

Study of Utilization, Turnover Time and Cancellation of Cases in OT

By

Milin M. Kavanar

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2015-2017



The IIHMR University, Jaipur

1, Prabhu Dayal Marg, Sanganer, Airport
Jaipur 302029, Rajasthan
Ph: 0141 3924700, Fax: 3924738
Website: www.iihmr.edu.in

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that Dr. Milin M Kavanar student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone internship training at Max Vaishali Hospital from 6-2-2017 to 5-5-2017 .

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

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.



Dean, Academics and Student Affairs
The IIHMR University, Jaipur



Chairman
The IIHMR University, Jaipur

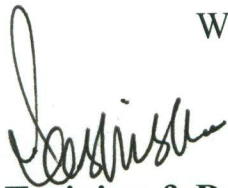
Date: 8th May'2017

TO WHOMSOEVER IT MAY CONCERN

The certificate is awarded to **Dr. Milin M Kavanar** in recognition of having successfully completed his Internship in the department of **Medical Administration** and has successfully completed his Project on **Study of utilization, turn over time & cancellation of cases in OT** From **6th February'2017 to 5th May 2017** at **Max Super Speciality Hospital, Vaishali.**

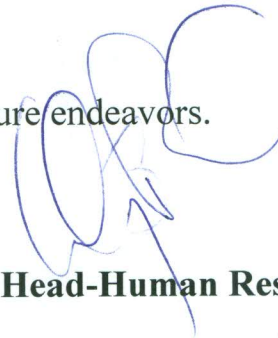
He comes across as a committed, sincere & diligent person who has a strong drive and zeal for learning

We wish him all the best for future endeavors.



Training & Development

Dr. Prashant Vashistha
MBBS (MAMC), MBA HCA (FMS), Six Sigma BB
Addl. Medical Superintendent
Max Super Speciality Hospital
W-3, Sec-1, Vaishali, GZB-201012



Head-Human Resources

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Study of Utilization, Turnover time and cancellation of cases in OT** and submitted by Dr.Milin M Kavanar

Enrollment No. IIHMR-U/01/2015-17/0306 under the supervision of Dr. S.D Gupta for award of MBA in Hospital and Health of the University carried out during the period from 6-2-2017 to 5-5-2017 of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.


Signature

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all ethical issues have been considered while collecting data for my dissertation titled **Study of Utilization, Turnover time and cancellation of cases in OT.**

A handwritten signature in blue ink, appearing to read 'Paulin', with a horizontal line underneath.

Signature of student

ABSTRACT:

Background: The operation theatre complex of a hospital represents an area of considerable expenditure in a hospital budget and requires maximal utilization to ensure optimum cost-benefit. Optimum utilization of the OT time has always been a priority area for hospital administrator's. In order to improve utilization of operating room it's essential to know how much time is spent on each activity. Cancellation of elective scheduled operations on the day of surgery leads to an inefficient use of operating room (OR) time and a waste of resources. Prolonged turnover time in OT causes potential loss or deferment of revenue for the hospital and internal customer dissatisfaction.

Objectives: The objective of this study is to collect the baseline utilization data of operating theatres in the operation theatre complex and to measure the turnover times for subsequent cases in the operating rooms and determine the reasons behind the long turnover periods

Method: A Prospective observational study was carried out at OT complex of a tertiary care hospital from 15th March 2017 to 8th April 2017

Result: The average adjusted OT Utilization was 75% and the average Raw Utilization was 64%.. The average turnover time of OT's was 59 minutes. 29% (119) of the cases had more than 1 hour of turnover time which led to increase in overall turnover time of all OT's. 65% of the cases were cancelled as patients didn't get admitted on the day of surgery. 16% of the cases were cancelled as they were unfit for the surgery. 11% of the cases were cancelled as the patients of IPD were not willing for surgery. 4% of the cases were cancelled as there was no financial clearance

Conclusion:

Avoidable causes were Doctors coming late for surgery, Improper OT scheduling, communication failure between patient and Administration, and patient not ready in ward while Non avoidable causes were surgery postponed or cancelled by patient, patient unfit for surgery, and emergency add on cases. The correction of these avoidable factors would increase the Efficiency of Operation theatre.

Acknowledgement

I sincerely thank the staff of Max Vaishali hospital for giving me an opportunity and practical experience in working as an intern and helping me to enhance my knowledge and providing me an helping hand throughout the training.

I am highly obliged and grateful to **Dr.Mohita Chandra (Medical Superintendant)** and **Dr. Prashant Vashisht(Additional Medical Superintendent)** for permitting to carry out the Internship training in Max Vaishali hospital.

Also I would also like to thank **Dr .Anindya Jain and Dr.Abhishek** for teaching and guiding me about the hospital.

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ABBREVIATIONS

PAC	Pre-assessment clinic
OT	Operation theatre
OR	Operating Room
IPD	Inpatient Department
JCI	Joint Commission International
OT	Operation Theatre
OR	Operating Room
ENT	Ear Nose Throat
OPHTHAL	Ophthalmology

1.1 Introduction:

Max Vaishali Super Speciality Hospital is a 350-bedded healthcare service provider offering Specialty Treatments and Tertiary Care facilities to its national and international patients. Built on 3.5 acres of land, this hospital is conveniently situated on NH24, and has been designed to exude a curative ambiance for all. The best in class infrastructure and technologically advanced equipment conjoined with a massive clinical talent pool ensures that the patients receive safe and compassionate patient care. The management team of the hospital carries an unrelenting zeal of developing an affordable and efficient health care system. Driven by its mission of providing innovative, efficient, high quality, and cost-effective health care solutions, the team at this hospital constantly endeavors to leverage its skill and expertise to the maximum. The dedicated team of seasoned specialists, accomplished surgeons, efficient nursing staff, and knowledgeable technicians offer the patients with a clinical experience which is at par with excellence. The hospital caters to relatively all the specialties, such as,

- Cardiology
- Dermatology
- Gastroenterology
- Gynecology
- Infertility
- Neurosurgery
- Rheumatology
- Orthopaedics
- Pulmonology
- Paediatrics
- Internal Medicine
- Oncology

Apart from offering Surgical, Preventive and Curative Services for all specialties, the establishment also offers,

- Emergency & Trauma Services
- Critical Care Services
- Ambulance Services

- Laboratory Services
- Diagnostic Services
- Homeopathy Treatment
- Nuclear Medicine Services.

