



A Study of Utilization of Operation Theatres in a Tertiary Care Teaching Hospital, Hyderabad

KEYWORDS

Operation Theatre, Operating time, Utilization.

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ABSTRACT

In any hospital, the Operation Theatre is said to be the primary source of revenue generation and also represents an area of considerable expenditure in a hospital budget, requiring maximum utilization to ensure optimum cost-benefit. The present study aims to understand the utilization pattern of the OTs of Nizam's Institute of Medical Sciences (NIMS), a tertiary care teaching hospital in Hyderabad, India for the time period of July 2011 to June 2012. Utilization of OT complexes in NIMS was found to be 72.51% for the time frame of July 2011 to June 2012, which was found to be optimum. Most of the scheduled hours were utilized for elective surgeries and unscheduled hours for emergency surgeries. Unscheduled hours was maximum utilized for emergencies in theatres which had dedicated tables well equipped for performing neurosurgical, vascular and orthopaedic surgeries, since traumatic cases were major part of surgical emergencies.

Introduction:

An Operation Theatre (OT) is that specialized facility of the hospital where life saving or life improving procedures are carried out on the human body by invasive methods under strict aseptic conditions in a controlled environment by specially trained personnel to promote healing and cure with maximum safety, comfort and economy. In any hospital, the OT is said to be the primary source of revenue generation with around 50-60 percent of revenue earned just by this area.¹ It is therefore desirable to optimise the efficiency of these assets. The efficiency of operating theatres can be measured in a variety of ways. Essentially it tends to be defined in terms of ability to translate available time into earnings.^{2, 3, 4} Utilisation is a simple and adequate measure of the efficiency of a theatre, because its ability to generate revenue (its efficiency) rises as the time for which it is used increases.

OT utilization is defined by Donham⁵ and colleagues as the quotient of hours of OT 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 Administrators. Baker had opined that 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.

The present study focuses to understand the utilization pattern of the Operation Theatres of Nizam's Institute of Medical Sciences (NIMS), Hyderabad, India. The institute is a well known tertiary care teaching hospital with around 1200 beds, rendering super-specialty services among various medical and surgical specialties. Half of the beds are allocated for various surgical departments of cardio-thoracic surgery, neurosurgery, orthopaedics, plastic surgery, gastroenterology, oncology, urology and vascular surgery. The institute has five OT complexes, four of which (OT 1, OT 2, OT 3 and IDOT) are scheduled for mostly elective surgical cases and one theatre for emergency services. These thea-

tres have a total of 18 operation tables equipped to handle all surgical cases for the above surgical departments. These theatres are scheduled for six days a week except for public holidays from 9:00 A.M. to 4:00. Scheduling of cases for operation theatres is closed type of scheduling i.e. OT tables fixed for specific departments except for one theatre complex, i.e. IDOT which follows open scheduling with prior appointment basis for all departments. Scheduled cases are usually elective surgeries, though rarely emergencies are performed in scheduled time. Apart from scheduled cases sometimes few surgeries both elective and emergencies are performed, usually referred as unscheduled surgeries.

Methodology:

The study design adopted was retrospective study design to study the utilization of OTs of Nizam's Institute of Medical Sciences, Hyderabad for the time period of July 2010 to June 2011. Four theatre complexes rendering services majorly for elective cases were selected for the study, excluding one theatre complex which renders emergency surgical services. The source of the data was the records maintained at the OTs. Number of surgeries done per table was noted down along with the time consumed for each surgery to calculate the utilization. Data collected was stored and analyzed in descriptive statistics.

Utilization index or coefficient (U) for OT is calculated as

$$U = N / M \times 100$$

Where N = Total number of hours the OT table was used per period.

M = Maximum number of hours the OT table can be used in the same period.

Results:

The records maintained at Operation Theatres were examined and the necessary data was collected into MS excel spreadsheets for the time period of July 2010 to June 2012. Number of working days for OTs was multiplied

by total number of OT tables to get available table days which was converted to hours. Data pertaining to time frame was recorded in hours to maintain the integrity and uniformity of data for easy calculations. The results obtained are shown in Table 1 and Table 2.

