of tertiary care hospital. Sampling will be Convenience sampling. The sample size will be 536 surgical patients of OT complex during 2 months of study. All the analysis and graphical depictions were done with the help of MS-Excel. This study will have 4 steps-

- Project design
- Data collection
- Data analysis
- Data Interpretation.

Project design first requires gathering, synthesizing and analyzing information with enough objectivity and detail to support a program decision that makes optimum use of resources to achieve desire result. First whole process of OT process flow was understood. Process mapping for the surgeries being performed was developed and track of activities taking place were monitored. For both the OT-Utilization and Recovery area utilization study was carried out. There are totally Four OTs of including one hybrid OT. Three OTs out of Four OTs are functional.

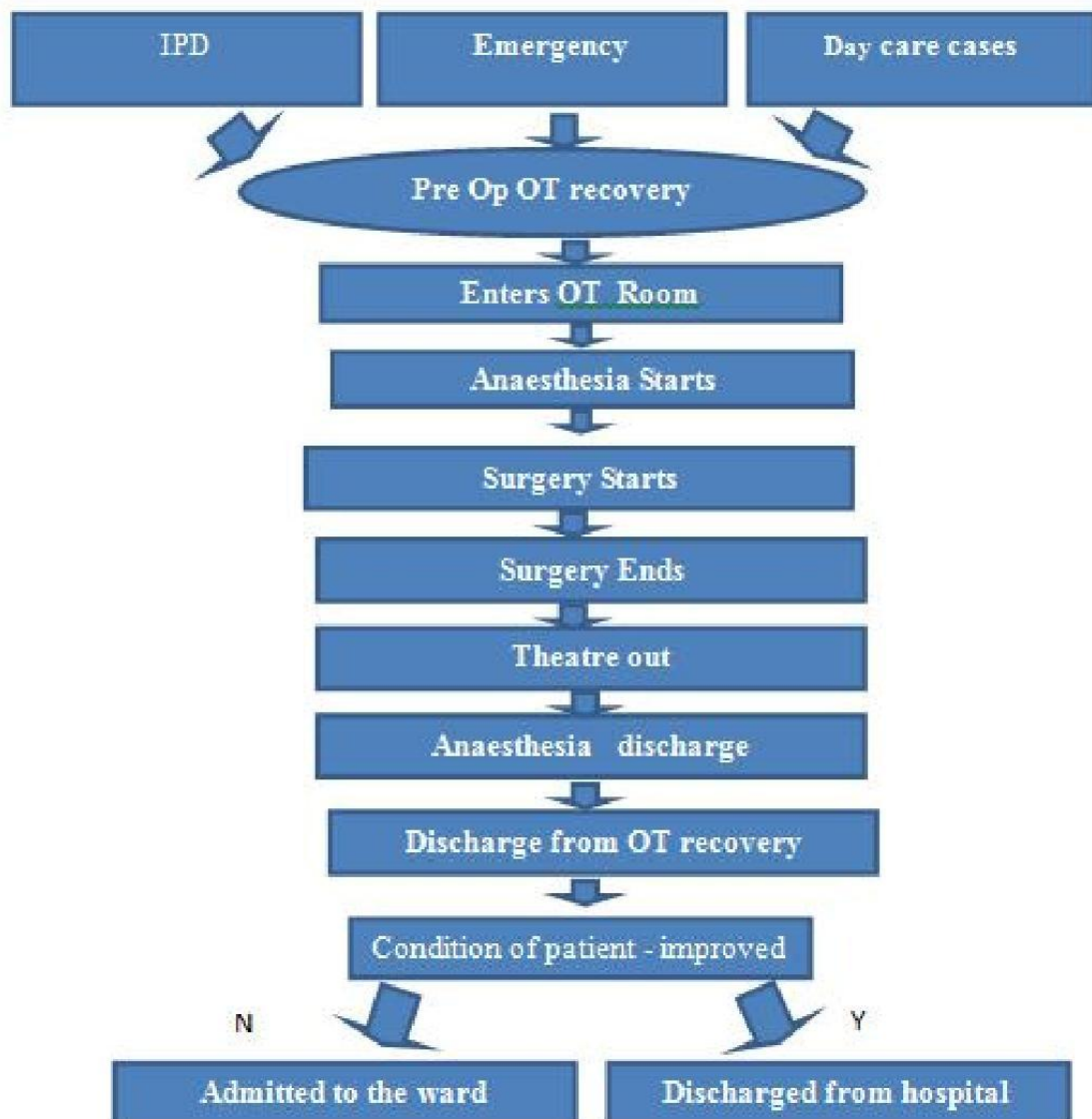
For OT-Utilization and the Recovery area utilization, the data was collected directly that included:

- i) Time at which patient is brought inside the pre-op recovery area –the time of movement of patient from the ward to pre-op recovery
- ii) Time at which patient is taken out from pre-op to main OT
- iii) Scheduled (listed) time of surgery
- iv) Exact time of surgery –as noted by self
- v) For how long the surgery took place
- vi) When was the patient brought into the post-op recovery area
- vii) Time of movement of patient from post-op recovery to the ward.