The hospital caters to its international patients by providing a wide array of services, such as, Travel Assistance, Language Services, and many more. Other facilities and amenities provided by the hospital include Blood Bank, Pharmacy, TPA Services, and Cafeteria.

The present study focuses to understand the utilization pattern of the Operation Theatres of Max Vaishali Hospital. The hospital has Seven Operation theatres, where procedures from following departments are performed:

- General Surgery
- Gynaecology
- ENT
- Cardiothoracic
- Surgical Oncology
- Orthopaedic cases.

These theatres are scheduled for six days a week from 8:00 A.M. to 5:00 P.M except for public holidays. Scheduling of cases for operation theatres is closed type of scheduling i.e. OT tables fixed for specific departments which is only for the first case of the day performed in each operation theatre except for one operation theatre (OT1) which is exclusively available for only cardiothoracic cases. Scheduled cases are usually elective surgeries, though rarely emergency are performed in scheduled time. Apart from scheduled cases sometimes few surgeries both electives and emergencies are performed, usually referred as add on cases.

An Operation Theatre (OT) is that specialized facility of the hospital where life saving or life improving procedures are carried out on the human body by invasive methods under strict aseptic conditions in a controlled environment by specially trained personnel to promote healing and cure with maximum safety, comfort and economy (Bhaumik, 2008)^[1].

One measure to assess how well an OT functions is the “time utilization”. Time utilization was defined by Donham, Mazzei & Jones (1996) ^[2] as the quotient of

hours of OT time actually used during elective resource hours and the actual number of elective resource hours available for use . According to Talati et al. (2015) ^[3] Planning of various activities in an OT must be done systematically so that the allocation of staff is done efficiently. This will involve close cooperation amongst surgeons and anesthetists. Realistic scheduling of procedures will avoid cancellation of operations. Potentially long operations should be identified and planned in a way that it is possible to complete them within the time available .

According to Donham RT, Mazzei WJ,&Jones RL (1996)^[2] OR utilization can be computed in two ways, raw and adjusted. Raw utilization is the total hours of elective cases performed within OR block time divided by the hours of allocated block time . According to Dexter et al. (1999)^[4] adjusted utilization uses the total hours of elective cases performed within OR block time, including “credit” for the turnover times necessary to set up and clean up ORs .

There are various factors contributing to effective utilization of available resource hours, such as trained staff, appropriate facilities, equipment, good communication, operational layout, etc.

Good utilization also depends on a complex interaction between the availability of personnel and resources and on the attitudes and good practice of all staff involved. Efficiency in the theater is inevitably influenced by a huge range of surrounding resources such as pre-operative planning and assessment, beds, theater sterile supply unit (TSSU) capacity and staffing levels in other disciplines . In order to improve the utilization of operating room it is essential to know how much time is spent on which activity .

There is a great need of making maximum utilization of the existing operation theatre complex for the benefit of the patients and the hospital. This study will throw some light on the present level of utilization of existing operation theatre complex of Max Vaishali Hospital.

Dawlatly ,Turkistani, Aldohayan, Zubaidi &Ahmed(2008)^[5] have said that Cancellation of elective operations is a parameter to assess quality of patient care and quality of management system. There are many reasons of cancellation of elective surgical cases; and they differ from hospital to hospital .

Therefore there is need to Identify the incidence rate of cancellations and analyze the causes of cancellation of Scheduled cases in Max Vaishali Hospital.

1.2 Aim: - To perform a thorough and step-by-step assessment of operating room (OR) time utilization, with a view to assess the efficacy of current practice .

1.3 Objectives:-

- To collect the baseline utilization data of operating theatres in the operation theatre complex of Max Hospital, Vaishali.
- To capture the start time for the first case of the day and analyze the causes of delay.
- To measure the turnover times for subsequent cases in the operating rooms and determine the reasons behind the long turnover periods.
- To analyze the causes of cancellation of Scheduled cases.

2.Literature Review:

According to Sonal Shukla(2008)^[6] , “ In any hospital, the Operation Theatre is said to be the primary source of revenue generation with around 50-60 percent of revenue earned just by this area.” As hospital budget is majorly spent on OTs, they have to be utilized maximally to ensure optimum resource utilization (Vinukondaiah, Ananthakrishnan,&Ravishankar,2000)^[7] Tyler, Pasquariello, and Chen (2003)^[8] noted “the economic importance of keeping operating rooms full as operating rooms are a major revenue producing service line, for both inpatient facilities and outpatient facilities, and may generate nearly half of a hospital's revenues. It becomes clear why an efficient and well utilized operating suite is economically desirable”. Tyler et al. (2003)^[8] also claims that “one hour of over-time costs approximately 1.5 times an hour of idle time”.

Dr. Mohammad Faisal (2005) ^[9] suggests that for optimum utilization of the operating units, the operation theatres should not be reserved rigidly for use by a particular department . The operation theatres should further be similar in design and character to make it easy for all surgeons and nurses to use them without the necessity of familiarizing themselves every time with a new set of conditions . According to Donham RT, Mazzei WJ,&Jones RL (1996) OR utilization is a commonly used criterion for deciding whether to allocate more or less block time to a surgeon .

