

A PROSPECTIVE STUDY ON OPERATING THEATRE SCHEDULING USING OPTIMIZATION

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ABSTRACT

There is an urgent need in the acute health system to use resources as efficiently as possible. One such group of resources is operating theatres, which have an important impact on patient flow through the hospital. Data driven insights into the use of operating theatres can suggest improvements to minimize wastage and improve theatres availability. Hospital administrators have the key priority to optimize the operation theatre. The present study was conducted in a super specialty eye care hospital in Mumbai for a period of 45 working days from June 2018 to July 2018. The average time of OT was taken as 6 hours/ day. The hospital has a well-equipped major Operation Theater Complex with 3 Operation Theater.

To evaluate the efficiency of operation theater in the hospital the parameters like patient In time, waiting area time, Recovery waiting area time, OT In time, OT Out time were taken and the recorded Data were analyzed using MS-Excel and SPSS.

Out of the total 100 scheduled cases 90 cases were operated and 10 cases were cancelled. The total working hours of OT was recorded which was 14:36 Hours/minis. The actual total utilization rate of OT was 18 %.(the mean time: waiting time of patient in waiting area was 0:10 hrs/min, Recovery room waiting area was 1:24 hrs/min, total OT utilization time 2:53 hrs/min.). Among the stated reason for cancellation patients medical condition was most common which accounted 30% of the cancelled cases.

The study gives a clear picture of the total OT utilization which was 18%. The following study shows that the OT is underutilized. The result shows that the OT utilization is much less than its capacity and other was cancellation of cases which accounted for 10% out of the total cases observed. Study of time utilization and cancellation are important tools in assessing the optimal utilization of available resource hours in an OT.

As the study shows it's not just the better organization of the OT activities but the concern of the hospital staff to optimize the available resources.

Keywords : Optimization, Operation Theatre, Health System

INTRODUCTION

The operation theatre is one of the most important areas within a hospital or other health care facility because the maximum revenue is generated from the OT and to

carry out various surgical procedures. Operating theatre (OT) services represents a significant proportion of hospital costs. As the major part of hospital budget is allocated in the OT. Efficient improvements in the OT even in small amounts can

improve productivity and yield considerable savings of resources. The success of OT management is important to the hospital in the sense that it has a high financial impact on the organization. Low utilization of operating rooms has been a problem in some of the hospitals.

Cancellation of operations in hospitals is a significant problem with far reaching consequences. The reported incidence of cancellation in different hospitals ranges from 10% to 40%. There are many reasons for the cancellation of the surgery and they differ from hospital to hospital. Cancellation disturbs patients flow in the hospital. Cancellation can interrupt the flow of the patient and decrease the utilization of theater.

Method: This study was done prospectively over a period of 45 days in an ophthalmic hospital. Operation theater utilization was studied with respect to In and Out time of the patients, waiting area time, and reasons for cancellation of cases.

REVIEW OF LITERATURE

- An audit study of OT utilization by Vinkondaiah et al cited 3102000 May-Jun;13(3):118-21.(14.3%) cancellations. Two hundred and two (65.2%) cases were cancelled due to lack of time, 43 (13.9%) due to emergency surgeries during elective list and 35 (11.3%) due to lack of fitness.
- In the year 2016 Dr.Mekala Jaya Krishna, Dr. K V Sandeep, Dr. Anuradha conducted a study on utilization of operating theatre. OT time has always been a priority for hospital administrators. The present study was conducted in Osmania General Hospital (OGH), Hyderabad a tertiary care teaching hospital for a period of 3 months from October 2016 to December 2016. Average utilization of OT complexes in OGH was 85% which was found to be optimum. The study helps us to know the existing work load as well as improving the patient care and the utilization of the facilities of OT's as the activities carried out in OT complexes can make or break the reputation of the hospital.
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RESEARCH METHODOLOGY

Objective:

- To determine the total time of Operation Theater utilization i.e. from June to July 2018.
- Gap analysis in available working time and utilization time of the OT
- To analyze the causes of cancellation of surgeries.

DATA COLLECTION

- **Primary data:** Observation of the patients scheduled for surgery.
- **Secondary data:** Secondary data was collected from the hospital records (Scheduling time), Hospital Information System (Spline Tech), research paper, articles.
- **Method**
- A prospective based Study was carried out in a 12 bedded superspeciality hospital over a period of two months (45 working days) i.e. from June to July 2018.

SAMPLING METHOD

- Census study of first 100 cases was taken during the month of June and July 2018. In this study the surgery were divided into two groups according to the surgery performed i.e. General ophthalmic surgery which include cataract, squint, Oculoplasty and the other was Lasik surgery.

Sample size : First 100 cases from advanced eye hospital and institute were observed during these two months.

