

**Summer Training at
Alchemist Hospital, Panchkula,
Haryana
(April - June, 2013)**

**A STUDY ON THE UTILISATION AND EFFICIENCY OF
MULTISPECIALTY OPERATION THEATRE**

**By
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**Under the guidance of
Dr. Ashok Kaushik**

**Post Graduate Diploma in Hospital and Health Management
2012-2014**



**Institute of Health Management Research,
Jaipur
2013**

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CERTIFICATE

This is to certify that **Dr. Namita Mukhi**, student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from Institute of Health Management and Research, Jaipur Batch 17th has undergone summer training in **Alchemist Hospital, Panchkula**, Haryana and has done following projects:

1. A Study on utilization and efficiency of multispecialty operation theatre.
2. An open file review of Inpatient medical records.
3. A strategic Marketing mix for Dental Department.
4. A study on incidence and reason of cancellation of surgical procedures on the intended day of surgery in MS-OT complex.

The candidate has successfully carried out the mentioned studies assigned to her during summer training from 09th April, 2013 to 05th June 2013 and her approach to study has been sincere, scientific and analytical.

I wish her success in all his future endeavors.

Dr. ASHOK KAUSHIK

Dean (Academics and Student affair) and mentor
IHMR, Jaipur

Ref: AHL/HR/TRG/012

13th June, 2013

TO WHOM IT MAY CONCERN

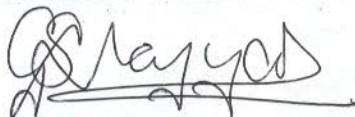
This is to certify that **Dr. Namita Mukhi**, Management Trainee from IIHMR, Jaipur has completed her Summer Training from 09th April, 2013 to 05th June, 2013 at Alchemist Hospital, Panchkula, Haryana.

She has successfully submitted the following projects to the Hospital which were assigned to her during this period:

1. *A study on utilization and efficiency of multispecialty operation theatre.*
2. *An open file review of Inpatient medical records.*
3. *A strategic Marketing mix for Dental department.*
4. *A study on incidence and reason of cancellation of surgical procedures on the intended day of surgery in M.S O.T Complex.*

She was found to be sincere and hardworking during her tenure. We wish her all the best for her future endeavors.

For ALCHEMIST HOSPITALS LTD.



Gladwin Sandeep Nayyar
Deputy Manager - HR & Admin

ALCHEMIST HOSPITAL LTD.
Sector-21, Panchkula (Haryana)

ACKNOWLEDGEMENT

I, Dr. Namita Mukhi, the performer of this study owe a deep sense of gratitude to all those who have contributed to the successful completion of this work.

First and foremost I am thankful to Almighty for his blessings bestowed on me in all my endeavours.

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I wish to express my thanks to all the respondents, OT Incharge, nursing and other staff of MS-OT for their co-operation that helped me complete this study.

Date: 8th May 2013

Dr. Namita Mukhi

DECLARATION BY CANDIDATE

I, Namita Mukhi, hereby declare that the research project '**A study on the utilisation of Multispecialty operation theatre**' undertaken by me at Alchemist Hospital is an original research work and will be used only for research and academic purposes only.

Dr. Namita Mukhi

Date : 8th May 2013

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Operational definitions:

1. Actual/ performance time: Time duration of surgery from the start of induction of anaesthesia till the wheel out of patient from operating room.
2. Adjusted OT utilisation: Percentage utilisation in hours of operating room when it is used for surgery including the credit time for making OR ready out of the total available resource hours.
3. Allocated time: theatre allocated time is the period for which the theatre is adequately staffed and scheduled for given services (elective surgeries in this study).
4. Cancellation: Those surgeries which were cancelled or postponed after being displayed on OT schedule list.
5. Case Juggling: A case was defined as juggled if the case was rescheduled beyond 2hrs in the OT list on the day of surgery.
6. Case shifting: Case was defined as shifted if the case was scheduled in OR -1 but performed in OR-2 or vice- versa.
7. Credit time: Time taken in making the OR ready for next surgery in accordance with the protocols of the OT manual of the hospital.
8. Duration of surgery: The duration of an operation was the time from the start of anaesthesia to the arrival of the patient in the recovery area.
9. Major surgeries: complex surgical procedures which require deep sedation or the administration of general anaesthesia.
10. Minor surgeries: surgical procedures which can be performed under local anaesthesia or moderate sedation and do not require administration of general anaesthesia
11. Operation room: Room where surgical procedures are performed.
12. Operation theatre: operating room with ancillary area is called operation theatre. An operation theatre may have more than one operation room.
13. OR “time-waste”: Defined as the time in which the scheduled OR was not busy with the scheduled patient.
14. OR “spill over”: any surgical case running beyond the scheduled time slot.
15. Prediction bias: The difference in time (in mins) for which the OR was booked for the surgery and the actual time which that surgery took in the operating room.
16. Raw utilisation: Measure of theatre utilisation as a ratio of total theatre used time upon the theatre allocated time.

17. Resource hours: Total hours of functional OR (from 8:00 hours to 20:00 hours every day excluding Sundays) which can be allocated for surgeries.
18. Wheel in time: Time when patient is taken inside the operating room from the pre-operative area.
19. Wheel out time: Time when the patient is shifted from operating room to post operative Room.
20. An over-booked list was one in which the sum of surgeons' average estimates for the duration of individual operations on that list exceeded the scheduled duration of the list by (arbitrarily) more than 20 min.
21. An under-booked list was one in which the sum of surgeons' average estimates for the duration of individual operations on that list was smaller than the scheduled duration of the list by (arbitrarily) more than 20 min.

Abbreviations:

OT – operation theatre

OR – operation room

MS-OT – multispecialty operation theatre

OR1 - operation room 1 of multispecialty operation theatre

OR2 – operation room 2 of multispecialty operation theatre



The Alchemist group was launched in 1981 by Dr. K.D Singh. Its business interests falls under the following categories: food processing, hotels and resorts, restaurants, road technologies, healthcare, education, pharmaceuticals, steel mesh, aviation, real estate and tea.

The Alchemist group has two tertiary care hospitals, in Panchkula and Gurgaon, with its flagship hospital located in Panchkula.

Alchemist hospital, Panchkula, is a private limited organization, set up in 2008.

Mission

To provide best healthcare services by highly qualified and trained personals so that the patient gets cared and cured.

Vision

Alchemist group aspires to be the most preferred healthcare organization for customers and employees by:

- (1) Offering affordable and, transparent and world class services.
- (2) Developing synergetic relationship between management and employees.

The Hospital is set up in 1.25 acres area, with coverage of 80,000 square feet. The building has two blocks; one is hospital block and the other service block. Each block has 5 floors, with a basement.

The hospital building has two lifts; one for patients and the other for attendants and staff. There are two parking areas, one for the attendants, patients and staff and the other for emergency cases with a separate entry from OPD area.

Alchemist hospital is a 100 bedded hospital, with 21 specialties. The top 5 specialties are: cardiology, cardiac surgery, neurology, neurosurgery, and joint replacement.

Basement of the hospital has the following departments: Administration, HR, Marketing, Billing, Finance, CSSD, laboratory, blood bank and food & beverages. Pharmacy, Laundry and Medical gases department is located in the basement of the Service Block.