Tyler et al. (2003)^[8] conducted research to determine the optimum utilization rate of an operating room and concluded that economic considerations are the reason it is desirable to keep operating rooms fully used when staffed. Their study indicated that efficiency increases as variation decreases, and the OR is most efficient with utilization between 85% and 95% . “However, when utilization begins to reach 90-95% and greater, delays and overtime costs may be incurred, and repeatedly running late is hard on staff morale and may make recruiting and retaining scarce staff more difficult”. Trade off analysis must be considered when attempting to increase utilization rates above 90%. In most hospitals the goal is to have each OR in use 75-80% of the time (Tom williams & Heather williams, 2016)^[10]. Studies have (Tyler et al., 2003)^[8] used the concept of over-utilization and under-utilization to quantitate the quality of OR scheduling. Ultimately, optimized utilization results from a balance between efficiency from an economic standpoint, and patient satisfaction. Clearly, efficiency improves by increasing patient wait time and becomes most efficient when patients are waiting when the OR becomes available, so idle time is reduced. Changes such as cases of different duration, changes in variability of case duration, emergencies, cancellations, and so on will decrease optimum utilization. To maximize utilization, factors such as the cost to the organization of asking patients to wait, cost of overtime, and the ability of surgeons to take cases to another suite must be considered (Tyler et al., 2003)^[8].

B.M. Sakharkar (1998)^[11] made a study on time utilization of operating rooms in a large teaching hospital and had observations that the maximum utilization was found to be between 10:00 am and 1:00 pm. Delay was caused by surgeons resulting in the operating rooms remaining idle to the extent of 105 minutes on an average. Out of the eight hours operation time available, only 5 to 6 hours were actually utilized. Ill – planned scheduling of operations and late arrival of surgeons were the main cause. Out of the available time, 54 per cent of the time was spent on actual surgery, 31 per cent for supportive activities for the operation, and 15 per cent waiting while the operating room was being made ready for operation .

In another study that was conducted at Sher- I-Kashmir Institute of Medical Sciences by Farooq Ahmed, Syed, Tabish, Qazi, &Atif (2003)^[12] out of the utilized time 66% was spent on actual surgery; 21% on supportive services and 13% on making room ready for operation. The results of the study suggests that utilization of theatre can be

increased by avoiding delayed starts, avoiding cancellation of cases, proper scheduling of surgeries by anaesthetizing the patients in an anesthesia room instead of operating room and by laying of sterile trolleys in layup room instead of operating room .

Dexter and Traub (2002)^[13] noted the cost of over-utilized time includes direct costs of overtime and indirect costs of possible employee dissatisfaction, resignation, and recruitment . However, poorly managed scheduling can lead to under-utilization as well as over-utilization, resulting in unpredictable schedules for staff. Mueller and McCloskey (1990)^[14] identified the importance that reliable scheduling has on nursing job satisfaction. Failure to have predictability has been linked to employee turnover and poor employee satisfaction leading to hidden costs. Weinbroum, Ekstein, and Ezri (2003)^[15] stated that the most significant barrier to real cost reduction in the OR is waste of surgical operating time. Wasted time was determined by evaluating the possible existence of periods of OR inactivity, idle time, and spill-over time and analyze the impact on OR performance and cost .

It is necessary to clearly and accurately define turnover time since the term has been used to describe different durations in the process. It is the simplest definition and data could be easily collected from the computerized OR records. Others have defined turnover time as the time needed to set up and clean up for the same procedure excluding gaps and delays (Mathias, 2000), or the sum of set-up time and room clean up time plus delay time for the same case (Mowbray, 2003)^[17]. For Adams, overall turnaround time starts when a surgeon leaves the OR after completing a case and ends when the surgeon arrives in the OR for the following case (Adams, 2004). This lack of consistency only adds to the controversy of turnover time studies. OR turnover time refers to the length of time that starts when one patient leaves the OR and ends when the next patient on the schedule enters the OR (Dexter, 2003)^[19].

Based on data collected from 134 US facilities for turnover time, the median overall was 28.5 minutes, while at the 95th percentile, turnover time was 21.4 minutes. Turnover time is measured from when the prior patient exits the room until the succeeding patient enters the room (Tina Foster,2012)^[20]. Another data collected at 31 US hospitals showed turnover time at the best-performing OR suites average less than 25 min (Dexter et al.,2005)^[30]. An American score system developed to quantify performance in surgical facilities classifies turnover time (incoming-outgoing patient) into three categories: poor,

time > 40 minutes, medium, from 25 to 40 minutes, and high performance, < 25 minutes (Macario, 2006)^[32].

Tarantino (2004)^[21] states that the turnover process is highly inefficient and time consuming and results in delays in the OR schedule. He also states that anxious patients and families have to wait longer before their scheduled procedure is performed and angry and frustrated surgeons have to adjust their schedules to accommodate the delays, or worse cancel cases due to lack of available time which may ultimately result in loss of revenue to both physician and hospital .

Cancellations interrupt patient flow and decrease the throughput of the theaters, resulting in wasted resources. Cancellation also results in psychological trauma to patients as they have to undergo the pre-operative mental and clinical preparation again. The emotional and economic implications for the patient and their families can be significant (Ivarsson et al., 2002) ^[22].

According to Dawlatty et al. (2008) ^[5] Unexpected operating room (OR) cancellations are traditionally divided into avoidable cancellations (e.g., scheduling errors, equipment shortages, and cancellation due to inadequate preoperative evaluation) and unavoidable cancellations (e.g., emergency case superseding the elective schedule, unexpected changes in the patient's medical status, or patient nonappearance. The reported incidence of cancellation in different hospitals ranges from 10% to 40%. There are many reasons of cancellation of elective surgical cases; and they differ from hospital to hospital ^[23, 24]. An operating room (OR) case cancellation rate is <5% from the best performing USA hospitals and prolonged turnovers [proportion > 60 min] is < 10% (Macario,2006)^[32].