The average utilization of all OT in the institute for the time period was found to be 72.51% ranging from 48.98% to 82.74%. A total of 3839 OT table days were available during the time frame accounting for 1768380 hours of Available time of OT service for the period. Out of this available period 1248696 hours was utilized for scheduled list of surgeries. An additional time of 150525 hours was utilized for unscheduled surgeries. This accounts for total utilization of 1399221 hours for all surgeries during the time frame of the study. Overall 8201 surgeries were performed during the time frame out which 7481 were elective surgeries and 720 were emergency surgeries. Out the total utilized time 1264191 hours (90.34%) were utilized for elective surgeries and 135030 hours (9.66%) were utilized for emergency surgeries. It was observed that 1202026 hours (96.26%) of scheduled time and 62165 hours (41.29%) of unscheduled time was spent for elective cases, whereas 46670 hours (3.74%) of schedule time and 88360 hours (58.71%) of unscheduled time was spent on emergency surgeries.

Table 1: Utilization of Operation Theatre – Operation Theatre Complex wise:

	Allocated time (hrs)	Scheduled Surgeries			Unscheduled Surgeries			Total			Efficiency
		Elective (hrs)	Emergency (hrs)	Total (hrs)	Elective (hrs)	Emergency (hrs)	Total (hrs)	Elective (hrs)	Emergency (hrs)	Total (hrs)	
OT 1	348530	37374 (10.72%)	1445 (0.41%)	38819 (11.15%)	9680 (27.79%)	13050 (37.46%)	22730 (65.25%)	36350 (103.71%)	13051 (37.46%)	49381 (141.77%)	76.40%
OT 2	412740	26843 (6.49%)	1853 (0.45%)	28696 (6.94%)	12611 (30.53%)	5213 (12.62%)	17824 (43.15%)	21762 (52.48%)	6721 (16.28%)	28483 (68.76%)	68.54%
OT 3	258120	42526 (16.47%)	2283 (0.88%)	44809 (17.35%)	18661 (7.23%)	2498 (0.97%)	21159 (8.20%)	46487 (18.01%)	46075 (17.85%)	92562 (35.86%)	82.74%
IDOT	300000	137580 (45.86%)	2550 (0.85%)	140130 (46.71%)	8181 (2.73%)	60 (0.02%)	8241 (2.75%)	15670 (5.22%)	2641 (0.88%)	18311 (6.10%)	48.98%

Utilization of Operation Theatre was analyzed in each individual Operation Theatre Complex. It was observed that highest utilization was in OT 3 complex (82.74%) and least utilization was seen in IDOT complex (48.98%). Emergency surgeries were performed maximum in OT 2 complex (19.39%), which has dedicated tables for Neurosurgery department, which handle most of the traumatic cases. It can be observed that most of these emergencies were performed during unscheduled hours of the theatre (80.25%). OT 1 and IDOT complexes were utilized mostly for elective surgeries, i.e. 95.51% and 97.92%. It was observed that most of the unscheduled hours were utilized for Emergency surgeries, except for IDOT complex, where elective cases were posted in unscheduled hours.

Table 2: Utilization of Operation theatre – Department wise:

	Allocated time (hrs)	Scheduled Surgeries			Unscheduled Surgeries			Total			Efficiency
		Elective (hrs)	Emergency (hrs)	Total (hrs)	Elective (hrs)	Emergency (hrs)	Total (hrs)	Elective (hrs)	Emergency (hrs)	Total (hrs)	
Cardiothoracic	348000	322506 (92.68%)	2544 (0.73%)	325050 (93.41%)	15000 (4.31%)	8308 (23.84%)	15830 (45.15%)	31711 (91.52%)	15830 (45.15%)	47541 (136.67%)	81.1%
Neurosurgery	368300	348225 (94.55%)	22215 (6.03%)	370440 (100.00%)	12018 (3.26%)	49780 (13.57%)	61798 (16.83%)	21645 (5.88%)	65140 (17.72%)	86785 (23.56%)	71.24%
Orthopaedics	270000	259776 (96.21%)	10224 (3.79%)	270000 (100.00%)	4044 (1.50%)	4282 (1.58%)	8326 (3.07%)	26626 (98.64%)	756 (2.80%)	27382 (100.93%)	82.93%
Plastic Surgery	117000	115811 (99.00%)	1189 (1.02%)	116999 (100.00%)	5811 (4.96%)	12171 (10.41%)	17982 (15.37%)	16838 (14.39%)	11043 (9.43%)	27881 (23.83%)	47.00%
General Emergency	141000	137326 (97.39%)	3674 (2.61%)	140999 (100.00%)	8181 (5.84%)	7115 (5.09%)	15296 (10.93%)	14844 (10.52%)	450 (3.01%)	15294 (10.82%)	78.73%
Oncology	129000	126490 (98.05%)	2510 (1.94%)	129000 (100.00%)	1508 (1.16%)	1396 (1.08%)	2904 (2.24%)	21896 (16.97%)	386 (1.50%)	22282 (17.31%)	61.13%
Urology	168000	151500 (90.18%)	16500 (9.82%)	168000 (100.00%)	8830 (5.25%)	700 (4.17%)	9530 (5.67%)	14230 (8.47%)	1250 (7.29%)	15480 (9.22%)	78.82%
Vascular Surgery	44000	19020 (43.23%)	893 (2.03%)	19913 (45.03%)	411 (1.00%)	1133 (2.85%)	1544 (3.95%)	20935 (47.56%)	1211 (2.68%)	22146 (50.21%)	43.96%