Reception and registration, Outpatient clinics, Lifestyle clinics, Help desk, In-Patient Admission desk, Emergency department, Imaging services (X-rays, USG, CT scan), Cardiac (echo, TMT, Holter), Dietary services and Cafeteria are on the ground floor.

The hospital is supported by 5 operation theatres, with 2 general OTs, 1 cardiac, 1 Neuro and 1 for joint replacement, all located on the first floor. It also has SICU, Cath lab, CCU, Labour room, Nursery and NICU.

HDU, MICU, dialysis and endoscopy are located on the second floor.

General wards are on the second floor, twin sharing, private and deluxe rooms are on the second, third and fourth floor. Suites are located on the fourth floor.

Medical record department and store is on the fifth floor.

Table 1.1: Distribution of beds

Department	Distribution of beds
First floor	
Triage	10
CTVS-ICU	6
CCU	8
NICU	7
ICU-1	9
ICU-2	7
JRSU	6
SICU	4
Second floor	
Economy room	9
Twin-sharing	2
Private room	3
Third floor	
Twin-sharing	6
Private room	6
Deluxe	2
Fourth floor	
Twin-sharing	6
Private	6
Deluxe	1
Suite	2

Emergency department- a section of an institution that is staffed and equipped to provide rapid and varied emergency care, especially for those who are stricken with sudden and acute illness or who are the victims of severe trauma.

The emergency department of the hospital is 6 bedded and located on the ground floor with separate entrance and guided assistance for parking. The diagnostic facilities e.g. CT scan, MRI are located close to the department. Portable X-ray machine is also available.

Timely emergency care is continuously available 24 hours/day, seven days a week.

There are 3 ambulances outfitted with advanced life support available round the clock, accompanied with a specialized nurse. A doctor accompanies the ambulances if the medical condition of the patient demands.

The department uses a triage system of screening and classifying clients to determine priority needs for the most efficient use of available personnel and equipments.

. The department is equipped with a defibrillator, cardiac monitors, gas pipes, ambu bags, vital drugs and other resuscitation equipments. There is an isolation room and a plaster room in the emergency department.

The most common emergency encountered is cardiac cases. There are 30-40 medico-legal cases per month and 4-5 brought dead in a month.

Blood bank- A place, or organization, or unit, or institution for carrying out all or any of the operations for collection, Apheresis, storage, procuring and distribution of blood drawn from donors and for preparation storage and distribution of blood components.

The blood bank of Alchemist hospital is located on the basement of the hospital.

The blood bank adheres to norms under drugs and cosmetics act 1940 and rules 1945 as amended from time to time.

It uses latest GEL technology, for blood grouping, cross matching and antibody screening.

It also conducts mandatory tests for hepatitis B, C, Malaria, VDRL and HIV.

Platelet Apheresis also being done with the help of com.tec blood separator for dengue and patients requiring platelets.

The blood bank uses latest technology in refrigerators for safe storage of blood at proper temperature.

Medical records department- it maintains and analyzes patients' medical records.

Medical records of patients start building the day he is admitted in the hospital. It consists of his case sheets, physical condition, investigation, operation/procedure details, daily progress and discharge information. All these papers are deposited in this section after the discharge/death of the patient and are arranged according to the MR number.

Medical records of in-patient and out-patient are maintained separately. These are confidential documents and its handing over to the patients or doctors should be against the signature of the person/officer concerned.

The department has the following persons:

- (1) Medical records officer
- (2) Senior records technician
- (3) Junior records technician

Medico-legal cases are maintained separately and the medical records officer is responsible for providing assistance to police officers in the form of requirement of injury report, MLC investigation report.

The medical records are retained for 5 years but in case of MLC, retention period is 10 years.

Pharmacy- Alchemist hospital has its own pharmacy i.e. Alchemist pharmacy

The OPD pharmacy is located on the ground floor and the IP and central pharmacy in the basement. The services are 24x7 available.

The OPD pharmacy is utilized to obtain prescribed and over-the-counter medications.

Central pharmacy accepts requests for medications from, emergency, OT, ICU through indents being put up by doctors.

IP pharmacy accepts requests for medications, through indents, being put up by IPD patients.

Narcotic drugs are stored separately, issued on special request from doctors.

CSSD (central sterile supply department)

- ❖ One of the most sophisticated, technically advanced world class department in the area.
- ❖ Receives, stores, sterilizes and distributes supplies to all departments including the wards, outpatient department and other special units such as operating theatre (OT) , Cath lab and ICU.
- ❖ LOCATION- it is located in the basement of alchemist hospital building and connected to OT by dumb waiter.
- ❖ PLANNING – it is in accordance with the principal of zoning having four zones:
 - ✚ ZONE 1 – **Dirty area** where receiving counter is there and decontamination and disinfection is done.

- ✚ ZONE 2 – **clean area** for assembling and packing. supplies are received through double door washer placed in zone 1 .
- ✚ ZONE 3 – **sterilising area** with two double door autoclaves opening into issuing zone.
- ✚ ZONE 4 – **Issuing** .storage and distribution is done here. A double door issuing counter is present.
- ❖ VALIDATION of sterilisation is done regularly by use of physical , chemical and biological markers .
- ✚ Physical validation – temperature, humidity and other sterilisation cycle details are attached with every cycle run.
- ✚ Chemical – chemical dye tapes and indicators are present in every pack to be sterilised and as label on packs. BOWIE – DICK test is done daily.
- ✚ Biological – microbiological organism cultures are kept and tested in lab for any growth every week.

LAB SERVICES:

- ❖ Lab is designed to handle large volumes of samples efficiently and effectively
- ❖ Deliver high quality rapid services with standard turnaround times for each service provided.
- ❖ Equipped with latest technology and techniques.
- ❖ Sample collection room is located in OPD area and Laboratory is located in basement.
- ❖ Stringent quality controls and processes backed by contemporary IT network and efficient logistics management ensures highest level of accuracy of tests conducted.
- ❖ Lab is first to have:
 - ✚ Fully auto analyser dry bio chemistry.
 - ✚ Five part with retic-haematology auto analyser.
 - ✚ Equipped with cytopsin for all body fulides malignancy diagnosis.

IMAGING/ RADIOLOGY

- ❖ Equipped with the latest state-of-the-art equipment for routine as well as specialized radiological procedures.
- ❖ Digital routine x-ray ensuring high quality services.
- ❖ Special procedures and contrast studies are performed on remote controlled digital fluoroscopy machine.
- ❖ High standards of patient safety are maintained by adhering to guidelines for radiation safety.

OPERATION THEATRES

Alchemist Hospital has five operation theatres that are equipped with anaesthesia machines of international standards, cold operating lights, advanced air filtering system, central gases and suction, image intensifier, electrosurgical units and endoscopic equipments.

The theatres are staffed by an experienced team of anaesthesiologists, technicians and nurses and follow strict protocols for infection control.

These ensure high standards of patient safety during and after surgery by following pre-operative and operative checklists.

They have 5 modular OTs – one OT dedicated for cardiac, one OT specially assigned for orthopaedic surgeries, one OT for neurosurgeries and other non infected cases, two OTs are assigned as multispecialty operation theatres for all other specialities.