Data collection:

- Primary data source: By direct observation of the processes and discussion with the staff and team members.
- Secondary data source: Review of O.T registers.

Process flow:



CHAPTER 4: DEFINITIONS

- Utilization = utilized hours/ resource hours
- Utilized hours= no. of hours during which OT is used
- Resource hours= functional hours * no. of days*no. of OT rooms
- Major case = any surgical procedure done under general anesthesia
- Minor case - any surgical procedure done under local anesthesia
- The scheduled elective theatre timings- Timing from 8.30 a.m. to 5:00 p.m.
- Extended OT-utilization timings =Timings from 5:00pm evening to 8:00am in the morning.
- A Pre Anesthesia Room is attached to each O.R. where patient is wheeled in before surgery and I/V lines are set
- Pre-operative time- Time taken in recovery area prior to the surgery.
It includes Floor-in time (time patient arrives from the ward to the pre-op room) till Theatre-in time (the time patient enters the operating room).

CHAPTER 5: OBSERVATIONS AND INTERPRETATION

TURN AROUND TIME:

This chart shows the time taken in different steps of process which takes place in OT on an average. The time starts from the pre op time which takes 58 min. Nine min. are spent to shift patient from pre-operative area to OT (9 min.). The patient remains in anesthesia for 2 hours and 07 min. i.e. the anesthesia time (2.07 hrs.) which also includes the surgery time of 1 hour and 40 min. i.e. the time in OT (2.07 hrs.). The time taken in shifting patient from OT to recovery room is 15 min. (0.15 min.). The patient stays in post-operative recovery room for 2 hours and 29 min. i.e. Post op time (2.29 hrs.).

The total time thus calculated as Time in OT + time from OT to recovery + Post-op time = 2.07 hrs. + 0.15 hrs. + 2.29 hrs. = (5 hrs. and 51 min.). So, the turnaround time comes to be approx. 5 hrs and 51 min.

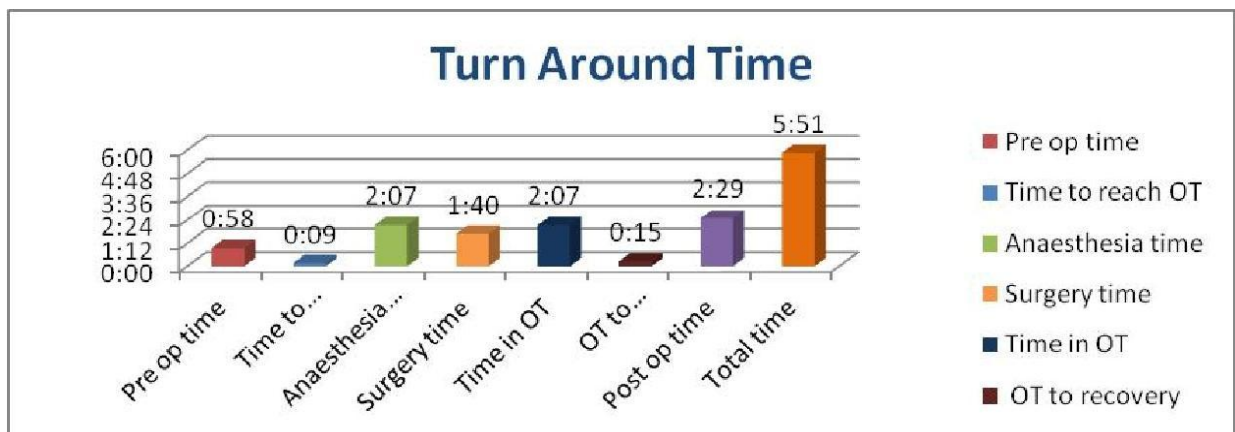


Fig 1.0 showing the process of timings included in total turnaround time

Interpretation-TAT in OT complex in this hospital is 5 hrs. and 51 min.

REASONS FOR DELAY IN SURGERIES:

The chart 2.0 depicts that approximately 58% of surgeries are executed on Time while 42% surgeries are being delayed for many reasons. The reasons are financial (14.4%), due to surgeons(9.01%), scheduling errors (9.91%), patients related reasons (8.11%) like unfit for surgery or late admission in hospital and delay in sterile supplies from CSSD(<1%).