Cancellations of the surgery were classified as:

- Potentially avoidable (no OT time, no postoperative bed, list error, administrative cause, equipment or transport problem, communication failure, patient not ready, and no surgeon available); or
- Non avoidable (cancelled by patient, patient clinical change, emergency priority, patient not ready, and no surgeon available) .

According to Shakti Gupta and Sunil Kant ^[26], utilization essentially means “The use of the equipment to the full potential. Utilization index or coefficient is one of the

important parameters to monitor the functional status of the equipments. It is the parameter to assess the productivity of the service or equipment.

Use coefficient= $N/M \times 100$

Where N=Average number of hours the equipment/service is used per day.

M= maximum number of hours the equipment or service can be used per day

3. Methodology:-

3.1 Study design: The prospective, observational study was conducted at Max Vaishali super specialty Hospital.

3.2 Study duration: This study was carried out for a period of 24 days from 15th March to 8th April 2017 in Operation theatre complex.

3.3 Study area: Operation theatre complex (Operation theatre 1 to Operation theatre 7) of Max Hospital Vaishali.

3.4 Sample Technique: Non probability Convenient sampling.

3.5 Sample size:

- A total data of 535 cases was examined during the period of study.
- Out of which 406 cases underwent surgeries, which included planned as well as add on cases.
- And 129 cases were who had their operations cancelled on the day of surgery.

3.6 Data collection:

- Primary data collection: - Data was collected from personal observation and information gathered by discussion with staff.
- Secondary data collection: Data was collected from OT Register and OT records.

The following times were recorded for each operated case:

- In time: The time at which the patient entered the OT.

- Out time: The time at which the patient was shifted out of the OT.

3.7 Inclusions:

- All surgeries performed in the working hours of OT (8am -5pm).
- All cases that were induced in anaesthesia before 5pm.

3.8 Exclusions:

- Surgeries performed on Sundays were excluded.
- The cases that were induced in anaesthesia after 5pm were excluded.

3.9 Study tools used:

- Observational study was used to understand the processes in OT
- Data was analyzed in Microsoft excel to calculate operation theatre utilization, cancellation rate, delay rate and average turnover time.
- The Utilization of operation theatre was calculated using the formula:

$$\text{Coefficient} = N/M \times 100$$

Where N= number of hours the OT was used

M= number of hours the OT was functioning.

- The cancellation rate was calculated using formula:

$$\frac{\text{Total no of cancellations during study}}{\text{Sample size}} \times 100$$

Sample size

- The turnover time was calculated using formula: The time interval between the Exit of one patient in OT and entry of consecutive patient in the OT.
- Brainstorming sessions were undertaken to find out the causes for delay
- Fish borne Diagram was used to understand the causes of delay

Ethical Considerations:

- Confidentiality of Patients was maintained.
- Information received was not be misused in any form.
- Data collected will solely be used for the purpose of academic project
- The study was undertaken with due consent of departmental head

4. Results:

FIGURE 4.1: OT Utilization

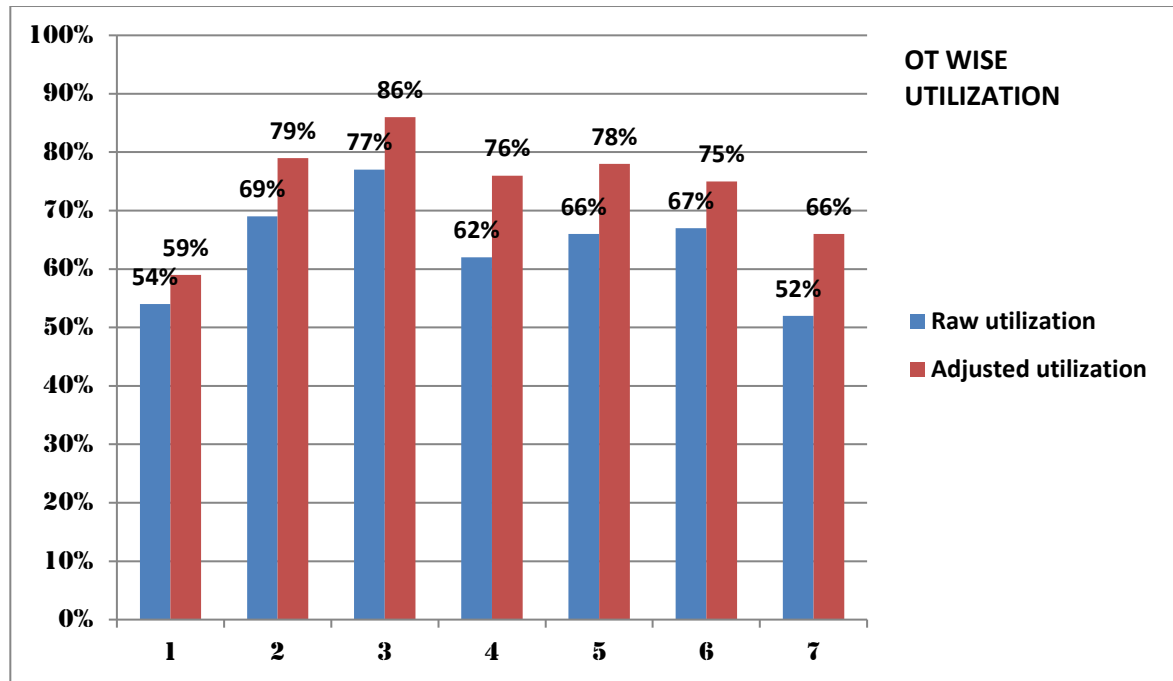


Table 4.1: Raw and Adjusted Utilization OT wise

OT.NO	No.of surgeries	Raw utilization	Adjusted utilization
1	20	54%	59%
2	61	69%	79%
3	51	77%	86%
4	81	62%	76%
5	71	66%	78%
6	44	67%	75%
7	77	52%	66%

- It was expected to have minimum 75% adjusted utilization in each OT.
- OT 1 was having the lowest adjusted utilization as it was exclusively used for cardiothoracic cases and there were only 1 case on average per day.
- OT 2 met the expectations with 79% of adjusted utilization with 61 surgeries performed.

