



**Research Article**

## **STUDY OF OPERATION ROOM TIME UTILIZATION**

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### **ABSTRACT**

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. Operation room utilization analysis is essential to assess the existing workload as well as to optimize facility functioning and patient scheduling for surgical operations. It also aids in allocating reserve time for emergency operations, asepsis measures and procedures and provides decision making information for augmentation or downsizing of the facility. The operation time utilization varies in different healthcare settings. Optimum utilization of the OT time has always been a priority area for hospital administrators.<sup>1</sup> The present study revealed that the utilization though satisfactory could be further maximized.

The OT utilization is very complex. There exist long waiting lists in every surgical discipline leading to dissatisfaction and discontentment among patients as well as doctors. Even with the existing bed strength and number of OTs, one way of solving this problem increasing manpower and supplies. Restructuring the reorganization of O.T. personnel should be done so that adequate number of staff is available in each shift. Also, the policy on providing incentives can be tried on experimental basis for a short period to test its feasibility.

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## **INTRODUCTION**

Technological advances like minimally invasive surgery which need costly equipment, payments based on diagnosis related groups, captivated payment and discounted fee-for service have all significantly reduced margins in the surgical business. It is therefore, not surprising that this area is earmarked by many hospitals as a place to reduce expenses. All of us who work in the Operation Room (OR) must be cost efficient and must maximize productivity for long-term success. Achieving these goals requires reliable data to help various stakeholders, chief executive officer, Chief Financial officer, nurses, surgeons and anesthetists-all have to align what sometimes appear as disparate goals. One measure of how well an OR functions is the "utilization"<sup>2</sup>.

OR utilization is defined as the "quotient of hours of OR time actually used during elective resource hours and the total number of elective resource hours available for use". Optimum utilization of the OT time has always been a priority area for Hospital Administrator's. Accurate records, weekly analysis of recorded data, establishment of operating room rules and regulations and strict adherence to and enforcement of approved policies and procedures are essential ingredients for an efficient operating of an operating room.

Thus it is clear that study of operating room records can provide means of assessment of the degree of utilization of operation theatres. The study had two objectives: to examine the utilization of operation theatre in the International OT Complex at Apollo hospital, Hyderabad in relation to work load. And to identify the bottlenecks, if any, in proper and efficient utilization of Operation Theatre time and based on that, suggest remedial measures for improving the Operation Theatre Utilization.<sup>3</sup>

### **Aim**

To study Operation Room time utilization, identification of bottle neck areas and to recommend ways to improve the optimal utilization of the operation theatre.

### **Objectives**

The study had three objectives:

1. To examine the utilization of operation theatre in the International OT Complex at a tertiary care hospital in Hyderabad.
2. To identify the bottlenecks, if any, in proper and efficient utilization of Operation Theatre time
3. Based on the above objectives, suggest remedial measures for improving the Operation Theatre Utilization.

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## REVIEW OF LITERATURE

Any effort to improve the design or operation of ORs is a major undertaking due to the inherent complexity of the processes involved. This complexity can be attributed to several factors. First, determination of a schedule of patient arrival times that balance patient waiting with resource utilization (e.g. OR, surgeons, nurses, etc.) is a complex problem which includes decisions such as sequencing of patient arrivals, allocation of patients to ORs, and matching of patients with surgical teams. Second, ORs are usually part of a surgical suite where they share common resources required in both reception of arriving patients and post-surgery recovery of patients. In the disposal of post-operative patients, Intensive Care Beds are a vital resource which is unfortunately prone to much utilization uncertainty due to their multiple users, and this uncertainty is exacerbated in hospitals with Emergency Departments. Therefore managing the patient traffic through a surgical suite requires a holistic approach with account of both upstream and downstream resource requirements<sup>4</sup>

There is significant uncertainty in several activities involved in the delivery of surgical care, such as the uncertainty related to arrival times of patients, OR personnel availability, duration of the surgical procedure, etc. Inevitably, this makes advanced planning of OR utilization very difficult. Given the underlying complexity in operation management of ORs, it is not surprising that a multitude of performance measures that can be used to assess the ORs of a hospital have been reported in the literature.<sup>5</sup>

Academic Literature on utilization of OT complex is lacking in Africa & Indian Sub- continent. Improved theatre utilization would lead to a reduction in cost recovery from each patient. In one of the study in Africa it was concluded that private OT utilization rates were higher than public Operation theatres due to commercial nature of private healthcare and absent consequent cost drivers in public healthcare sector. In Africa the 48% utilization in OTs observed was significantly lower than the global benchmark of between 70-80<sup>6</sup>

The implementation of the opportunity cost concept in measuring the cost of a good is the method that best reflects a manager's efficacy in the management of the resources used. The focus on economic measurement by opportunity cost is a relevant instrument of feedback for planning and control. Measurement is the first stage that leads to control and, eventually, to the improvement of a process.<sup>(28)</sup>

## METHODOLOGY

### Sample size

- For analyzing average time utilization for different phases involved in the OT's, all the surgical procedures were monitored for the month of July 2014.
- A total data of 488 cases during the period of study was examined.