INTRODUCTION:

Operation theatre is the most vital and imperative facility of a hospital. It is the heart of any hospital where all the surgical procedures are performed. The concept of “operating theatres” has its origin in its history around 15th century. Earlier there used to be an elevated table and all around raised chairs for students to see the operation. Modern OR is said to have descended from the Roman Military tent and hospital system. Like all other medical facilities, Operation theatres are also the offspring of wars. Subsequently the word ‘operation theatre’ (OT) has been replaced by ‘operation room’ (OR) which refers to the room in which surgery takes place. The operating room with ancillaries is called as operation theatre/suite and numbers of operation theatres or suits together form an Operation Unit/ Operation Theatre complex. The concept of these conventional Operation Theatres has seen a drastic drift to the modern Operation rooms with Laminar Airflows and state of art equipments. There has been transformation of operation theatres as the place where surgical procedures are conducted to operation theatre complex where not only surgical procedures are performed but also the patients care and safety are also of essence.

There are four crucial pillars of OT functioning are surgical safety, sterilisation or zoning, quality of care and team work.

Safe surgery is the basic aim of any surgical unit. Adherence to WHO safe surgery protocols and checklists enables to assure the safety of patients. It is fundamental that an operation theatre be designed scientifically to ensure safety, sterility, easy maintenance and effective utilisation. The form of operation theatre should follow the functions it performs. And all the zoning should be done in accordance to the infection control practices.

The quality of care in surgical unit is a measure of timely, safe and best care to patients. Maintenance of the quality indicators of operation theatre and striving for total quality management of the processes of Operation theatre is mandatory. Assurance of quality also reduces the variability in outcome of the operation theatre. It evaluates the efficiency of operations and also ensuring reduction of waste processes.

Many surgeries are technically complex and requires a range of people with different skills to be in one place. These include one or more surgeons, one or more anaesthetists, as well as special theatre nurses and practitioners and a range of assistants and technicians. Staffs from other departments, such as radiology or pathology, and supporting staff of housekeeping and maintenance are also sometimes required. Many of these staffs are involved in preparing patients for operations and in moving them in to and out of theatres at the right time. Gathering the right people at the right time in the right place is difficult enough in itself, but it is only half the battle. They have to work together in harmony, with

common goals and agreed standards. Each person must not only be skilled in his or her own role, but must also understand and co-ordinate with others' roles. Besides the people, a wide range of consumables (from syringes to replacement hip joints) and equipment (from surgical instruments to operating microscopes) have to be assembled without failure. Thus the team work is a requisite of essence for efficient functioning of operation theatres.

It is the most important cost centre of any hospital. Operation theatre not only involves the maximum expenditure but is also the primary source of revenue generation for hospital. Thus it is a vital expenditure and revenue centre at the same time. For maximising the cost benefit ratio of operation theatre complex, hospitals needs to utilise operation rooms in most efficient manner possible.

The operation theatres are fundamental centres both for hospital as well as patients. Surgical operations are an important part of hospital acute activity. For many patients they are the sole reasons for hospital admissions. Thus it necessitates the hospital to ensure the '**Right case at right place to right person in right time**'.

Alchemist hospital is a tertiary care 130 bedded hospital with OR complex as an imperative and central facility. This hospital caters to surgical needs of surrounding Tricity area of Chandigarh, Panchkula and Zirakhpur and distant patients from areas of Haryana, Punjab and Himachal. OR complex in Alchemist hospital consists of 5 operation theatres, 1 Labor room and 1 Cardiac Cath lab.

Table no 2.1: OT ASSIGNMENT

OT NO.	Name Of Speciality
1	MSOT- multispecialty OT
2	MSOT- multispecialty OT
3	Neuro OT
4	Ortho OT
5	Cardiac OT

OT-1 and **OT-2** are multispecialty OT where major and minor operations of general surgery, gastroenterology, paediatric, gynaecology, ENT, nephrology, cosmetic and plastic surgery, endocrinology.

NEURO OT is for neurosurgery but is also used for non infected cases when MSOT is busy.

ORTHO OT is used for only ortho surgeries and **CARDIAC OT** specifically used for cardiothoracic surgeries.

All OT's run for six days a week and on Sunday only emergency cases are done.

LITERATURE REVIEW:

Operation theatre is that specialised 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.(Gupta S., Kanta S., Chandrashekar R., Satpathy S. , 2007). Also insisting that no single plan is there to suit all hospitals.

Michael B. Bose and David C. Davies said that operating theatre is one of the most expensive departments of any hospital. Its capacity often limits the amount of surgical work that can be carried out. Routine operation list are prepared and planned in advance, so that each surgical team should be able to ensure that its share of theatre time is fully utilised.

Grouping of all operation rooms into surgical suite has been found to be advantageous in optimisation of facilities and economies of manpower. It also leads to better command and control and flexibility in use. (Sakharkar B.M.)

In a study conducted on time utilisation of operating theatres in a large teaching hospital, it was found that out of available time only 56% of the time was actually spent on surgery, 31% on supportive activities and rest was left unutilised in waiting.

In another study conducted by Farooq Ahmed Jan, Sayed A Tabish, it was found that out of total utilisation time 66% was spent on actual surgery, 21% on supportive services and 13% on making room ready for surgery. The result of this study suggests that utilisation of theatre can be increased by avoiding delay starts, avoiding cancellation of cases, proper scheduling of surgeries and induction room.

According to Shakti Gupta and Sunil Kant OR utilisation essentially means “The use of the equipments to full potential.” Utilisation index or coefficient is one of the important parameter to monitor the functional status of the equipments. It is also a parameter to assess the productivity of service or equipment. OR utilisation measures the use of an OR that is properly staffed with people needed to successfully deliver a surgical procedure to a patient.

There are several models for measuring operation theatre utilisation but studies suggest that there is no universally acceptable measure of theatre utilisation. Models applied in different settings and using different practices yield inconsistent result which are difficult to benchmark.

The PAH model

This theatre utilisation project was carried out at the Princess Alexander hospital (PAH) Brisbane in 1995-96 to identify preferred measure of theatre performance (Kasap, 1997). The PAH adopted the theatre utilisation approach using the occupancy definition of utilised time.

Raw OR utilisation is the total hours of elective cases performed within OR time divided by the hours of allocated time where as the adjusted utilisation uses the total hours of the elective cases performed including “credit” for the turnover time necessary to set up and clean the OR.

NEED/ IMPORTANCE OF THE STUDY

- ❖ Operation Theatre is a cost centre and revenue generation centre, thus there is a need to efficiently utilise the operation rooms for maximum cost benefit.
- ❖ Application of this study will help improve the productivity and efficiency of operation theatre and also minimise the variability in outcomes.
- ❖ Study on present utilisation and demand status of Operation Theatre can be helpful to the management in making decisions for augmentation or downsizing the facility resources accordingly.
- ❖ In- depth analysis of OT functioning may yield opportunities for more improvement in management of operation theatres.

RESEARCH QUESTION:

- ❖ What is the utilisation efficiency of operation rooms 1 and 2 in multispecialty operation theatre of Alchemist hospital?
- ❖ What are the bottlenecks in the efficient functioning of multispecialty Operation theatre?

AIM OF THE STUDY:

- ❖ This study will throw some light on the present level of utilisation of existing multispecialty operation theatre in Alchemist hospital. Based on the utilisation efficiency metrics, this study aims to give some suggestions to increase utilisation and efficiency of MS-OT.
- ❖ This study also aims to evaluate the contentment of surgeons and anaesthesiologist from OT functioning and thus improving their satisfaction of working in OT because they are biggest assets for operation theatre.