- OT 3 was having the highest adjusted utilization i.e. 86% among all with 51 surgeries.
- OT 4 met the expectations with 76% also with maximum no of surgeries performed i.e. 81 surgeries.
- OT 5 met the expectations with 78% adjusted utilization with 72 surgeries performed.
- OT 6 met the expectation with 75% adjusted utilization
- OT 7 performed maximum no. Of surgeries i.e. 77 surgeries but was having lowest adjusted utilization after OT 2 with 66% adjusted utilization.
- As OT 1 was used only for cardiothoracic cases and was having only 1 surgery per day on an average, it was excluded from further studies in analyzing turnover time of each OT.
- Even though OT 7 performed the maximum no. Of cases it was having lowest adjusted utilization, which meant that it would have the maximum longer turnover time as compared to other OT.
- The average adjusted OT Utilization was 75%.
- The average Raw Utilization was 64%.

4.2 Turnover time:

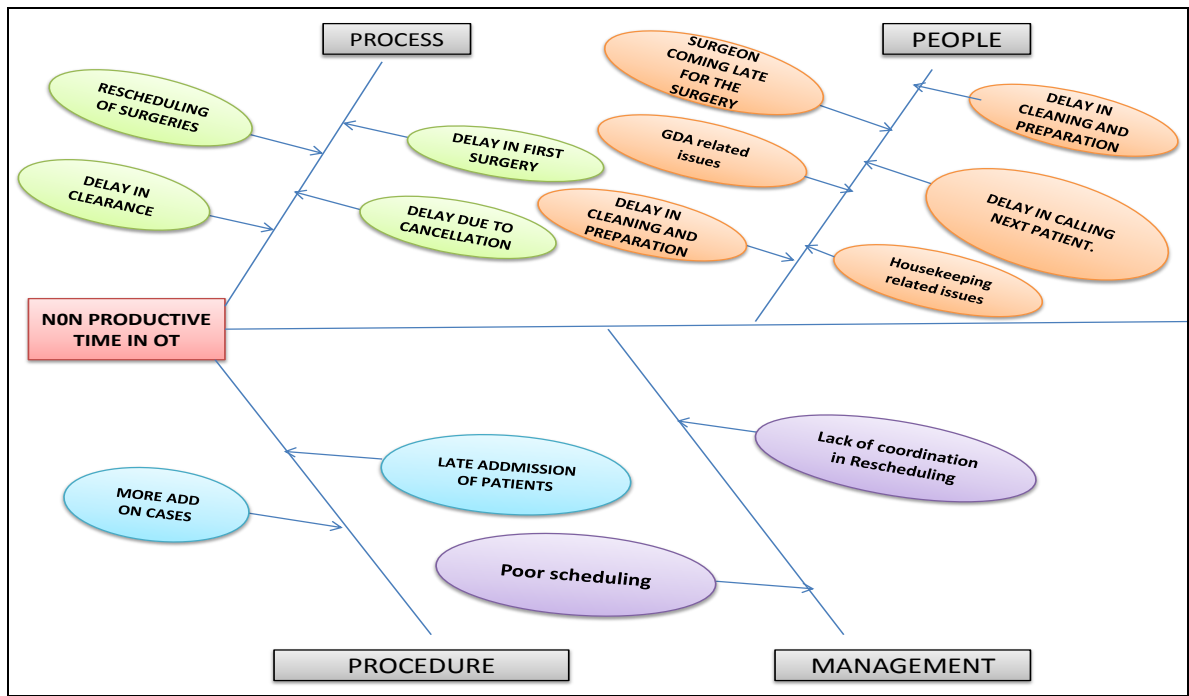
Table 4.2:

AVG TURNOVER TIME OT WISE	
OT2	52MIN
OT3	1HR
OT4	50MIN
OT5	53MIN
OT6	1HR21MIN
OT7	56MIN

- As said earlier OT7 was having the lowest adjusted utilization after OT1 hence it should have longest turnover time, however here it's not the case. It's because out of 77 cases performed in OT7 30 cases were having turnover time more than 1hour while 22 cases had turn over time less than 16 minutes which led to decrease in average turn over time of OT7 compared to other OT's.