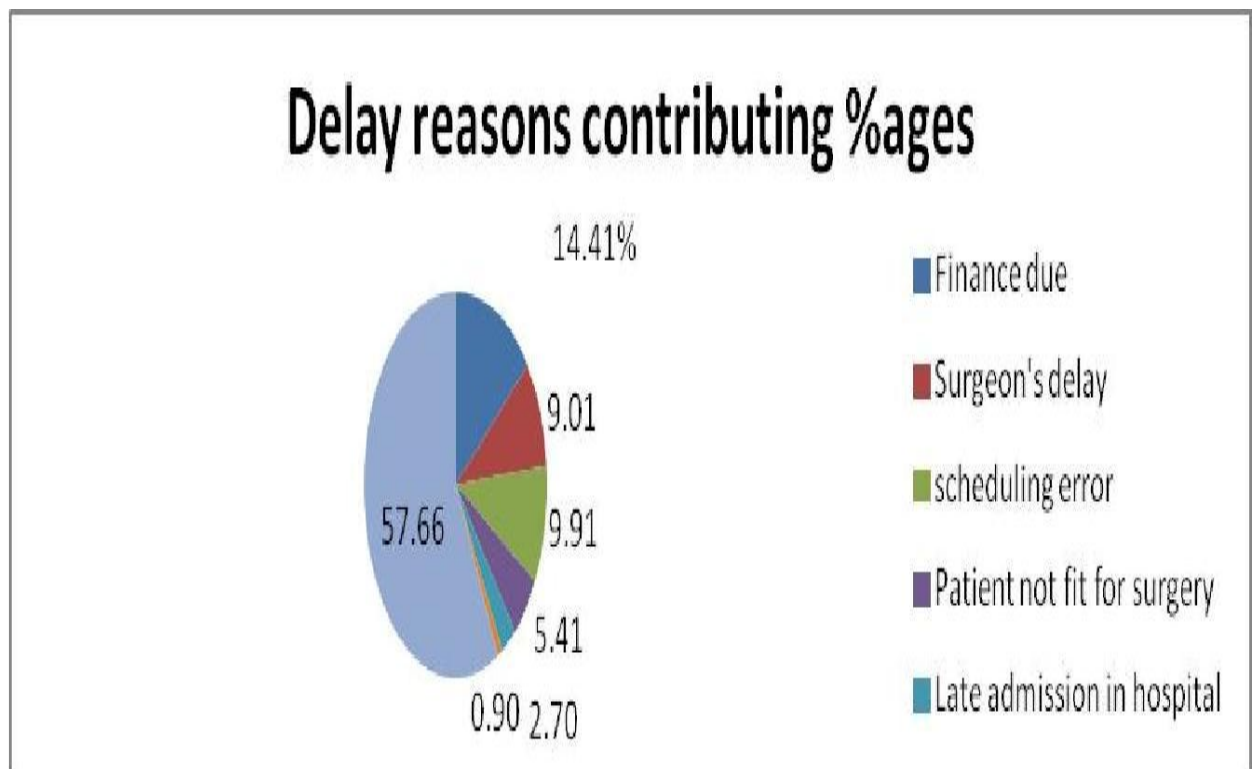


Chart 2.0 shows the four major reasons of delay of surgeries.

Delay reasons	No. of cases	In percentage
Finance due	75	13.99%
Surgeon's delay	48	8.95%
scheduling error	52	9.70%
Patient not fit for surgery	28	5.22%
Late admission in hospital	15	2.79%
Delay in sterile supplies	8	1.49%
no delay	310	57.83%
Total no of cases	536	

Table 3- shows reasons of delay and frequency in sample size of 536 patients

Interpretations- There are four major reasons for delay in decreasing order of percentage are financial, scheduling errors, surgeons' related and patients' related reasons.

TIME OF DELAY:

Table shows average maximum and minimum time of delay in procedure

Time of delay	
Average	1:08
Maximum	7:00
Minimum	0:00

This chart compares the range of delay timings from minimum (0.0 hrs.) to maximum 7.0 hrs. in different number of cases. The average delay in timing is calculated to be approx. 1 hours and 08 minutes