OBJECTIVE OF STUDY

➤ General objective

1. To study the utilisation and efficiency of Multispecialty operation theatre of Alchemist Hospital.

➤ Specific objectives

1. To evaluate the utilisation of MS-OT.
2. To determine the efficiency in functioning of MS-OT by calculating efficiency metrics.
3. To evaluate the satisfaction of surgeons, anaesthesiologist and OT staff with the functioning of operation theatres.
4. To determine the efficiency in scheduling and running of MS-OT.

METHODOLOGY:

❖ **Study design and approach**

This study was performed prospectively in operation theatre complex of a multispecialty hospital with focus on Multispecialty operation theatre that alone accounts for 70% of the surgeries. The approach adopted in this study is a descriptive.

❖ **Time frame**

This study was conducted for a period of two months (April 2013 to May 2013) which included 50 working days for MS-OT excluding the Sundays and gazetted holidays.

❖ **Data source**

This includes collection of primary data from the hospital MS-OT records to describe and interpret the utilisation pattern of multispecialty operation theatre. The data regarding the scheduling and utilisation pattern was collected from records obtained from MS-OT in the format of OT schedule list and OT performance list. OT schedule list for next day is generated everyday at 16:30 hours including patient name, MR. No., IP no. , diagnosis, surgical procedure to be performed, surgeons' name, anaesthesiologists' name and scheduled time of surgery and operation room allotted (Annex-1). OT performed list is also released everyday at 17:00 hours recording the actual wheel in and wheel out time of patients in operation theatre and operation room where the surgery was performed along with all other patient details of OT list(Annex-2).

Another source of data was monthly census of surgeries and satisfaction survey done by self-administered questionnaires to surgeons, Anaesthesiologist, nurses, technicians and other OT staff.

❖ **Method of data collection**

Data collection of OT schedule list and performance list and from medical record department was done in person. This study also included the personal non participative observation and informal conversation

with OT staff. A qualitative approach was also adopted by administering written questionnaires to OT staff, Anaesthesiologist and Surgeons for getting the perspectives of all concerned persons with functioning of operation theatre. These self administered questionnaires were used to analyse the satisfaction of all OT users with various parameters. It was conducted to get illuminating insight into various aspects of operation theatre functioning.

❖ **Inclusion criteria and exclusion criteria**

- ✚ All the surgical procedures performed in OT 1 and OT 2 of MS-OT for a period of April and May 2013 were included in the study.
- ✚ Only elective surgeries were included for evaluation of performance.
- ✚ Cases performed in the Labor room were also excluded.
- ✚ Neuro and Ortho surgeries were excluded from MS-OT schedule list.

❖ **Method of data analysis**

All the above data collected during study was used to compute efficiency of operation theatre using efficiency metrics. The factors were computed using averages, percentages, frequency and descriptive statistics. The finding were analysed for the threshold level recommended in various studies.

OR efficiency Metrics:

Efficiency metrics included 8 parameters customised according to the applicability to MS-OT of Alchemist Hospital. Out of 8 efficiency metrics calculated – 7 were quantitative parameters measuring the performance and one was qualitative parameter to measure the satisfaction of OT staff.

This study will measure MSOT efficiency on following 8 OT efficiency metrics parameters as follows:

1. **OT Utilisation:** Utilisation of MS-OT as per speciality, OR and elective day care and emergency was calculated. End utilisation of planned hours and raw as well as adjusted utilisation was calculated.
2. **Delay in first case start:** Calculation of mean delay in start of first cases as it creates ripple effect throughout the schedule.
3. **Start time tardiness:** delay in starting of all cases taken throughout the day. Calculating average delay in wheeling in of patients per case was calculated.
4. **OT schedule list utilisation:** comparing the OT schedule list released everyday at 16:30 hours for next day surgeries with the actual performance list generated at 17:00 hours after all surgeries. The rates of add-ons, cases shifted from OR1 to OR2 and vice versa were calculated to highlight the utilisation of schedule list.
5. **Case cancellation rate:** Reasons and Percentage of 'on the day of surgery cancellation' were computed.

6. **Turnover time of OTs:** calculating average turnover time between two successive operations and also prolonged delays beyond 45 mins for turnover.
7. **Prediction bias:** Bias in case duration estimates per 8 hours of OR time and average bias per case and percentage of cases over running and over- booked.
8. **Satisfaction score:** The perspective of surgeons, anaesthesiologist, nurses and technicians were evaluated through a satisfaction schedule.

The performance of MS-OT based on these parameters was used to compare with threshold values of analysis done at various hospitals.

DATA ANALYSIS AND DISSCUSION:

1. **OR Utilisation:** Efficiency of any operating theatre is most commonly expressed by terms of theatre utilisation. It is the most important Performance indicator of operating rooms sought by managers. The Operation Theatre (OT) is said to be the primary source of revenue generation with around 50-60 per cent of revenue earned just by this area. This is more so for surgical specialities. The OT complex in a hospital also represents an area of considerable expenditure in a hospital budget and requires maximum utilisation to ensure optimum cost-benefit. Thus this is also indicative of value for performance. Optimum utilisation level helps to ensure that patients are getting good value for their elective surgery out of pocket expenditure. The utilisation level of MS-OT is given in Table 2.2., Table 2.3, Table 2.4 and Table 2.5.

Table 2.2: MS-OT monthly utilisation per OR

OR	April	May	Total surgeries	Percentage
OR-1	74	80	154	56.3%
OR-2	59	61	120	43.7%
Total surgeries	133	141	274	

Table 2.3: MS-OT month-wise utilisation as per day care surgeries

Surgeries	April	May	Total surgeries	Percentage
Day care	41	56	97	35.4%
Non day care	92	85	177	64.6%
Total	133	141	274	

Table 2.4: Speciality wise utilisation of MS-OT

Speciality	April	May	Total	Percentage (%)
Obstetrics	26	33	59	
General surgery	36	31	67	
Urology	34	32	66	
Plastic surgery	15	19	34	
Ophthalmology	07	07	14	
ENT	08	14	22	
Gastrointestinal	05	01	6	
Ortho	02	04	6	
Total	133	141	274	

Theatre utilisation is most descriptive parameter for efficiency, represented by a ratio of theatre used time upon the theatre allocated time.

$$\text{Theatre utilisation} = \frac{\text{Theatre used time}}{\text{Theatre allocated time}}$$

Based on the settings of this study, the PAH model of theatre utilisation was used for calculation which uses the occupancy definition of utilised time.

$$\text{Utilisation} = \frac{\sum (\text{patient out OR} - \text{Patient in OR})}{\text{Scheduled time}} * 100$$

Scheduled time here includes all the operating time and not just the session allocated time.

Raw utilisation of operation theatre is the total hours of elective cases performed within the OR time divided by the hours of allocated time.