### Data Analysis

The data obtained from the observation was of a predominantly intuitive in nature and thus MS-Excel proved to be sufficient.

A table was developed in the MS-Excel which had provisions for noting down the wheeling times as well as intubation/extubation times along with the patient names, the type of

anesthesia given and the OT in which the patient was taken. The actual time taken was obtained by direct observation and noting down method. If an operation was cancelled, the reason for the same was recorded.

Since the data collection was undertaken prospectively by a single investigator on a day-to-day basis, the records used for this study were reliable. In addition, operation theatre utilization was studied with respect to starting and closing time of the operation room and the interval between surgical procedures.

### Calculations for OT Utilization

Though the hospital expects OT to function for 12 hrs each day, for the purpose of this report optimal utilization of each OT of 10 hours is considered for the ease of calculations.

Total no of OT's in OT complex = 4 Per day working hours of OT = 12hrs

No of days for which data has been collected = 30 days  
OT cleaning time after every case = 15mins

## RESULTS

### Based on Utilization of OT

Though the hospital expects OT should function for 12 hrs each day, for the purpose of this report optimal utilization of each OT of 10 hours is considered.

Thus, the formula for optimal utilization is as follows:

### Total no. of working min. of OT

= No. of OT\* per day working hr of OT\* Total no. of working days for which data has been collected \*60

3 different types of values were noted:

**Wheeling time:** This is the time elapsed between wheeling in and wheeling out of the patient. It also includes intubation and extubation time.

**Time taken between surgeries / Turnaround time of patient in OT:** This time includes the time spent on cleaning the OT, time taken to shift patients and time spent for the next case to start.

### Total OT cleaning time (ideal)

= 15 min\* total no. of cases (assuming 15 minutes for cleaning time between each surgery)

= 15 \* 488

= 7320 minutes.

It was observed that the total time taken between surgeries/turn around time was 6826 minutes.

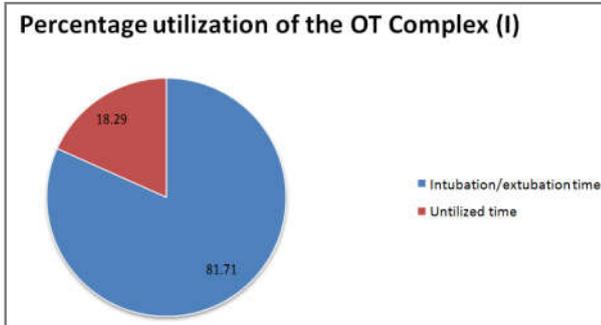
**Unutilized time:** This is the time where the OT is not occupied or not used for any surgical activities. There are 2 types of unutilized OT time. These are:

- The OT is occupied by the patient but the surgery has not commenced. The reasons for this could be
- Unavailability of the surgeon
- Unavailability of consumables
- Equipment not being ready/available These factors lead to delay in surgeries.

The formula to calculate this time is as follows:

**Table 1** Operation Room Idle Time

	Wheeling time	Actual operating time	Unutilized time
Utilization for all the OTs in the OT complex in min/month	48,629	39,753	8903



**Figure 1** Percentage Utilizations of Operation Room

**Interpretation:** Out of 48,629 minutes of wheeling time, 39,753 minutes were pure operative minutes and the unutilized time was around 8903 minutes where the patient was kept idle in the theatre. This unutilized time accounts for 18.29%.

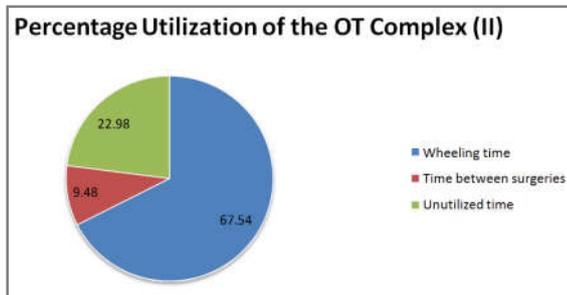
The next type of unutilized time was when the OT is unoccupied for surgeries. This time is calculated as:

$$= 72,000 - (6826 + 48,629)$$

$$= 16,545 \text{ minutes}$$

**Table 2** Idle Time of Operation Room

Time in Mins	Wheeling time	Time taken between surgeries	Unutilized time
Utilization for all OTs in International OT in min/month	48,629	6826	16,545