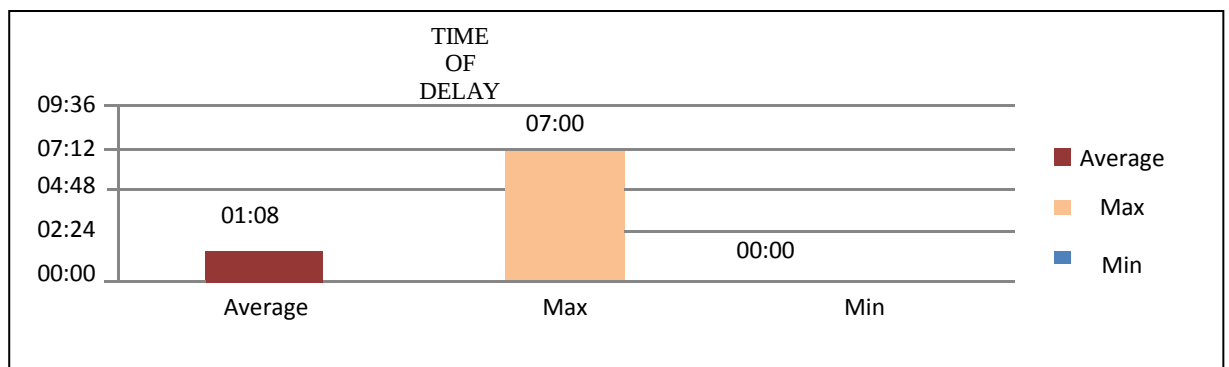


Figure 3.0 compares average, minimum and maximum times of delay in surgeries

Interpretations- On an average every surgery is delayed by 1 hour and 08 minutes. Maximum delay occurs during Orthopedics surgeries like Open Reduction and Internal Fixation because approval for TPA patients is delayed due to TPA-procedures.

PRE OPERATIVE TIME:

Table shows average maximum and minimum pre operative time during which patient stays in pre op area before surgery.

pre operative time	
Average	0:58
Maximum	4:20
Minimum	0:10

Chart 4.0 compares the maximum (4 hours and 20 minutes), minimum (10 minutes) and the average time (58 minutes) for which a patient was kept in the pre-op recovery area prior to the surgery. Maximum time taken was for Orthopaedic Cases like in Tibial Osteotomy and Fixation. The reason being when patient's vitals were checked he was not found stable for surgery hence stayed in pre-op room. Minimum time taken was for Gynaecology (caesarean Section) which was an emergency case so as soon as the patient was brought in pre-op got immediately transferred to the OT within 10 minutes. On an Average patient stays there for one hour which is sufficient for the pre-surgical check that includes Patient Verification (in terms of identification and surgical site marking), Filling of all related consent forms, Filling of pre surgical time out form, Recording all the basic vital signs and checking the patient's condition before surgery.

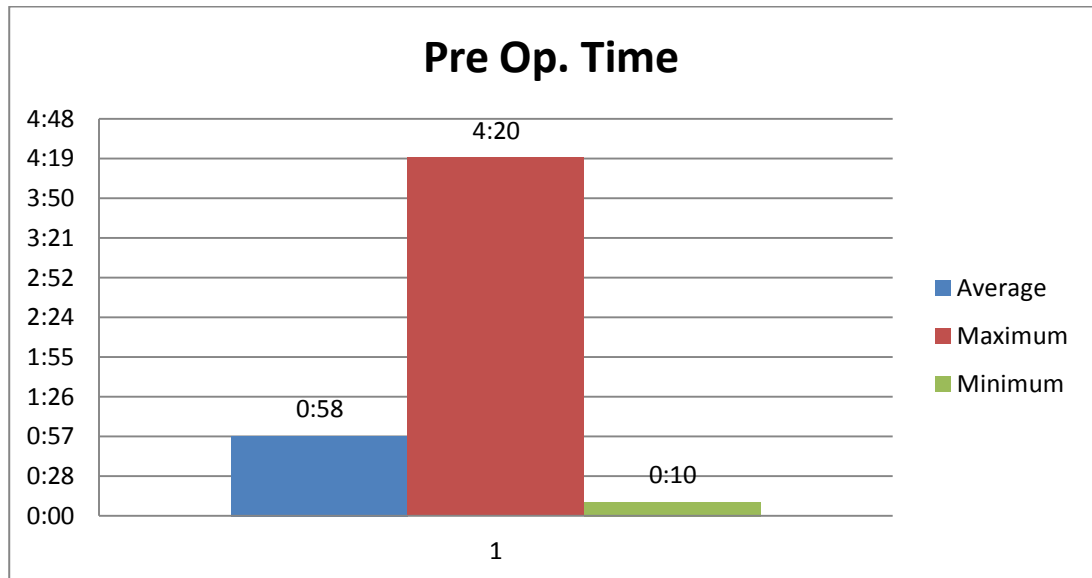


Chart 4.0 shows the maximum, minimum and the average time for which a patient was kept in the Pre-operative recovery area

Interpretations— On an average every patient keep in pre op recovery ward by 58 minutes.

ANAESTHESIA TIME:

Table represents average maximum and minimum anesthesia time.

Anesthesia time	
Average	2:07
Maximum	9:30
Minimum	0:30

Chart 5 compares the maximum (9 hours and 30 minutes), minimum (30 minutes) and the average time (2 hours and 07 minutes) for anesthesia time which includes anesthesia start / induction and end time in OT. Maximum, minimum and average time depends upon the kind of surgery and anesthesia given to patient. The patient is moved out of OT after the anesthesia effect lowers and patient responds to verbal commands, out of sedation.