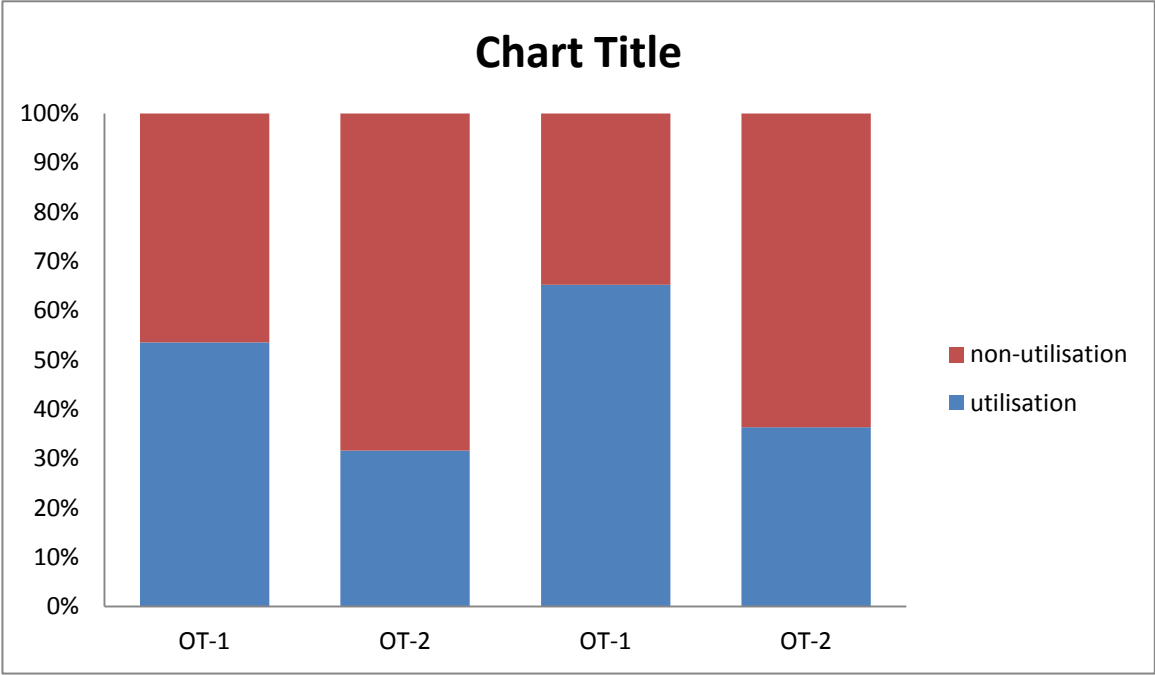
$$\text{Raw utilisation} = \frac{\text{Total hours of cases performed}}{\text{total resource hours of allocated OR}}$$

But surgical procedures require preparation of OR and some special requirements before operation, thus a significant time should also be allocated to such activities or also called the ‘credit’ time for turnover. Thus we calculate the adjusted utilisation of OR.

Adjusted utilisation of operation theatre uses the total hours of hours of the elective cases performed within OR time allocated including the credit for the turnover time necessary to set up and clean the ORs.

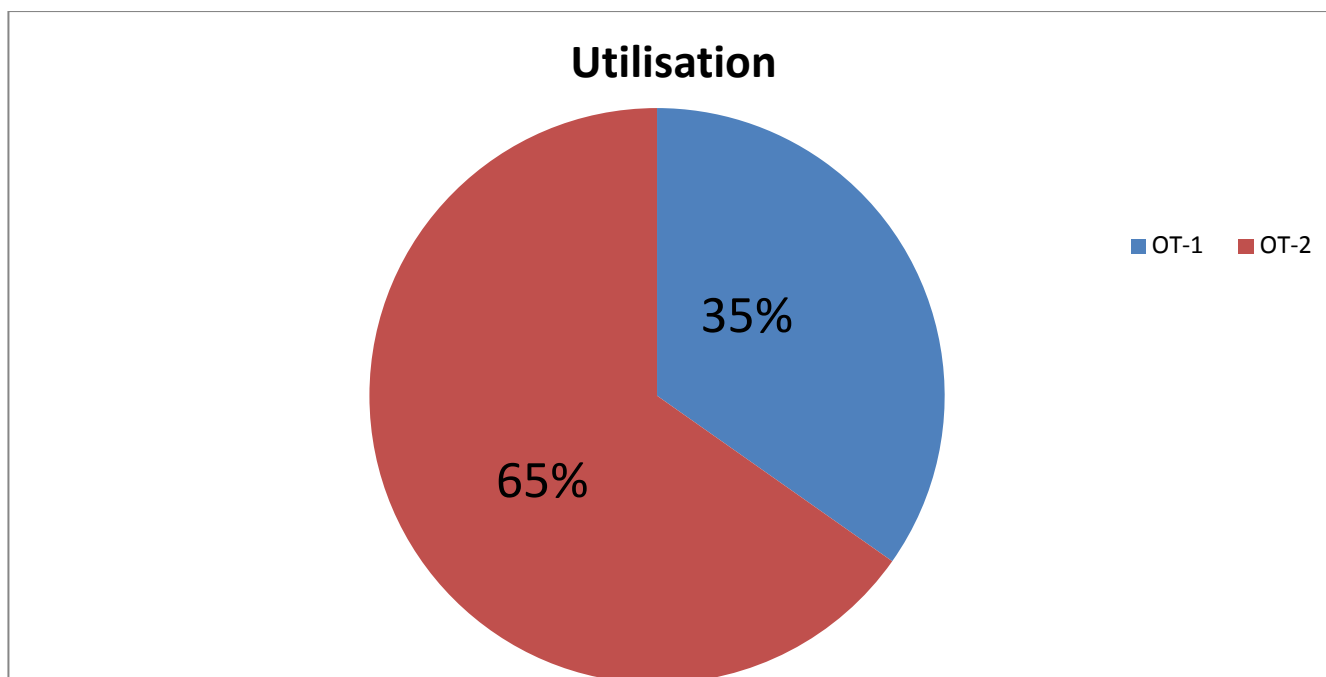
$$\text{Adjusted utilisation} = \frac{\text{total hours of cases} + \text{“credit” time}}{\text{total resource hours of allocated OR}}$$

Table 2.5: Utilisation of MS-OT



MS-OT	OR-1		OR-2	
	Hours	Percentage utilisation	Hours	Percentage utilisation
Raw utilisation	18480	53.56%	10920	31.65%
Adjusted utilisation	22510	65.24%	12550	36.37%
Total resource hours	34500		34500	

Figure2.1: Utilisation of OR-1 and OR-2



Thus the system appears to be used much below its designed capacity. The utilisation of OR-2 (36.37%) is considerable less than OR-1 (65.24%) and utilisation of both the ORs is suboptimal. This utilisation level needs to be increased so that maximum efficient costing can be achieved with maximum resource utilisation.

2. **First case delays:** Normally the OT starts at 8:00 hours and the first cases in OR are generally scheduled at 8:00 hours or 8:30 hours every day. The delay in start of first cases is of utmost importance as this delay has a ripple effect over the whole OT schedule throughout the day. Table 2.6 describes the present status of first case delays.

Table 2.6: First case start delay

First case start time	Mean delay	median	Standard deviation	% cases
8:00 hours	32.82 mins.	27 mins.	23.93 mins.	87%

In the study it was found that average mean delay per first case was 32.82 minutes with a standard deviation of 23.93 minutes. The range of delay was found to be extreme so a median delay was calculated as 27 minutes. Delay in starting the first case causes tardiness in the whole schedule list throughout the day. Most common reasons for delays in start of first cases were delay in admission process of day care patients, or late reporting of patients. Second only to these reasons were delays due to surgeons reporting late. On the contrary the operating rooms were always found ready before time.

For an efficient functioning OT, the recommendations of various studies suggest a delay of less than 15 mins. and for less than 10% cases.