Utilization of Operation Theatre by individual departments was also calculated. Utilization of scheduled and unscheduled hours of operation theatres was highest for Plastic surgery (87.07%) followed by Oncology, Gastroenterology and Urology. Vascular surgery scored least (45.90%) in

terms of utilization. It can be noted that almost all Departments utilized the most of scheduled hours for elective surgeries except for department of plastic surgery which utilized considerable fair amount of scheduled hours for emergencies (13.30%). Neurosurgery, Orthopaedics, Plastic Surgery, Gastroenterology and Vascular Surgery departments utilized more than half of unscheduled hours for emergencies. Around one fifth of the total time was spent in emergencies by the departments of Neurosurgery and Plastic Surgery.

Discussion:

The OT is one of the most expensive departments of any hospital. Operating time is money and it is to be emphasized that efficiency in the operating room is encouraged.⁶ Effective OT utilization for every hospital should be calculated. Every effort must be made to reduce the number of idle theatre hours.

Attainment of utilisation levels between 70% and 80% is realistic⁷ and can meet variations in demand resulting from complications arising during procedures. Several descriptive studies support this finding.^{8, 9} Computer simulations and mathematical models, both of which are essentially idealisations, compute the practical capacity for operating theatres at between 80%¹⁰ and 90%.¹¹ Utilisation of 100% is referred to as 'the holy grail', because it is essentially sustainably unattainable owing to unavoidable variations in procedures and loading.¹²

It can be inferred that utilization of OT in the institute is optimum, except for IDOT complex. The reason can be explained by the difference of scheduling surgeries in the theatres. Due to open scheduling, many times theatre tables are under booked for surgeries by the department. It can be noted that utilization of theatre by various departments is also optimum, except for the departments of vascular surgery and cardiothoracic surgery. This was mainly due to underestimation of time consumed by each surgery resulting in cancellation of surgeries posted last in list, leading to unutilized time at the end of the day in Operation Theatres. Such arguments are, however, potentially flawed, mainly because durations of surgical operations cannot be predicted with certainty and the impact of complications that may arise cannot be ignored. Although utilisation measured longitudinally may be characteristic, utilisation would typically vary from day to day, depending on caseload and the individual nature of procedures.¹³

Scheduled hours are usually planned in hand, so most of the surgeries posted are elective cases. Rarely this time can be used for few anticipated emergency surgeries. Whereas unscheduled hours are utilized for mostly emergency surgeries. It can be inferred in the present study that most of the unscheduled time in all theatres was utilized for emergencies. This time was maximum utilized for emergencies in OT 2 complex (80.25%) followed by OT 1 (56.09%) which had dedicated tables well equipped for performing neurosurgical, vascular and orthopaedic surgeries, since traumatic cases were major part of surgical emergencies.

According to Michael B. Rose and David C. Davies⁶ the OT capacity often limits the amount of routine surgical work that can be carried out. Surgeons, therefore, have a responsibility to ensure that theatre facilities are used as fully as possible, and also that good use is made of the operating time in the theatre. Routine operation lists are prepared / planned in advance, so that each surgical team

should be able to ensure that its share of theatre time is used as fully as possible, without being exceeded more often than necessary. Utilization of theatre can be increased by avoiding delayed starts, avoiding cancellation of cases, proper scheduling of surgeries by anaesthetizing the patients in an anaesthesia room instead of operating room and by laying of sterile trolleys in layup room instead of operating room.¹⁴

Conclusion:

Utilization of Operation theatre complexes in NIMS was found to be 72.51% for the time frame of July 2011 to June 2012, which was found to be optimum. The study suggests optimum utilization of the OT time in varied healthcare settings, which has always been a scope of research in Hospital Administration.

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