Quality tool : The quality tool used in the study was Value Stream Mapping (Current Value Stream Maps) it is widely used in healthcare.

The following parameters were recorded they are as follows: Patient In time, waiting area time, Recovery waiting area time, OT In time, OT Out time.

Surgery are scheduled everyday i.e. on Monday, Tuesday, Friday, Saturday – Cataract surgery, on Wednesday and Thursday - Squint and Occuloplasty. The hospital has 3 operation theaters which include one for Refractive surgeries which is a semi sterile OT. The rationale of the study is to find out the OT utilization and to examine the factors that are affecting the utilization and cancellation of cases. The entire list was scheduled to start at 09:00 hours in the morning. The allocated time for Operation Theater was 6 hours / day.

The parameters recorded are as follows: Patient In time, waiting area time, Recovery waiting area time, OT In time, OT Out time.

Patient In time: It is the time when the patient steps into the hospital.

Waiting area time: It is the area where the patient arrives before he/she is shifted to the recovery room. Here dilatation is done, surgical list is taken.

Recovery waiting area time: It is the time where the patient is there for longer duration because here the patient is again dilated, all the vitals are examined, consent form is filled, and patient is made ready for the surgery.

OT in time: It is the time when the patient is wheeled in the OT to undergo surgical procedure.

OT out time: It is the time when the surgical procedure is over and the patient is wheeled out of OT.

A diagrammatic presentation is done of the OT utilization below in (Figure No:1)

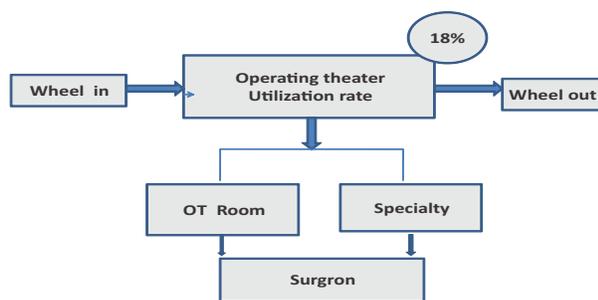


Figure 1

The number of operation cancelled and reasons for cancellation were document the cancelled case were about 10 % out of the total 100 Cases observed. The reasons are stated below in the form of table and graph. Table(1) Graph(1.1).

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Table 1

Cancellation	Number
Insurance related problem	20%
Physical condition of patient	30%
Patient related problem	20%
Doctors related problem	20%
Hospital related problem	10%

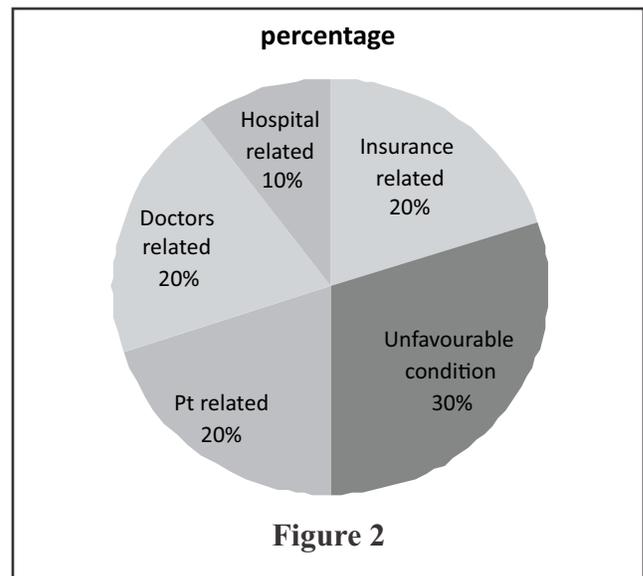


Figure 2

The above figure shows the graphical representation of the cases which were cancelled.

Reasons for cancellation of cases

Insurance Related: Out of 10 cases which were cancelled 20% cases were due to delay in the approval of insurance which was claimed for the surgery.

Unfavorable condition: It is related to patient according to the protocol of the hospital before going under any kind of surgical procedure the patient has to be medical fit. For that he/she has to undergo some pre – operative test under the supervision of an MD or General

Physician. If the Doctor declares that the patient is medically fit then only he/she can be operated. In 30% cases the patient was medical unfit for the surgery.

Patient related problem: According to the protocol of the hospital the patients are prescribed antibiotic drops which they have to apply a day prior to the surgery to reduce the eye infection and if not taken then the surgery is cancelled for that particular day and the other reason was patient wanted the surgery to be scheduled on some other day due to some personnel reason. 20% case was cancelled due to the above unavoidable situation.

Doctors related: 20% cases were cancelled due to the following reasons

- As it was a combine surgery it was posted on 20th June (EVA/LA)
- The doctor was not able to come due to heavy rain so the case was posted on 10th July.