2. **On-time starts or delays:** Tardiness in start of every case in MS-OT was computed and it was found to be reducing the time that patients have to wait for their surgeries once they arrive at the hospital, especially if the preceding case runs late, is another important goal for the OR manager. In the study it was found that average delay of 33.50 minutes with a standard deviation of 23.67 minutes per case in MS-OT.

Facilities with long workdays will have more tardiness because the longer the day, the more uncertainty there is about case start times. Tardiness does not necessarily depend on the durations of preceding cases or on the relative numbers of long and short cases. Rather, tardiness per case grows larger as the day progresses because the total duration of preceding cases increases.

Table no. 2.7: On time start Delays				
Time	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 15 minutes	19	31.7	31.7	31.7
15- 30 minutes	16	26.7	26.7	58.3
30-45 minutes	13	21.7	21.7	80.0
45-60 minutes	5	8.3	8.3	88.3
65-75 minutes	4	6.7	6.7	95.0
More than 75 minutes	3	5.0	5.0	100.0
Total	60	100.0	100.0	

In well-functioning OR suites, the cumulative tardiness of the start of scheduled cases should be less than 45 minutes per 8-hour OR day. To achieve this, the OR manager should properly determine when patients should be told to arrive (not too early or late), and sequence each surgeon's list of cases in the same OR on the same day with the most predictable case first and the least predictable (often the longest) case last.

Presently the MS-OT functioning seems to be plagued with systemic delays and late starts.

4.**Turnover (turnaround) time:** The time between two surgeries should be optimised such that there should be adequate time for cleaning and preparing OR for next procedure and should be small enough to avoid delay in taking up next surgery. Despite this, turnover time also receives much attention from OR managers because it is a key satisfier for surgeons and patients waiting for surgery. In the qualitative analysis of surgeons’ satisfaction done in the study, the surgeons reported dissatisfaction with the turnover times between two cases as third most disagreeable factor. In the analysis of performance list of MS-OT, the turnover time between two surgeries were calculated for surgeries done in the study period. Data was analysed by categorising turnover time as less than 45 minutes, above 45 minutes.

Table 2.8: Turnover time of MS-OT

Turnover time	No. of cases	Percentage (%)
Less than 25 mins	68	44
25-45 mins.	40	25
More than 45 mins.	49	31
Total	157	100

Prolonged turnovers (delays). A length of time between cases that is longer than a defined interval (eg, 45 minutes) should be considered a delay, not a turnover. Prolonged turnover times peak in the middle of the workday because that is when most turnovers occur. According to studies fewer than 10% of prolonged turnovers (delays) should last longer than 45 minutes in well-functioning OR suites. The turnover time of above 45 minutes in MS-OT was found in 31% of cases which necessitates the rectification action.

Inadequate turnover time: turnover time of less than 30 minutes was reported before 44% of cases which indicates inadequate sterilisation practices in operation theatre. And 8% of cases in the OT performance list reported no turnaround between two cases which may be a documentation error but still indicates inefficient OT sterilisation practices.

5. **Prediction bias:** Prediction bias is the bias in case-duration estimates per 8 hours of OR operating time. Prediction bias indicates whether the estimate of case times is consistently too high or too low in schedule list.

Some surgeons consistently shorten their case-duration estimates because they have too little OR time allocated and need to "fit" their list of cases into the OR time that they do have. In contrast, other surgeons purposely overestimate case durations to maintain control and access of their allocated OR time, so that if a new case appears, their OR time is not given away.

An accurate or near accurate prediction of case duration is important in scheduling the operation theatre list effectively. Usual overruns leads to delay in successive cases and usual under runs leads to under utilisation of operation theatre.

A major cause of variation for case duration is the fact that each surgery is unique in its own right and the duration of each operation cannot be exactly forecasted. But our constant effort should be that forecasting the duration of surgeries should be accurate at least eighty percent of the time.

Efficient OR suites should aim for bias in case-duration estimates of less than 15 minutes per 8 hours of OR time.

Table 2.10: Prediction bias per day

The schedule list for cases and the performance list of those cases were compared for the bias in scheduling and booking of operation theatre. The data was collected from OT schedule list as the time for which the case was scheduled and compared with the actual wheel in and out time of that case. The data was used to compute the accuracy of estimating the duration of common elective surgical procedures. The mean prediction bias for the study period was found to be 89.44 minutes per 8 hours of scheduled OR time with a standard deviation of 40.25 minutes. Such a large variation in estimation of case duration also indicates less utility of OT schedule list.

Table 2.11: Percentage prediction bias

Prediction bias	No. of times	Percentage (%)	Mean bias	Standard deviation
Over booked	58	51.78%	42.86 mins.	25.69 mins.
Over spilled	52	46.42%	54.44 mins.	37.99 mins.

The analysis reveal that 51.78% cases are finished before the scheduled time slot by an average of 42.86

Mean prediction bias (per 8 hour)	Median bias (per 8 hour)	Standard deviation	Minimum bias (per 8 hour)	Maximum bias (per 8 hour)
89.44 mins.	85 mins.	40.25 mins.	30 mins.	170 mins.

minutes and 46.42% cases extend beyond the scheduled slot by an average of 54.44 minutes. Both these bias refer to two significant problems. An average over booked slot is OR ‘time- waste’ as time in which the scheduled OR was not busy with the scheduled patients leading to wastage of precious operation theatre utilisation time and over running of cases by average time of 54.44 minutes will lead to considerable delays or postponement of cases to follow.

5. Operation theatre scheduling list utilisation: The OT schedule list is the released at 17:00 hours on the day before the surgery. It contains the list of all the procedures which have been scheduled to be performed on the next day with the timings for each case. This list also displays the name of surgeon performing the operation and the anaesthesiologist. The schedule list is displayed and circulated so that all concern persons with the procedure can accordingly plan their times and be ready at the time of procedure specially the surgeons who have to plan their patient appointments according to the surgery timings.

Poor scheduling of Operating Theatre may cause longer waiting time and can also worsen the patient’s disease.

OT scheduling efficiency was measured as a parameter of OT schedule list utilisation. Following criteria was used to analyse utility of schedule list:

- ❖ High rate of add-ons
- ❖ Case juggling frequency
- ❖ Case shifting frequency

The OT schedule and performance list for the study period was compared for elective cases added after the schedule list was prepared and cases juggled or shifted from their respective time slots and allocated operation rooms.

Table no.2.9: OT list utilisation

MS-OT cases	No. of cases	Percentage (%)
Cases added	24	20.68
Cases juggled	13	11.20
Cases shifted	15	12.93
Total cases	116	

OT schedule list released a day before surgery should be accurate so that next day OT functioning is 90% as per the schedule. Thus the utilisation of OT list should be 80-90% for effective scheduling of cases.

6. **Cancellation:** Cancellation of operations is a significant problem with many undesirable consequences for hospital and patients both. It results in wasted operation theatre time and decreasing efficiency of theatre. Cancellation of scheduled operations has a huge opportunity cost. Operations cancelled by patients on the day of surgery costs a lot to hospital in terms of wasted operation theatres resource hours and logistics spent in preparing for operations. It also costs staff time in preparing instruments, supplies, theatre etc for procedure. Surgeons also lose their valuable time as last minute cancellations disrupt their outpatient time also. An operation cancelled by hospitals cause discomfort both physical and psychological to patients as well as conveys inefficiency in management. Thus on the day of surgery cancellation rate should be as low as possible for efficient operation theatres. Cancellations well before time can be utilised for allotting the theatre for other procedure, thus increasing its utilisation and efficiency.