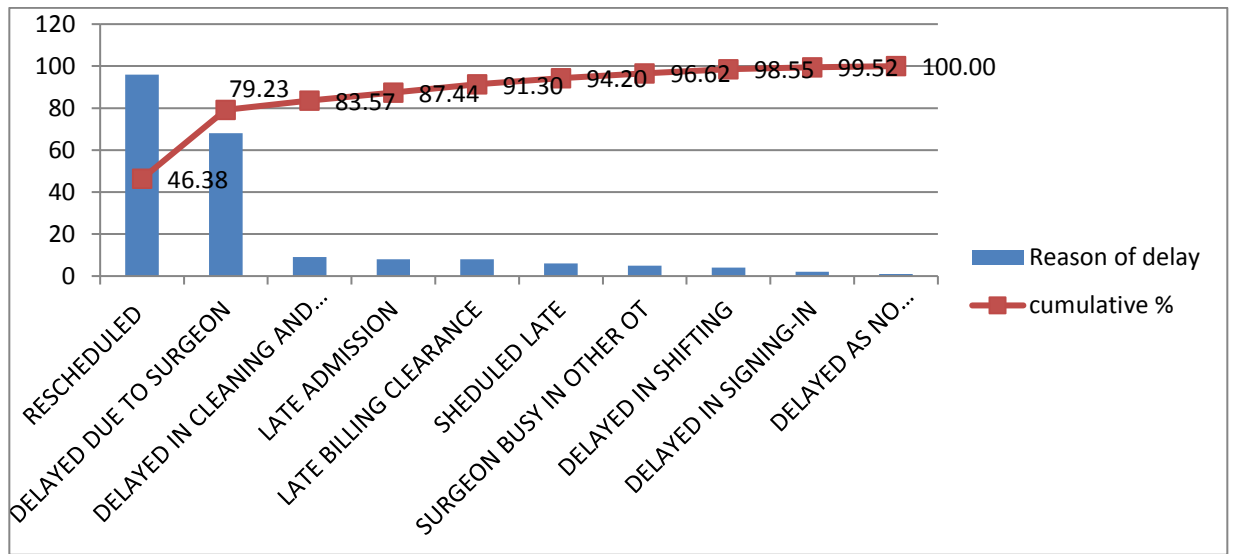
- OT6 was having the longest average turnover time according to the data i.e. 1 hour and 21 minutes. Here there was only one case that had turn over time less than 20minutes and 2 cases had 20 minutes turnover time. Rest 41 cases took more than 20 minutes of ideal turnover time. Also 22 cases took turnover time of more than 1 and half hour which led to increase in average turnover time of OT6.
- OT2 was having 52 minutes of average turnover time. In this OT out of 61 cases 11 cases had turnover time less than 20 and 18 cases had turnover time more than 1 hour.
- Similarly in OT3 out of 51 cases 40 cases took more than 20 minutes in which 15 cases took more than 1 hour however there were significant amount of cases i.e.11 cases that took less than 20 minutes reducing the overall average turnover time to 1 hour.
- OT4 was having average turnover time 50 minutes for 81 cases. 24 cases were having turnover time more than 1 hour. Here too there were significant amount of cases i.e. 16 cases that took less than 20 minutes turn over time which led to decrease in average turnover time less than 1 hour.
- Out of 71 cases in OT5 20 cases took more than 1 hour of turnover time and 12 cases took less than 15 minutes of turnover time which reduced the overall turnover time of OT5 less than 1 hour. The average turnover time of OT5 was 53 minute.
- The average turnover time was 59 minutes.
- This shows that 29% (119)of the cases had more than 1 hour of turnover time which led to increase in overall turnover time of all OT's . If there were no significant cases which had less than 20 minutes of turnover time the average turnover time of all OT would have been more than 1hour.

Figure 4.2: Fish borne diagram



This tool helped to find out all the possible causes that impacted the turnover time of OT.

Figure 4.3: Pareto Diagram



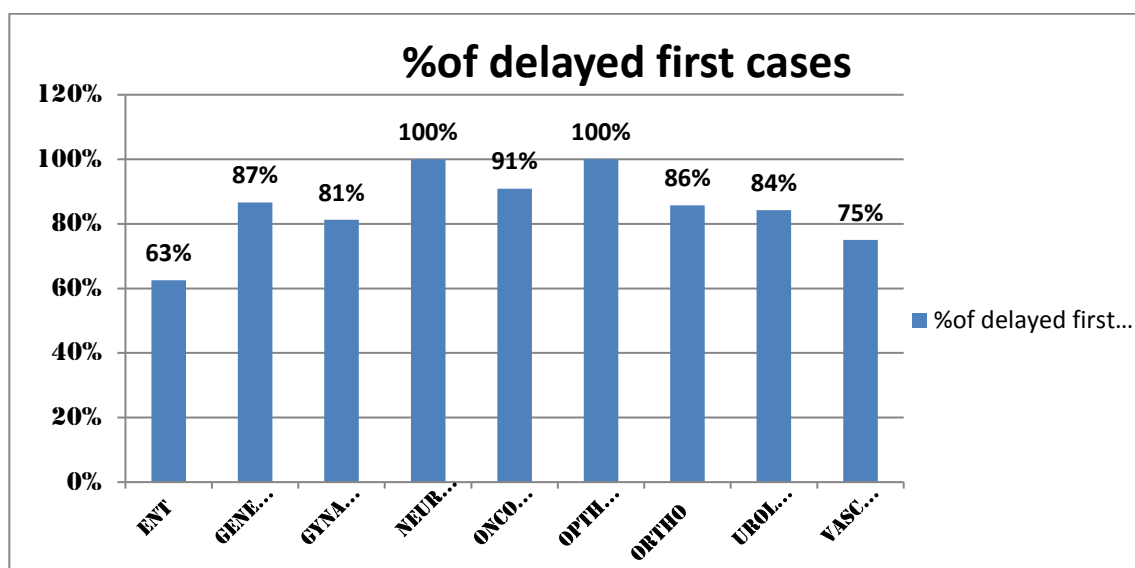
- This diagram helped to find out the vital few causes (20%, 2 out of 10 cases) that contributed for 80% of the problem in prolonged turnover time.
- Rescheduling and surgeon coming late for surgery constituted 80% of the problem for prolonged turnover time in OT.
- Rescheduling was the most common cause of prolonged turnover time. However cancellation of cases and more add on cases were the causes for Rescheduling.

Table 4.3: Reasons for delay in start of cases

REASONS FOR DELAY OF CASES	NO.OF CASES	% Delay
RESCHEDULED	96	46.38
DELAYED DUE TO SURGEON	68	32.85
DELAYED IN CLEANING AND PREPARTAION OF OT	9	4.35
LATE ADMISSION	8	3.86
LATE BILLING CLEARANCE	8	3.86
SCHEDULED LATE	6	2.90
SURGEON BUSY IN OTHER OT	5	2.42
DELAYED IN SHIFTING	4	1.93
DELAYED IN SIGNING-IN	2	0.97
DELAYED AS NO ATTENDANT WAS AVAILABLE	1	0.48

- 46% of the problems were caused due to Rescheduling
- 33% of the causes were caused due to surgeon coming late for surgery.