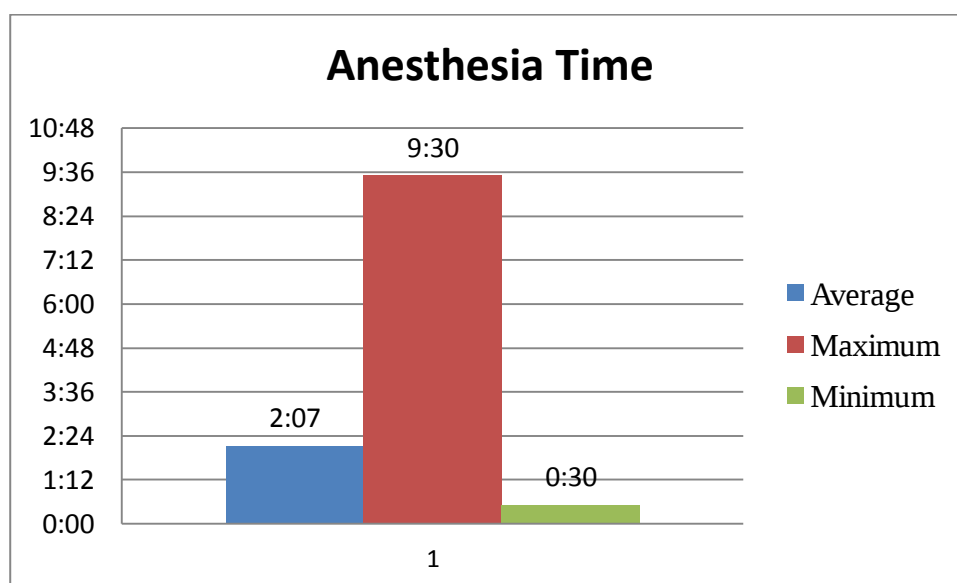


Figure 5 shows Anesthesia time which includes anesthesia start/ induction time till anesthesia end time in OT

Interpretations— On an average every patient has taken time for anesthesia by 2 hours 7 minutes. Maximum, minimum anesthesia time depends upon the kind of (major / minor) surgeries.

SURGERY TIME:

Table represents average maximum and minimum surgery time.

Surgery time	
Average	1:40
Maximum	8:30
Minimum	0:15

Chart 6 compares the maximum (8 hours and 30 minutes), minimum (15 minutes) and the average time (1hours and 40 minutes) for surgery. Its maximum, minimum and average time depends upon the kind of surgery the patient undergoes. Usually spine surgeries, orthopedic and plastic cases are expected to take long duration.

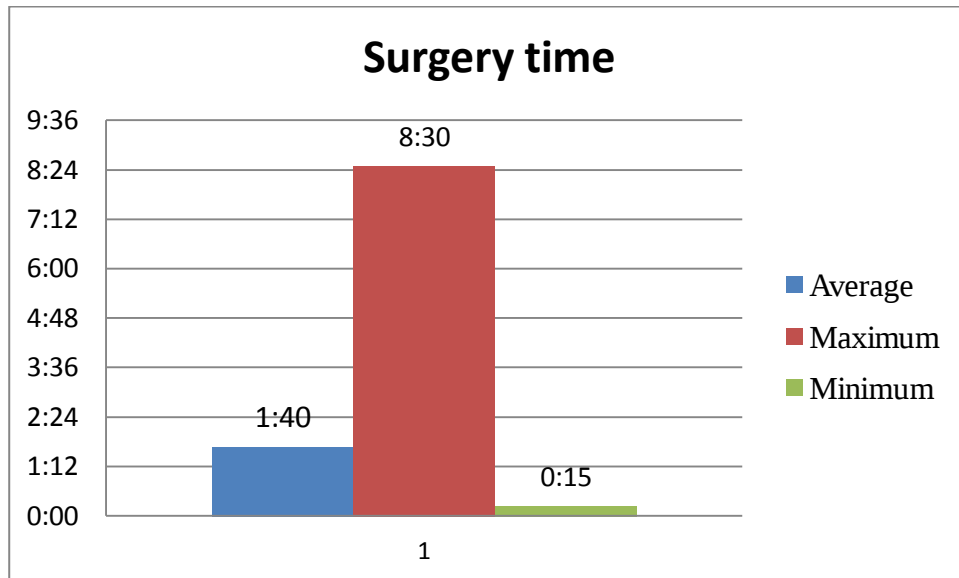


Figure 6 shows the time taken for surgery

Interpretation- In major surgeries like Neuro (spine) & orthopaedic (B/L TKR, THR) surgeries may taken maximum time for surgery

POST -OP TIME

Table shows average maximum and minimum post op time during which pt is kept in post op area after surgery.