A cancellation rate of procedures in OT on the day of intended surgeries is calculated with reasons. The cancellation rate of less than 5% is considered good for efficiently functioning operation theatres, according to various studies. All the operations cancelled after being displayed on OT schedule list of multispecialty OT were included for a period of 60 days for month of April and May. The operation was

defined as cancelled if it was not done on the day on which operating time was allocated to the patient and scheduled in the operative list prepared the day before. It included Postponed operations also which were not performed on the same day.

A total of 21 procedures cancelled during the study period was analysed and the cancellation rate of 9.8 % was found. Data for cancelled operations were calculated on a format with MR. No of patient, name, age, sex, diagnosis, operation to be performed, surgeons name and reason for cancellation. Majority of cases (38%) were cancelled because of patient reason where patients didn't turn up on the day of surgery. Another important reason for cancellation was patients not fit medically for surgery (28.5%) followed by pending financial clearances in 18% of cases.

This high cancellation jeopardise the efficiency of operation theatre as leads to wasted time of OT if it can't be rescheduled. It necessitates the decrease in cancellation as well as timely notification of cancellations so that operation theatre can be allotted for other procedures.

8.Satisfaction score: The perspective of every team member of operation theatre is different in context to the OT efficiency. A surgeon generally looks for on time starts, rapid turnover, first case of the day, easy availability of OR time. Nurses working in the operating room (OR) may understand efficiency as individual knowledge and experience applicable to the care of the patient as well as preventing problems before they occur, whereas managers understand efficiency in terms of production per unit of time or completing assignments as planned.

The hospital administrator may want the highest "throughput" of cases with the least operational cost. A quality manager concerned with quality of care provided to patient and least waiting time for patients. A safety manager views efficiency in surgical safety and interested in knowing the percentage of patients without injury.

Nurse Managers, on the other hand, may focus on disposable supply costs per case; the percentage of cases in compliance with flash sterilization policy; the ready availability of instruments; and other resources, such as imaging equipment, maintaining flexibility to move cases around, and having adequate reserve capacity for add-on or emergency cases.

Thus getting the perspective from each type of employee can be illuminating. Conducted satisfaction survey on surgeons, anaesthesiologist and OT staff was helpful in identifying the dissatisfaction parameters with the lowest-scoring. More in-depth analysis of these factors may yield opportunities for improvements.

The following factors influencing OT functioning were evaluated for satisfaction on a Likert scale and an average score was calculated for each respondent group.

Table 2.14: Satisfaction survey scores

(1=strongly agree, 2= agree, 3=neither agree nor disagree, 4=disagree, 5= strongly disagree)

Q.no.	Parameter	Surgeon (n=12)	Anaesthesiologist (n=4)	Staff (n=14)
1.	There is no delay in OT due to efficient patient Admission process. (spl. Day care)	3.4	3.75	2.8
2.	Surgeries always start on scheduled time	2.9	2.75	2.4
3.	Adequate nursing support	2.5	3.75	NA
4.	Surgeons are always on time	NA	3.25	2
5.	OT is ready at the time of surgery	2.4	2.75	NA
6.	We have adequate nursing support	2.5	3.8	NA
7.	OT runs as per OT schedule list	2.3	2.3	NA
8.	Patients have to wait for minimum time before surgery	2.7	2.5	NA
9.	There is short turnover time between two cases	2.9	2.3	NA
10.	We are satisfied with the sterilisation practices of OT Between two successive cases.	2.1	1.8	NA
11.	We usually get the desired OT booking slot for Elective surgery while booking.	1.8	NA	NA
12.	We have ability to add non elective cases	2	NA	NA
13.	Anaesthesiologist are always on time	2.1	NA	1.5
14.	We have adequate technician support	2.2	2	1.9
15.	Shifting of patients from wards/rooms is always on time	NA	NA	2.2
16.	We get sterilised instruments on time	NA	NA	1.5
17.	There is never a delay in surgery due to arrangement of blood and other prosthetics.	NA	NA	2
18.	Patient instructions, consent and other formalities are already complete before surgery.	NA	NA	1.4

19.	We are satisfied with the support of helping staff and housekeeping staff.	NA	NA	2.5
20.	We have adequate communication across various departments.	NA	NA	2.2

Table 2.15: Total satisfaction index

OT	Satisfaction score(out of 5)	Percentage(%) dissatisfaction
Surgeons	2.5	50.4%
Anaesthesiologist	2.9	57.2%
OT staff(nurses, technicians)	2.2	43.7%

There is dissatisfaction among all the respondent groups on some factors which are common like admission process or flow of patients to OT, delay in surgeries and OT not running as per schedule. There is found to be dissatisfaction among surgeons and anaesthesiologist regarding nursing support. Nursing staff is not satisfied with surgeons not finishing their surgeries on time and non satisfactory support from helpers and housekeeping.

OT functioning involves team work and coordination among staff for smooth streamlined flow of patients. Thus there is a need of improving the factors causing dissatisfaction among respondents.

Table 2.16: Total Efficiency metrics:

s.no.	Parameter	Recommendations for good performance	Study results
1.	OT Utilisation	80-90%	61.76%
2.	Delay in first case start	Less than 15 mins.	33 mins
3.	Start time tardiness	Less than 15 mins.	34 mins.
4.	OT schedule list utilisation	90-100%	70-80%
5.	Case cancellation rate	Less than 5%	
6.	Turnover time of OTs (more than 45%)	Less than 10% cases	31%
7.	Prediction bias (per day)	Less than 45 mins.	85 mins.
8.	Satisfaction score	Not more than 2	2.5 (avg)

Suggestions:

1. Proper documentation of policies and procedures

Establishing OR rules and regulations, strict adherence to and enforcement of policies and procedures along with continuous monitoring is required as an essential ingredient for efficient OT management.

There is strong need of proper documented set of policies and procedures to be followed in MS-OT. A comprehensive set of SOPs or standard operating procedures should be developed for MS-OT. These standard operating procedures should not only be documented but staff should be trained accordingly. The compliance of staff with the policies should also be ensured.

These policies should include all aspects of OT functioning accounting from OT discipline to cancellation, scheduling, postponement, preparation, maintenance, patient flow, safety and sterilisation standards to be followed. It should also include job responsibilities of the staff clearly.

Not directly a cause of variation, but a concern during this study, was the accuracy of the data that is input in the computer system and other registers maintained in the OT. Accuracy and timeliness of data is essential as it is used to provide vital information to managers and supervisors for tracking purposes and to follow-up on key process performance.

2. Adding surgeries

As the utilisation of the ORs is suboptimal so to increase the use of resource hours more cases can be added. More surgeons can be appointed on board to increase surgical load of hospital to match its actual capacity.

3. Redesigning of MS-OT

As the MS-OT complex of this hospital poses a serious problem in zoning with no separate disposal zone available for patient wheel out. This facility has many sharing resources which are advantageous for grouping of ORs but the utilisation of OR 2 is very less. This facility of the hospital has a common pre-operative and post-operative area. Keeping in view the constraints of design of MS-OT and utilisation pattern of OR-2, it is suggested to decommission OR-2 and utilise the room in redesigning of MS-OT in such a way that it complies with the zoning practices.