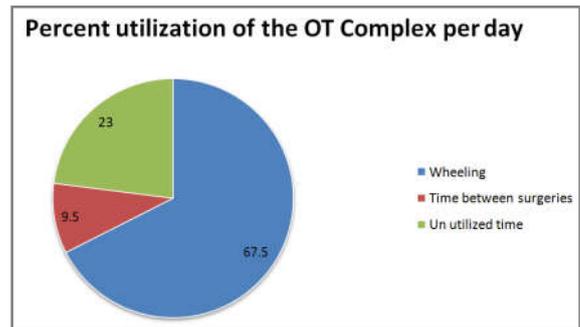


**Figure 2** Percentage Utilization of the OT Complex

**Interpretation:** From the above calculation, it is seen that 16,545 minutes are unutilized and the theatre was empty though it was open. According to the hospital's SOP's the wheeling time only is considered as the utilized time for the recordings. Thus, if we consider the wheeling time to be the utilized time then, on the whole, an average of 67.5% of OT time is utilized for the month.

**Table 3** Un utilized Time between Surgeries

Time	Wheeling Time	Time	Unutilized time
Average Time utilized in min/day	405	57	138



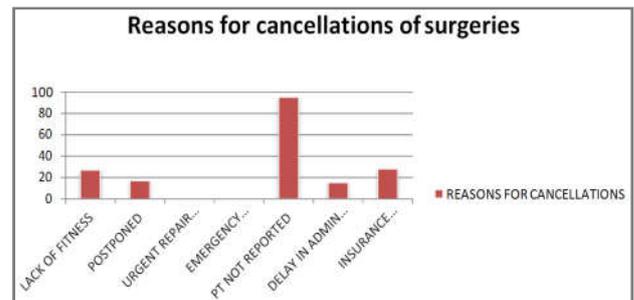
**Figure 3** Percent utilization of the OT Complex perday

**Interpretation:** If we consider the average values per day, then on an average 67.5% of the time is utilized in the OT Complex (considering the wheeling time to be the utilized time).

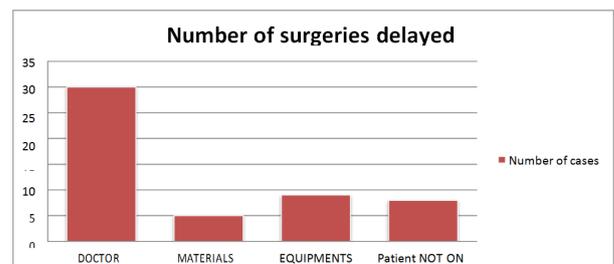
Below is a comprehensive analysis based on utilization of each OT for the month in min is tabularized:

**Table 4** Monthly Un Utilized Time of each Operation Room

	OT11	OT12	OT14	OT15
Expected				
utilization time	18000(300hrs)	18000(300hrs)	18000(300hrs)	18000(300hrs)
Wheeling time	11212(186.8 hrs)	12867(214.45hrs)	13092(218.2hrs)	11471(191.18hrs)
Break time	2685	1310	1248	1583
% utilization	62.28	71.48	72.73	63.72

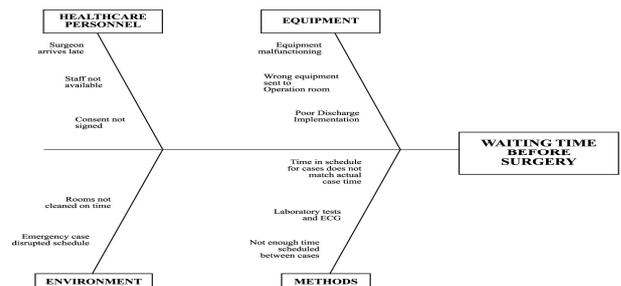


**Figure 4** Reasons for cancellations of surgeries



**Figure 5** Number of Surgeries Delayed

**Critical Analysis of Causes for delay in surgeries**



**Fig 6** Root Cause Analysis of Delayed Surgeries

### Recommendations

As per the inference that was obtained, only 6.75 hrs is utilized /day on an average which results in 3.25 hrs being unutilized. There are a number of ways in which this time can be optimized for surgeries. Some of my suggestions are as follows:

1. Reducing number of cancellations
2. Avoiding late Start
3. Policy on anesthesia
4. Increasing house-keeping staff
5. Scheduling Rules
6. Pre Admissions Process
7. Information System

Apart from the above recommendations, a financial incentive to both the surgeons and the housekeeping staff will go a long way in encouraging them to be more efficient, thus leading to an optimal utilization of all OT resources. This incentive can be a small part of the revenue generated from the surgeries performed in the OTs.

### CONCLUSION

Even with certain existing lacunae and constraints, the OT utilization of the International OT is not so optimum as per the literature. There exist long waiting lists in every surgical discipline leading to dissatisfaction and discontentment among patients as well as doctors. Even with the existing bed strength and number of OTs, one way of solving this problem, is by enhancing manpower and supplies. Restructuring of personnel should be done so that adequate number of staff is available in each shift. Also, the policy on providing incentives can be tried on experimental basis for a short period to test its feasibility.

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