Post op time	
Average	2:29
Maximum	4:30
Minimum	1:20

Chart 7 compares the maximum (4 hours and 30 minutes), minimum (1 hour 20 minutes) and the average time (2hours and 29 minutes) for stays post op in the recovery room. Patient is being assessed to be ready for discharge out of hospital or ward. All their vitals like pulse, temperature, blood pressure, Oxygen saturation are measured regularly at the interval of 15 minutes. These vitals are measured till the patient is normal.

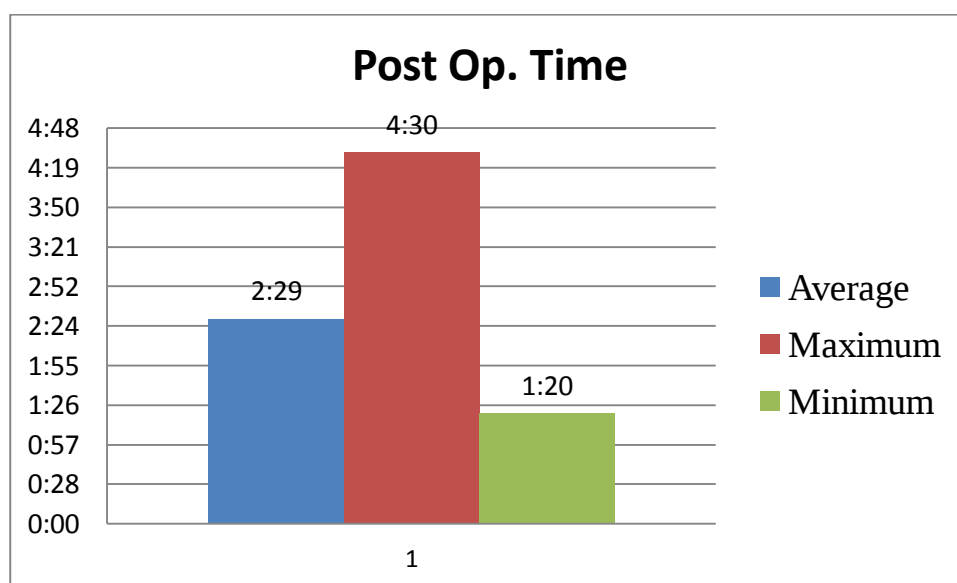


Figure 7 shows the time for which patient stays post op in the recovery room

Interpretation- post op stays in the recovery ward depends upon the kind of surgery the patient undergoes, if the surgery is major like brain surgery on that case patient may require post op stays long duration.

TOTAL PROCESS TIME:

Table represents average maximum and minimum total process time.

Total process time	
Average	5:51
Maximum	12:10
Minimum	3:20

Chart 8 compares the maximum (12hours10), minimum (3 hour 20 minutes) and the average time (5hours and 51minutes) for total process time in operation theater. In this graph maximum time was took for plastic Surgery that was being done for the Brachial Plexus Repair. Another Surgery that took 8hrs 50mins was an orthopedic case that took long time for the entire OT process because patient checks & another formal process for surgery.