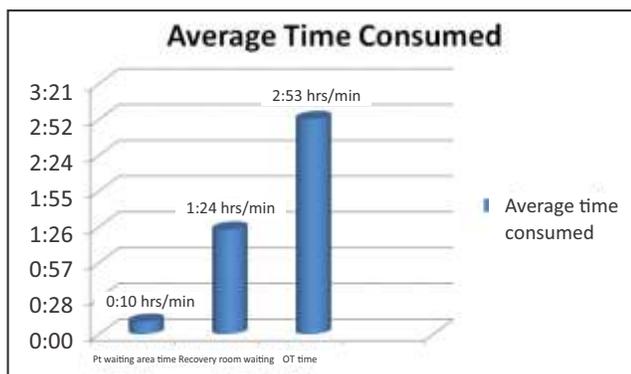
Hospital related: In 10% of cases it was seen that surgery was postponed as the injection was near expire and the patient was not ready to get it injected so the surgery was postponed and scheduled afterwards.

Average time consumed by the patient in the hospital area is shown below in both tabular and graphical form. (Table (2)) (Figure (3))

Table : 2

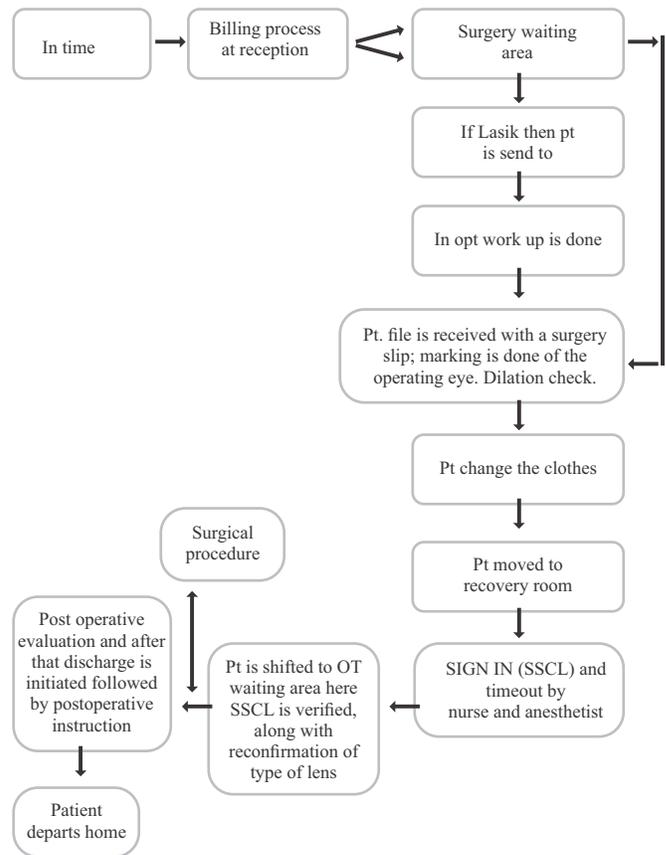
Areas of hospital	Average time consumed
Patient waiting area time	0:10 hrs/min
Recovery room waiting area time	1:24hrs/min
OT time	2:53hrs/min

Figure 3



Above is the graphical representation of the average time consumed in the hospital by the patients.

PROCESS FLOW (Figure 4)



DESCRIPTION

Patient waiting area time: It is the area where patient arrives after payment of bill. Here the patient gives the surgical slip to the patient care executive and then the patient is dilated. On an average the patient waits here for 10 minis.

Recovery room waiting: It is the area where the patient's vital sign are checked consent forms are filled; eyes are dilated and the patient is made ready for the surgery. On an average the patients waits here for 1hr and 24 minis.

OT time: It is the time when the surgical procedure is carried out (operation theater) i.e. on an average 2hrs and 53 minis.

Data Analysis: It was done using MS- Excel. To calculate , (Allocated) average hours of OT was taken as 6 Hours per day and number of working days were 45 days so (45*360 = 16200 hrs) and the actual utilization time of both the OT to was 14:36 hrs calculate this mathematical analysis was done so to get the total utilization rate following formula is applied:

$$\begin{aligned}
 \text{Utilization Rate} &= \frac{\text{Number of working days} * \text{total OT time in a day}}{\text{Actual OT time utilizes}} \\
 &= \frac{45 * 360}{14 * 60 + 36} \\
 &= \frac{16200}{876} \\
 &= 18.49\%
 \end{aligned}$$

So the total OT utilization rate is 18.49% in 45 days.

The number of operation cancelled and reasons for cancellation were document the cancelled case were about 10 % out of the total 100 Cases observed

The below process flow describes the full process of the patients i.e. when the patient enters the hospital till he/she departs from the hospital.

