Factors Affecting utilization of Operating Rooms in a Tertiary Care Hospital

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Abstract

This exploratory study was conducted in multi speciality tertiary care 90 bed hospital in National Capital Region with an objective to understand the functional process of existing operation theatre complex and assessment of Operating Room (OR) utilization. Operating Rooms of any hospital requires huge investments on capital as well as manpower. Therefore, the hospital management encourages maximum utilization to ensure optimum return on investment. Typically 9-10% of the hospital revenue is spent on operating area while it generates 50-60 % of the total revenue.

The study was carried for 30 days in the month of June 2012 to July 2012 in order to actually see how much time is spent on each of the different activities carried out in Operating Rooms. According to the result of the study, entire surgical procedure is divided into six main activities. In that, maximum time is spent (around 50%) on actual surgery and remaining time is for other activities like cleaning, anaesthesia, administration, anaesthesia reversal etc. The study revealed that the utilization of all the operation theatre is between 30 to 40 percent which is much below its capacity and there is a scope to improve the utilization level. Maximum utilisation is observed in the morning shift. The trend between January to June 2012 shows that except for the month of May 2012, the utilisation pattern is almost same. In the month of May 2012, there is a slight improvement in terms of utilisation of operation theatre. The study suggests that for optimum utilization, attention must be paid for the coordination of different activities within the OR as well as and other associated activities related to surgery.

Introduction

Quality healthcare services with the efficient use of resources are the main concern of today's private corporate hospitals. Hospitals want to reduce costs and improve their financial assets, on the one hand and at the same time they want to maximize the level of patient satisfaction. One of the sections of the hospital which is of particular interest, for maximising the revenue is Operation Rooms.

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An operation room (OR) is a place where the surgery and surgical procedures are conducted. It is technically a therapeutic aid in which a team of surgeons, anaesthetists, nurses, and sometimes pathologists and radiologists work upon the patient. The OR complex of a hospital represents an area of considerable expenditure in a hospital budget and requires maximal utilization to ensure optimum cost-benefit**.** The operation theatre typically consumes 9-10% of the hospital budget. In any hospital, operation theatre generates 50-60 % of the total revenue.

OR utilization is defined by Donham and colleagues as OR time actually used during operation hours out of the total number of elective resource hours available for use. Optimum utilization of the OR time has always been a priority area for Hospital Administrators. Factors affecting utilization rates include the accuracy of estimated case times, cancellation rates, no. of add-ons available to fill gaps, selection of the longest cases etc. The utilization level of OR is typically highest in the morning and lowest in the evening .

Technological advances like minimally invasive surgery, costly equipments, payment based on diagnosis-related groups, captivated payment and discounted fee for service have all significantly reduced margins in the surgical business. Operating time is money and it is to be emphasised that efficiency in the Operating Room is encouraged. 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. Thus it is clear that study of Operating Room records can provide means of assessment of the degree of utilization of operation theatres.

REVIEW OF LITERATURE

An Operation Theatre is a high cost specialized facility of a hospital where life saving or life improving interventions are carried out on human body by invasive methods under strict aseptic conditions in a controlled environment by specialised trained personnel; in other words, the aim of a well equipped operating room is to provide successful surgical procedures to every needy patient. The infrastructure and the personnel who operates the facility, require a huge financial investment in terms of fixed and variable costs. Thus, efficient utilisation of the facility is always monitored by the senior management continuously.

Operation Theatre utilization is an important indicator to measure the performance of the hospital as facilities to further feed the patients to intensive care unit, in-patient departments and diagnostic procedures. The performance is judged in terms of return on investment. The manpower and the equipments used in the Operating room are specific and hence not suitable to use anywhere else in the hospital. Utilization of theatre can be maximised by avoiding delayed starts, cancellation of cases, proper scheduling of surgeries, by anesthetising patients in an anaesthesia room instead of operating room & by laying of sterile trolleys in layup room instead of operating room.

A study on operation room utilization was done at AIIMS in 2001 where 13052 cases were performed during the study period (June 2000-july 2001), showed that the utilization of main operation theatre complex at AIIMS, New Delhi is optimum. At the same time, in spite of the optimum utilization, there are long waiting lists leading to dissatisfaction among patients who are seeking medical care at AIIMS. The study also suggested carrying out minor surgeries in the small operating rooms near OPD and it would save the time of main operation theatre complex to perform major operations. They also suggested that even with the existing bed strength and no. of ORs, one way of reducing the waiting time of patients to undergo surgeries is to run the ORs in two shifts or increase the operating time. This would involve extra manpower, supplies and costs.