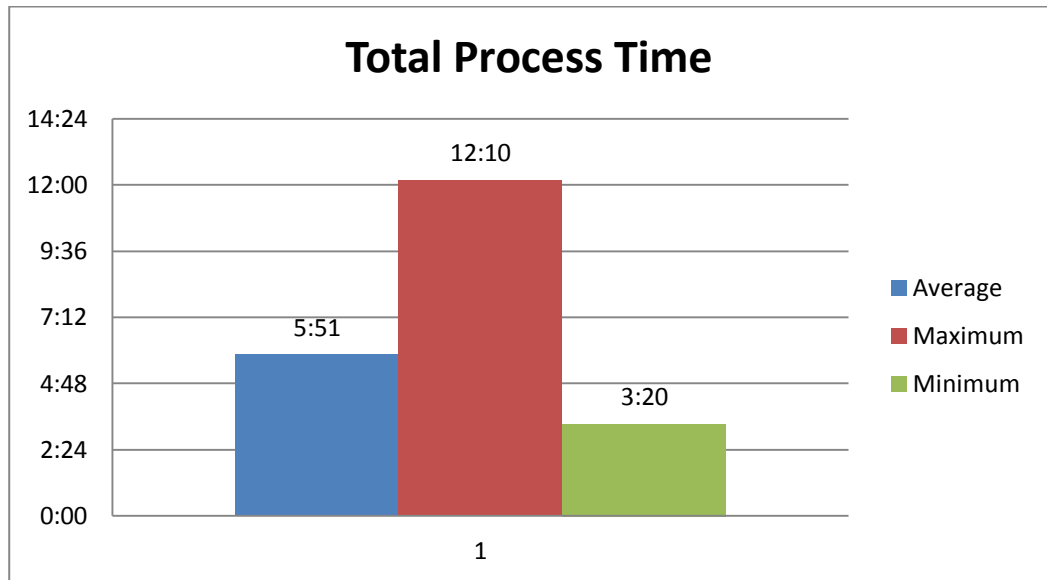


Figure 8 shows the total time for a process in OT

CHAPTER 6: SCHEDULE UNSCHEDULE CASES ANALYSIS

Table shows distribution of scheduled and unscheduled surgeries

Type of surgery	Frequency	percentage
Total surgeries	536	
scheduled	334	62.31%
unscheduled	202	37.68%

Chart 9 shows that 62.31% surgery cases were scheduled and 37.69% cases were unscheduled.

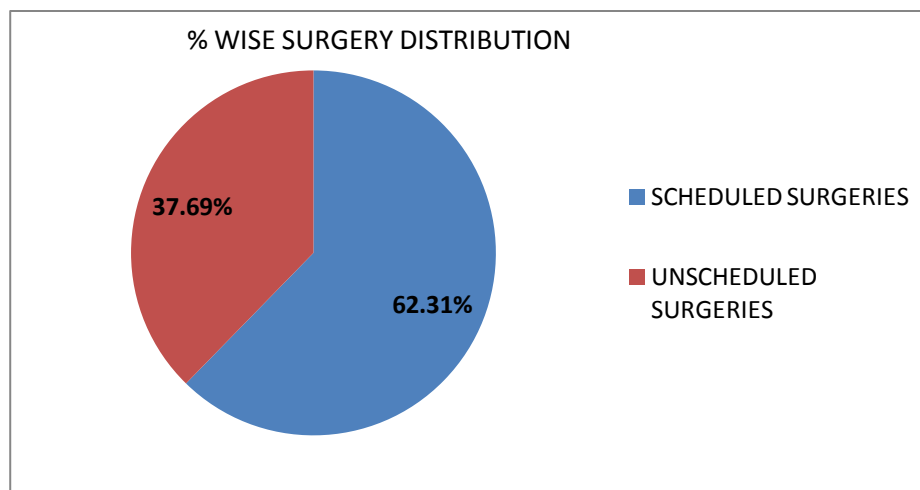


Figure 9 shows scheduled and unscheduled cases percentages

Interpretation: cases of general surgeries were unscheduled mostly because of delayed admission.

Table shows distribution of unscheduled elective and emergency surgeries

Type of surgery	Frequency	percentage
Total unscheduled surgeries	202	
unscheduled elective	118	58.41%
unscheduled emergency	84	41.58%

Chart 10 shows that 58.4% surgery cases were unscheduled elective and 41.59% cases were unscheduled emergency.

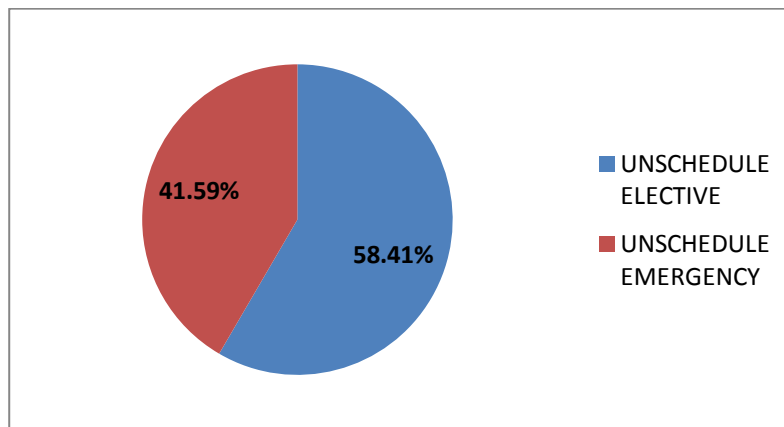


Figure 10 shows unscheduled elective and emergency cases percentages

Interpretation: Delayed admission results in increase no of unscheduled elective cases.

Table shows speciality wise distribution of unscheduled elective surgeries

Speciality	Frequency	Percentage
Neuro	2	1.69%
General	60	50.84%
Plastic	10	8.47%
Ortho	15	12.71%
Gynae	6	5.08%
Vascular	3	2.54%
Uro	16	13.55%
Onco	4	3.38%
Ent	0	0%
Mis	1	0.84%
Gastro	1	0.84%

Figure 11 shows that a specialty wise percentage of unscheduled elective cases in which general surgery cases percentages is high.