4. Decommissioning of OR-2 and Reassignment

The utilisation of OR-2 was found to be only 35% which indicates a potential waste of valuable operation theatre time. Thus OR-2 can be reassigned as a more useful facility like induction anaesthesia rooms for all

the OTs or dedicated emergency operation room. Depending on the requirement or demand, it can be used as minor OT or Plaster Room.

5. Strengthening OTMIS (OT management information system)

Presently the OT- MIS utilisation is limited, which should be increased with new modules to facilitate the function planning of OT. The OT-MIS use should be increased for the purpose of OT booking, OT scheduling, patient transfer indication, OR functioning status flags and OR delay or over run notifications also. All the surgeons should be given access to OT-MIS for better planning of their cases and precious time.

6. OT managers

Operation theatre management is a task where function follows the form of management. The capacity needs to be increased or modified according to demand. As no dedicated operation room is there for emergency so there are emergent case additions to MS-OT to be managed. Management is an art of coordinating, monitoring and controlling and OT is a crucial area requiring management. Thus there is a need for operation manger. Every day one staff nurse of OT should be assigned on OT duty and the staff on OT duty should not scrub in for any procedures. OT duty on rotational basis should include assuring OT running as per schedule, managing all requirements, patient transfers, handovers and turnovers of OT. Appraisal of OT nurses should include this as one of the criteria.

7. Audits

Regularly audits should be done for quality assurance, safe surgery practices and infection control practices. Timely, effective OT utilisation should be calculated and every effort should be made to reduce the idle theatre hours. The audit should also include checking of documentation accuracy of booking, cancellation, indicator and all registers.

8. Introducing lean six sigma approach

Six sigma approach should be introduced which will help decrease the defect and variability in outcome such that 99.99966% of the outcomes are free of defects. It can be introduced with lean methodology addressing process flow and waste issues increasing the utilisation of OT.

9. Anaesthesia induction room

Studies have shown that a separate anaesthesia induction room increases the utilisation of OR for actual surgical time. A single induction room for all the OT can considerably streamline the patient wheeling in all operating rooms.

10. Change of flow of patients to OT

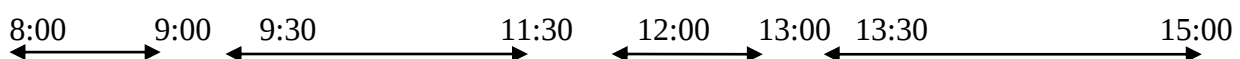
The flow of patients to OT should be modified specially for day care patients so that they report to OT in scheduled time. Generally day care surgeries planned at around 08:00 hours are delayed because of patient unpunctuality or admission process delays. The admission process of day care patients should be hastened by doing maximum formalities before the day of surgery. Pre surgical counselling of patients should be done and proper instructions regarding the surgery given. Patients should be encouraged to follow the instruction and show compliance with reporting time of surgery. Usually day care patients should be scheduled early for surgery so that they can be discharged on same day after post operative care but patients should not be scheduled too early so that admission process delay affects the OT scheduling.

11. Booking of operation theatre

While booking the OR for procedure, care should be taken allocation of appropriate surgical time or slot to surgeon. No overlapping or consecutive booking without turnover time should be done. OT-MIS should be used for booking to facilitate proper scheduling.

The present booking format needs some modifications:-

- a) A column for patient medical condition should be introduced like diabetic, latex allergy, positive patient etc.
- b) OT booking by OT staff should be restricted to few staff members depending on their competency.
- c) OT booking basis of first come first serve (FCFS) to semi blocked booking. The surgical workload of various departments should be computed and depending on the utilisation pattern of OT by various departments and OPD shifts of surgeons, some surgical slots should be blocked and rest day can be utilised open for surgeries by other specialities.
- d) OT booking, if done manually should be done on a horizontal scaled pattern to avoid any overlapping booking. (Annex-)



12. Efficient OT scheduling

The scheduling of OR1 and OR2 should be done in such a way that no bottlenecks should arise in functioning of OT. Both the OR should be scheduled as dependent variables as they are situated in same

complex and share resources. The case duration should be estimated as accurately as possible to furnish best utilisation. There should be a knowledgeable and accessible scheduler. A standard preference card should be used for allocating OR and surgical time.

When cases are less it is more advisable to conduct back to back cases and shut down the facility as it results in decreased stress on infrastructure. All the high cost running equipments except for air handling unit can be shut saving resources.

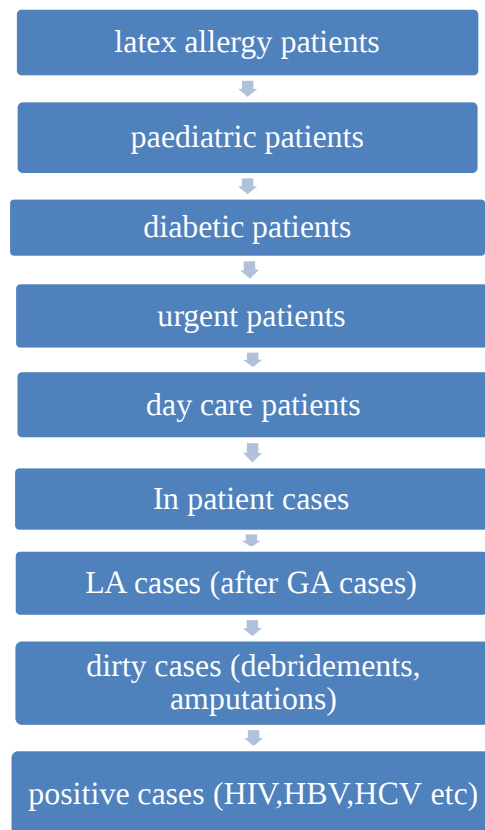
Too many cases on the list should also be scheduled wisely so that maximum utilisation is there. Theoretically, if a lot of short cases are scheduled, with many short turnover times, an additional case can be performed within the same staffed workday.

Approach to reduce tardiness in the list could be move cases from one OR to another to reduce tardiness. Although this greatly reduces tardiness for those few cases that are moved, when this reduction in tardiness is spread across all cases, the overall effect is small. To have a significant impact on tardiness for a substantial number of individuals, interventions must involve large numbers of cases. But it should be done only as a corrective action of unavoidable delay and not as routine approach.

Create a dynamic or auxiliary schedule at the beginning of each day with new start times for each case that are constantly updated after compensating for lateness of first cases and case-duration bias. These revised start times can be used to determine better patient arrival times and to determine the start times of cases for "to follow" surgeons.

Introducing OT scheduling guide:

Presently only one protocol was followed that is scheduling infected cases as the last case on the list. Patients with special clinical requirements or patients requiring special preparation should be placed first in the list and day care patients should be put early in the schedule. There is a need of comprehensive preference card or OT list scheduling guidelines as:



13. Continuous quality improvement

The efficiency metrics could be used by OR managers for evaluating baseline performance and identifying areas that need improvement. Certainly, safety and patient outcomes can't be compromised when aiming for a more efficient OR suite.

Conclusion:

Limitation of the study:

Review of studies suggests the use of various models of operation theatre utilisation measures but there is no consistency and universality in these models. Models applied in different settings and in different practices yield different results making it difficult to benchmark the outcomes.

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