CONCLUSION

- The hospital has well equipped 3 major Operation Theater Complex. The study which was conducted for a period of 2 months (45 working days) gives a clear picture of the total OT utilization which was 18%. It means that the OT is underutilized, which is not good for the hospital. The result shows that the OT utilization is much less than its capacity and other was cancellation of cases which accounted for 10% out of the total cases observed. The reasons for cancellation of cases were insurance related, unfavorable condition of the patients, problems related to doctor, related to hospital. Cancellation of cases also has an adverse effect on the hospital. Maximum cases which were cancelled were 30% which was due to unfavorable condition of patients, 20% were related to insurance, 20% due to patient related problems, 20% due to doctor related problem, 10% due to hospital related problem. Due to cancellation of cases there was delay or rescheduling of other cases was done. The scheduling of the cases should be done properly so that number of cases can be increased for a day.
- Other than this there was a wastage of resources which includes electricity, air conditioners. The instruments also gets contaminated which are sterile. Patients have to wait for a longer period for the doctors to come and due to which the whole schedule gets disturbed.

- As the study shows it's not just the better organization of the OT activities but the concern of the hospital staff to increase the number of cases in order to utilize the OT optimally.

Result : The study which was conducted for a period of 2 months (45 working days) gives a clear picture of the total OT utilization which was 18%. It means that the OT is underutilized, which is not good for the hospital. The result shows that the OT utilization is much less than its capacity and other was cancellation of cases which accounted for 10% out of the total cases observed.

REFERENCES

- Dexter F, Abouleish AE, Epstein RH, Whitten CW, Lubarsky DA. Use of operating room information system data to predict the impact of reducing turnover times on staffing costs. *Anesthesia & Analgesia*. 2003;97(4):1119-26.
- Donald C, Caroline A, Chen CH. Optimum. *Operating Room Utilization*. *Anesth Analg*. 2003; 96:1114–21.
- Dr. Mekala Jaya Krishna. “A Retrospective Study on Utilization of Operation Theaters In A Tertiary Care Teaching Hospital.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* ,vol. 16, no. 12, 2017, pp. 23–28.
- Essex-Lopresti M. Operating theatre design. *The Lancet*. 1999;353(9157):1007-10.
- Faiz O, Tekkis P , Mcguire A, Papagrigoriadis S, Rennie J, Leather A. Is theatre utilization a valid performance indicator for NHS operating theatres? *BMC health services research*. 2008;8(1):28.
- Humphreys H. Infection control and design of a new operating theatre suite. *Journal of Hospital Infections*. 1993; 23(1): 61-67.
- Jawaid M, Askari Raza, Qureshi MA, Manzar S. Quality of operative notes. *J Postgraduate Med Inst*. 2008; 22(4): 274-6.
- Jawaid M, Masood Z, Humayun S. Operative Notes: A simple yet effective teaching resource for training. *Pak Armed Forces Med J*. 2011; 1.
- Kikuchi H. Infection control in operation

- theaters: preface and comments. *Masui*. 2010;59(5):554-5.
- Littlejohns P , Watt JC and Rawlinson J. An Evaluation programme for Hospital Information System Northern Province.1999. Available from URL: [http:// www.bmj. com/ highwire/ filestream/ 440656/ fieldhighwire_ adjunct_ files/0](http://www.bmj.com/highwire/filestream/440656/fieldhighwire_adjunct_files/0)
 - Magerlein JM, Mar t in JB.Surgical demand scheduling: a review. *Health Serv Res*.1978;13(4):418–33.
 - Quayle SN. Efficient costing and budgeting in the operating theatre. *Natnews*. 1978;15(2):11–4.
 - Reena Kumar . Kumar R, Sarma R. Operation Room Utilization at AIIMS, a Prospective Study. *Journal of the Academy of Hospital Administration*. 2003;15(1):1-6.
 - Shah J, Ansari A,Bhattacharyya .Cancellation of Urologyoperations. *Clinical Governance J*.2006; 11(2): 128- 133.
 - Time utilization of operating rooms at a large teaching hospital. Authors: Farooq Ahmed, Syed Tahish, ShiguftaQazi, and M.S Atlif. Vol 15, No. 1 (2003-01-2003-06)
 - Vinukondaiah K, Ananthkrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. *National Medical Journal of India*. 2000;13(3):118-20.
 - Wilkinson DS, Pifeleti F . General surgery in Tonga: an audit. *Pacific Health Dialog*.1999;6(2):199-201.
 - Zafar A, Saeed T ,Griffin S, Ahmed S, Ansari JA. Cancelled elective general surgical operations in Ayub Teaching Hospital. *J Ayub Med Coll*.2007; 19(3):64-66.