Rudolph D'sa has studied operation room utilization at Father Muller Medical College, Mangalore. The study revealed that out of 8572 surgeries performed during the study period, the average OR complex utilization was only 5 hrs. 25 minutes per day which comes out to be 21.8%. It has also observed that more than 25% of the surgeries conducted in major

ORs, were minor surgeries. The author suggested that efforts must be put in for the coordination of different activities in the OR among different departments.

The results of the study on time utilization of operating rooms at Sher- i – Kashmir Institute of Medical Sciences & Hospital showed that 66% of the utilized time was spent on actual surgery, 21 % on supportive services and 12.9 % on making the room ready for operation. The utilization rate was 64.31 % during the study period of 18 months. In this study, great variations were observed in the percentage of time spent on actual surgery, supportive services and on making room ready for surgery in different surgical specialities. Analysis of variance showed this difference to be significant ($p<.05$). Thus, difference is not by chance but depends on the type of the surgeries performed for example, case lengths are shorter in general surgery, paediatric surgery and urology; whereas they are longer in plastic surgery, neurosurgery and cardiovascular and thoracic surgery. Therefore, time spent on actual surgery in plastic, neuro and cardio-thoracic are longer. The time spent on making room ready can be reduced without compromising on time to make the OR aseptic for next surgery both at the start of day and in between cases.

The productivity in an operation theatre can be defined as surgical time divided by the total work hours of the operation room staff. This productivity factor is normally reduced in the case of operations that take only a short time to perform, since the time interval between operations is usually not reduced correspondingly. In order to maximize the utilization of operation theatres, it is essential to identify the amount of time spent on various activities in ORs and accordingly identify the factors responsible for delay in each such activity.

In the unit for outpatient surgery at Akershus Central hospital, 4.6 operations were performed daily in 206 days in 1993 with a productivity factor of 42% and an operation theatre utilization of 66% which is Operating Theatre time spent on specific patients/ total Operating Theatre time. The mean interval from the time the surgeons finished one operation until they could start the next was 33 minutes (confidence interval 32-34%) with a mean operating time of 44 minutes. In another study conducted in the same hospital, it was found that 54% of time was spent on actual surgery, 31% on supportive services and 15% waiting while operation room was being made ready for the next operation. In Central Middle-Sex Hospital, London an orthopaedic theatre timing survey showed that 60% of elective list time was used for operating, 21% for turnover and no useful activity occurred during the remaining 19% of theatre time.

Audit of surgical theatre utilization at Jawaharlal Institute of Postgraduate Medical Education and Research Pondicherry, India done prospectively over a period of 12 months with respect to the starting and closing of the operation theatre, interval between surgical procedures and cancellation of surgical procedures showed that theatre was functional for 279 days during the year of the study and 1773 cases were operated (6.3 cases/day) during this period. The total operating time utilization was 91.5%. The major reasons for cancellation of a total of 310 cases were lack of operating time (65.2%), emergency surgery during the elective cases (13.9%) and preoperative lack of fitness (11.3%). Among all the lists, 43.6% started late and 63.6% of lists finished well before the scheduled closing time. Absence of monitoring equipment and non-availability of additional qualified anaesthetists necessitated induction of anaesthesia in the main operating room and accounted for 11% of the total operating time.

There should be perfect planning of the OR scheduling, timely preparation, complete PAC, preoperative treatment & shifting of patient to theatre. One of the main objectives of hospital administration is to reduce the turnover time between two surgeries in any Operating rooms. For all planned or elective cases a schedule list must be planned well in advance with perfect time management. This will reduce the inconvenience to the patients as well as enhance the performance of the hospital. The postponement of an operation is highly dissatisfying. Therefore, any deviation in the scheduling must be supported by valid reasons and discussed thoroughly in meetings.

METHODOLOGY

Objectives

The proposed study is an attempt to understand the level of utilization of operating rooms in one of the private multi-speciality 90 bed corporate hospital in National Capital Region of India.

Data collection

Observations regarding functioning of OR, pattern of work and the activities of operating rooms were carried out with a view to actually see the process of OR. In this phase, the process for scheduling of surgeries and process of admission of patients were observed. Once the process of all the activities was mapped down, a study was carried for 30 working days excluding Sundays. The time of study for each day was 10 hours from 8 am-6pm. During this phase the activities within the operation rooms (OR 1, OR 2, and OR 3) were noted in a specially designed Proforma.