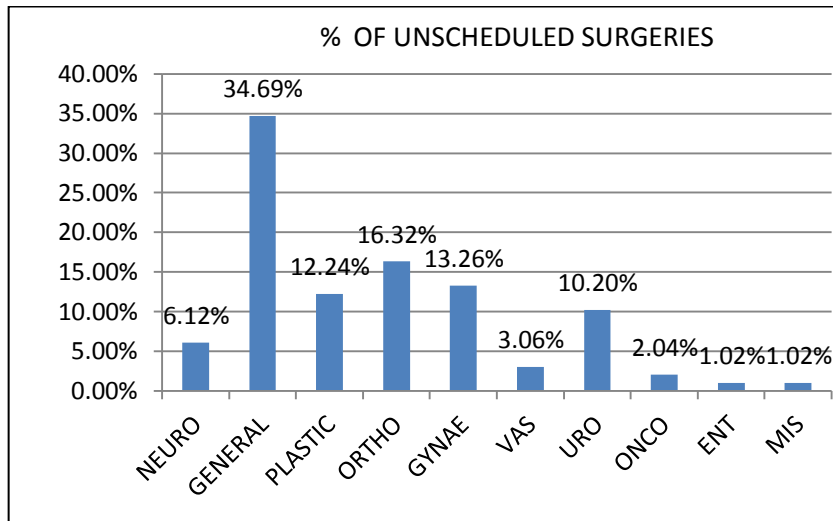


Figure 11 shows specialty wise unscheduled elective cases percentages

Interpretation: General and Ortho cases are unscheduled more as there is late intimation in theatre about surgeries plan.

CHAPTER 7: RECOMMENDATIONS

- There should be a theatre's users committee with a set of rules and responsibilities.
- There should be a policy document for operation theatre that should be reviewed regularly.
- Management Information to use theatre resources efficiently and effectively.
- Hospital should consider making use of analysis and measures of theatre utilization as a starting point for benchmarking.
- First case should reach O.T. in time from the ward, to allow the O.T. to be started on time.
- Perform all the minor procedures in minor O.T.'s attached to the OPD.
- The first case to be done in OT must be In-house so that delay because of late admission of the patient in the hospital can be avoided.
- More trolleys are needed to shift the patients in and out of M.O.T. Complex.
- The Anesthesia and other equipment must be made ready by the assisting staff so that the O.T. starts on time. The first scheduled case should start on time, so that subsequent surgeries are not delayed.
- There should be prior booking of equipments and ensure timely availability of equipments by HCA

- The ICU bed should be booked along with the scheduling of the OT surgery.
- The surgery should be scheduled only after financial clearance of the patient.
- Day care surgeries should be confirmed a day prior to scheduled day.
- Patient can be provided with reminder of preoperative instructions and appointment time online or through SMS
- In case of sterilisation cycle failure, extra stock of inventory should be provided to OT.

CHAPTER 8: CONCLUSION-

The utilization time of existing OT complex is 72% and the maximum possible OT utilization by global standard ranges from 85% to 90%. So, there is a gap of 13% to 18%. This gap is due to delay of approximately 1 hour in OT timings in the existing setup. The major reason for this delay can be attributed to TPA cases in which approval is required in orthopedic cases. So, the gap can be fulfilled i) by scheduling TPA orthopedic cases properly and ii) by increasing the shifts from 2 to 3.

There are various other reasons which cause delay in surgeries they are:

- First case delay: It was observed that the surgeon arrives late for first scheduled case which leads to delay in subsequent scheduled surgeries.
- The patient doesn't come for the scheduled surgery leading to cancellation of surgeries on the scheduled day.
- Due to financial clearance issues, the patient does not arrive on time for surgery.
- Patients requiring immediate intensive monitoring after surgery need to be shifted to ICU. Due to non availability of ICU bed, there is delay in shift out from operation theatre leading to delay in subsequent surgeries.
- Non-availability of porter to shift out from wards/ICU to OT leading delay in patient in time.
- Equipments such as portable X ray, C arm which were required for certain surgeries were not available on time.

- Delay in performing investigations of patients preoperatively.
- Patients not following the preoperative instructions.
- Certain surgeries were delayed /cancelled/postponed because patient was not medically fit for surgery at the scheduled time and day.
- Failure of sterilization cycle

ANNEXURE:

Utilization of OT

Average TAT of particular OT =

Total TAT of all surgeries performed in a particular OT during the study period

Total no. of surgeries performed during the study period in particular OT

Number of surgeries that can be actually performed =

Functional working hours of OT

Average total time taken for surgery in particular OT

Average total time taken for =

Total time taken for all surgeries in a particular OT during the study period

Total no. of surgeries performed in particular OT during study period

[Total time taken for surgery= time spent on actual surgical procedure + TAT]

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