Figure 4.4 Delayed first cases speciality wise



- 85% of the lists started late i.e. after 8.15am
- Neurosurgery and Ophthalmology department had maximum number (100%) of delays when starting first case of the day.
- While ENT department had lowest delay in starting the first case the day.

Table 4.4: Speciality wise delay in first case

SPECIALITY	NO.OF FIRST CASES	FIRST CASES DELAY	%of delayed first cases	CASES STARTED BETWEEN 8am to 8.15am
ENT	8	5	63%	3
GENERAL SURGERY	15	13	87%	2
GYNAECOLOGY	16	13	81%	3
NEUROLOGY	15	15	100%	0
SURGICAL ONCO	11	10	91%	1
OPHTHALMIC	3	3	100%	0
ORTHOPAEDIC	21	18	86%	3
UROLOGY	19	16	84%	3
VASCULAR	4	3	75%	1

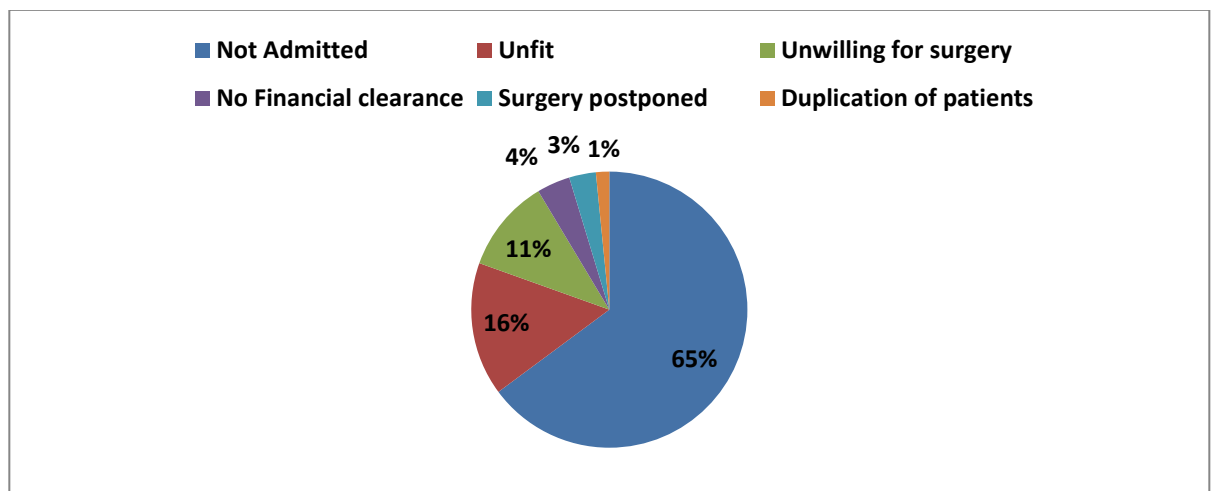
- Cases that started after 8.15am were considered as the delayed case.
- In neurosurgery out of 15 cases 0 cases were started on time before 8.15am.

- Similarly in Ophthalmic surgery department out of 3 cases 0 cases were started on time. However, there were only 3 cases as compared to 15 cases of neurosurgery that started as the first case of the day.
- In Surgical oncology out of 11 cases only 1 case was started on time before 8.15am.
- Orthopaedic surgery had maximum no. of first cases. Out of which only 3 cases were started on time out of 21 cases.
- Urology had started only 3 cases out of their 19 cases on time.
- Gynaecology department started only 3 cases on time i.e. before 8.15 out of their 16 cases.
- ENT cases started on time as compared to other departments. Out of 8 cases of ENT 3 cases were started on time.

4.4 Cancelled cases:

- During the study period of 24 days 535 cases were scheduled out of which 129 cases were cancelled.
- 24% of the cases were cancelled due to various reasons

Figure 4.5: Reasons of cancelled cases



- 65% of the cases were cancelled as patients didn't get admitted on the day of surgery. This patient's scheduled dates were either postponed or either they never showed up again.

- The patient's who never showed up again were either unwilling to do surgery or decided to do surgery in some other hospital
- The patient's who postponed their surgery had already discussed with their surgeons about postponing their surgery but sometimes this was not coordinated with OT coordinator leading to Rescheduling during the day of surgery due to cancellation.
- 16% of the cases were cancelled as they were unfit for the surgery. This was known when patient got admitted and thereafter PAC was done.
- 11% of the cases were cancelled as the patients of IPD were not willing for surgery.
- 4% of the cases were cancelled as there was no financial clearance .However this patient's surgery were postponed and done later after clearance was made.

Table 4.5:No. of canceled cases with with reasons

Reasons of Cancellations	No. of cancelled cases
Not Admitted	83
Unfit	20
Unwilling for surgery	14
No Financial clearance	5
Surgery postponed	4
Duplication of patients	2

- 83 cases out of 129 were cancelled as patients were not admitted
- 20 cases out of 129 were not admitted as they were found unfit after doing PAC
- 14 cases out of 129 were cancelled as IPD patients who were advised for surgery and scheduled the dates but later on unwilling for surgery.