Various data like time at which room is ready for usage, time taken for preparation of OR for surgery (placing of equipment, laying of sterile trolleys), time at which patient is received in operation theatre, time at which induction of patient or patient preparation is done, time at which anaesthesia is administered, time at which surgery starts, time at which surgery ends, time at which first patient leaves operating room, turnaround interval (time from one patient out and second in) and time at which operating room is ready for starting second patient etc have been taken for calculating effective OR utilisation level. Also any change in the operation schedule, time of such change and any cancellation of operation schedule or a case are taken into consideration. The records of Operation Theatre for six months i.e. from January to June, 2012 were also taken for analysis. The collected data included only the time utilized in administration of anaesthesia & the actual surgical time. So, the total utilization was calculated extrapolating the data of primary research and the secondary research.

Calculation of utilization of Operating Rooms:

$$\text{OR utilization rate} = \frac{\text{OR utilization time in hours} * 100}{\text{Total Resource Hours}}$$

Where Resource Hours = Total no. of hours available for performance of procedures

Data collected was expressed in percentages or averages.

STUDY FINDINGS

The activities of the operation rooms were divided into following six categories:

1. Time taken in preparation of OR
2. Time taken in induction of the patient and patient preparation
3. Time taken in administration of Anaesthesia
4. Time taken in actual surgery (from part preparation to closure of wound)
5. Time taken in reversal of anaesthesia
6. Time taken in cleaning the OR

The above activities were further clubbed into supportive services (preparation time of OR, Patient induction & preparation, Anaesthesia time & reversal of anaesthesia, cleaning time of the OR).

Assignment of ORs

The OR complex has 4 operation theatres. OR 1 is assigned to Gynaecological surgeries; OR 2 is assigned to General surgery, Ophthalmology, ENT, Plastic surgeries, Urology surgeries etc. OR 3 is assigned to orthopaedic & Neurology surgeries. OR 4 is occasionally used for septic cases.

During 30 days of study period excluding Sundays, a total of 153 surgeries were performed. Out of which 111 were major surgeries and 42 were minor. 55.26 % of the surgery were delayed and 44.74% of surgeries were on time. During the study period, out of 153 surgeries, 66 were performed in OR1, 60 in OR 2 and 27 in OR3.

Table 1: OR wise time spent on different activities during study period (30 days)

Activities	OR 1 (in hrs)	OR 2 (in hrs)	OR 3 (in hrs)
Preparation of OR	10.08	9.54	6.06
Induction & Patient prep.	7.08	9.24	4.38
Anaesthesia administration	10.26	10.2	4.11
Actual surgery time	49.98	61.38	42.45
Anaesthesia reversal	12.45	9.45	5.34
Cleaning OR	13.89	15.39	9.09
Total	**103.74**	**115.2**	**71.43**
Level of utilization (in %)	**34.3**	**38.3**	**23.8**

The study was conducted in 30 working days in the month of June and July 2012. Based on the study, complete surgery process is divided into six main activities. These different activities are specified in Table no. 1. While studying 153 surgeries during thirty days of the study period, it is revealed that in a surgery, maximum time is spent on actual surgery which ranges between 42 to 61 percent of the total time, followed by cleaning of OR, Anaesthesia reversal and Anaesthesia administration. A graphical representation of all these activities in different ORs with average time is also mentioned in graph no. 1. During the study period OR no. 2 was used maximum with 38.3 % utilization, followed by OR 1 (34.3%) & OR 3 (23%). The utilization level was calculated assuming maximum 10 hrs (8:00 am-6:00 pm) of working in each operating days.

Graph 1 : OR wise time spent (in %) on different activities during study period (30 days)