5.Discussion:

5.1OT Utilization:

The study of Tyler et al.^[8] indicated that efficiency increases as variation decreases, and the OR is most efficient with adjusted utilization between 85% and 95%. In our study the average adjusted utilization is 75%. However, Tom Williams & Heather Williams^[10] found that in most hospitals the goal is to have each OR in use 75-80% of the time. A study of B.M. Sakharkar^[11] showed that Out of the eight hours operation time available, only 5 to 6 hours were actually utilized. Ill – planned scheduling of operations and late arrival of surgeons were the main cause. Out of the available time, 54 per cent of the time was spent on actual surgery, 31 per cent for supportive activities for the operation, and 15 per cent waiting while the operating room was being made ready for operation. In our study 6 hours 20 minutes out of 9 hours 40 minutes i.e. 65% of the time was spent on actual surgery and rest of the time for supportive activities and making room ready. Here too in our study Ill – planned scheduling of operations and late arrival of surgeons were the main cause.

5.2 Turnover time:

Based on a study by Tina Foster^[20] on 134 US medical facilities for turnover time, the median overall was 28.5 minutes, while at the 95th percentile, turnover time was 21.4 minutes.

Another study by Dexter et al.^[30] at 31 US hospitals showed turnover time at the best-performing OR suites average less than 25 min. In our study the average turn over time was 59 minutes which was very poor. Kumar and Sarma^[31] in their study cited that the average clean-up time of all OTs ranged between 10 and 15 min. Macario^[25] in a study cited An American score system developed to quantify performance in surgical facilities, classifies turnover time (incoming-outgoing patient) into three categories: poor, time > 40 minutes, medium, from 25 to 40 minutes, and high performance, < 25 minutes. In our study all the seven OT had turnover time above 45 minutes which was poor performance.

5.3 Late start of first case:

Vinukondaiah *et al.*,^[7] showed that 43.6% of the lists started later than the scheduled time. From these 43.6% delays, 80.4% of the time the delay was due to late shifting of the patient to the OT and 17.1% of the time the delay was due to an emergency surgery from the previous night continuing beyond 8.00 am. In the remaining 2.5% of time, the delay was because of miscellaneous causes. In our study, there were delays on 15 occasions of 96 lists, i.e. 15.63%, and late shifting of the patient from the ward to the OT was the most common (44.66%) cause.

In our study 85% of the list of first case were delayed which started after 8.15am. However the main reason was cancellations of the scheduled first case due to which rescheduling was done and second case had to be called if available or any further available case had to be called. Cancellations of scheduled first case made further delays in preparation of patient in ward and administration of any premedication which led to long delays.

5.4 Cancelled cases:

In a study by Garg *et al.*^[27] 30.3% cancellations were reported on the day of surgery. The reasons for cancellation of the scheduled elective cases were 59.7% due to lack of availability of theater time, 16.2% did not turn up on the day of surgery, 10.8% because of medical reasons, 5.4% due to a change in the surgical plan and 3.7% because of administrative reasons (autoclaved instruments/linen not available, instruments not available), and miscellaneous reasons (no availability of senior surgeon for the case, ICU bed/ventilator, adequate blood products and refusal of consent by patient) were responsible for 4.2% of cancellations.

Schofield *et al.*^[28] in their study at a major hospital in Australia reported 941 (11.9%) cancellations out of 7913 theater sessions. The reasons included no bed available (18.9%), run out of theater time (16.1%), patient non-arrival (10.5%), patient unfit (9.2%) and cancelled by patient or relative (8.2%). In our study, there were no cancellations because of unavailability of bed or by patient/relative. 4.1% of the cancellations were due to non-arrival of the patient and 8.2% due to lack of fitness.

Paschoal^[29] reported that 54.3% cases of the total cancelled cases were due to absenteeism of the patient because of unawareness of the date of surgery, clinical problems like respiratory tract infections and social/economical reasons.

In our study 24% of the cases were cancelled. Out of which 65% of the cases were cancelled as patients didn't get admitted on the day of surgery, 16% of the cases were cancelled as they were unfit for the surgery. This was known after patient got admitted and when PAC was done. 11% of the cases were cancelled as the patients of IPD were not willing for surgery. 4% of the cases were cancelled as there was no financial clearance.

6. Conclusion:

OT attained optimum utilization of 75% as per the literature. However in spite of attaining optimum utilization there was long turnover time even for the OT3 which had 86% Adjusted Utilization. The average turnover time of OT's was 59 minutes. This long Turn over time created the scope of improvement in obtaining more efficient Utilization. Turn over time was long mainly due to Rescheduling and surgeon coming late for surgery. Rescheduling was done mainly due to cancellations of the first case and more add on cases. Cancellations of scheduled first case made further delays in preparation of patient in ward and administration of any premedication which led to long delays. This was due to lack of communication between the patients prior to one day regarding surgery confirmation. The cancellations were known at morning 8am when patient didn't showed up for surgery. This created chaos in the OT list. There were many add on cases as all the cases which were added prior one day after 4pm joined the add on case list. This led to more rescheduling which increased turn over time. This are the main factors that account for inefficient use of operating facilities. .

Avoidable causes were Doctors coming late for surgery, Improper OT scheduling, communication failure between patient and Administration, and patient not ready in ward while Non avoidable causes were surgery postponed or cancelled by patient, patient unfit for surgery, and emergency add on cases. The correction of these avoidable factors would increase the Efficiency of Operation theatre.

7. Recommendations:

- Final OT list should be prepared till 5pm which is currently prepared till 4pm. This will reduce no. of add on cases
- OT list should be finalized after communication with patient, departmental coordinators and doctor one day prior to OT schedule. This will reduce cancellation rate.
- First case for the OT should be the patients who are already hospitalized.

- There should be OT booking and cancellations through HIS which will make booking transparent.
- Doctors should be reminded 1 Hour prior to their case on the day of surgery and 1 day prior for their first case.
- Integration of HIS on doctor's smart phone showing OT booking and scheduling.
- A checklist should be maintained by Departmental coordinators tracking patient's availability and the same should be shared with administration

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