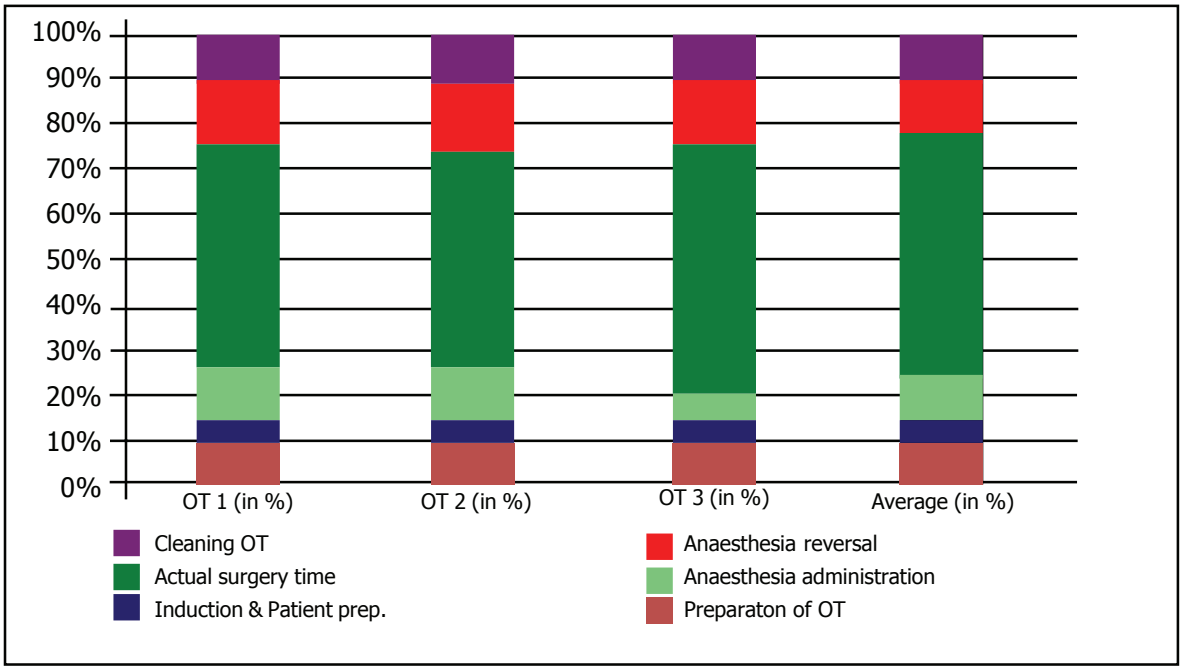


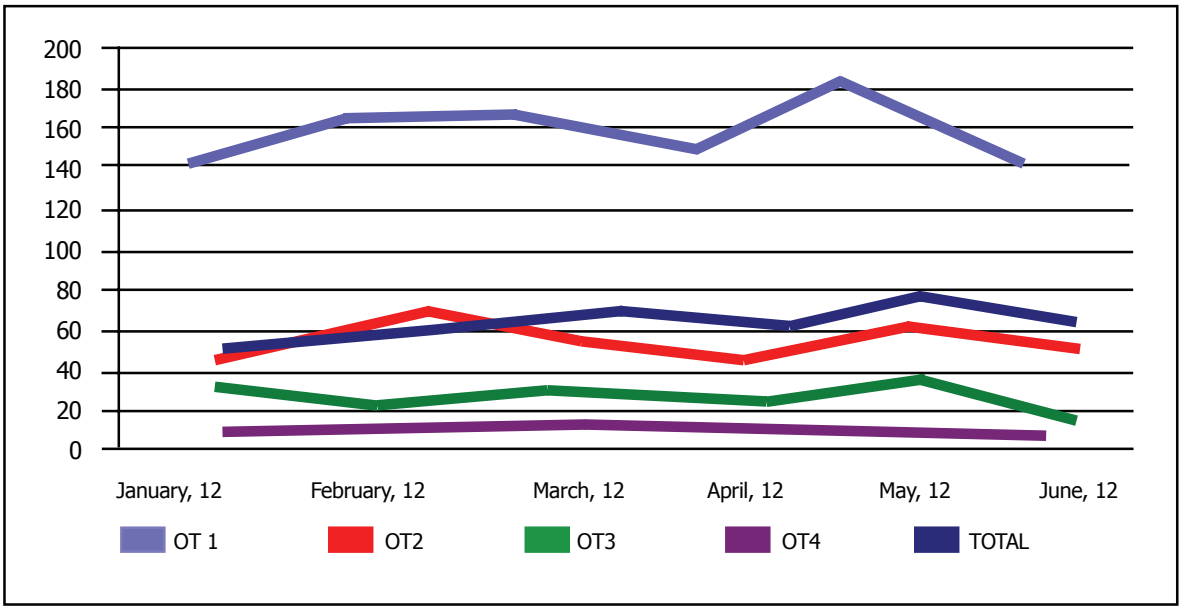
Table 2:- OR wise no. of surgeries , major (MJ) and minor (MN) performed between Jan. to June 2012

OR	JAN, 12		FEB, 12		MAR, 12		APR, 12		MAY, 12		JUNE, 12		TOTAL	
	MJ	MN	MJ	MN	MJ	MN	MJ	MN	MJ	MN	MJ	MN	MJ	MN
OR 1	40	12	45	15	50	21	49	16	49	27	41	28	139	71
OR 2	38	11	50	19	41	13	40	8	48	11	39	13	127	32
OR 3	23	09	17	07	20	8	19	6	30	6	16	0	65	12
OR 4	5	4	8	2	7	7	4	8	3	7	3	1	10	16
TOTAL	106	36	120	43	118	49	112	38	130	51	99	42	341	131

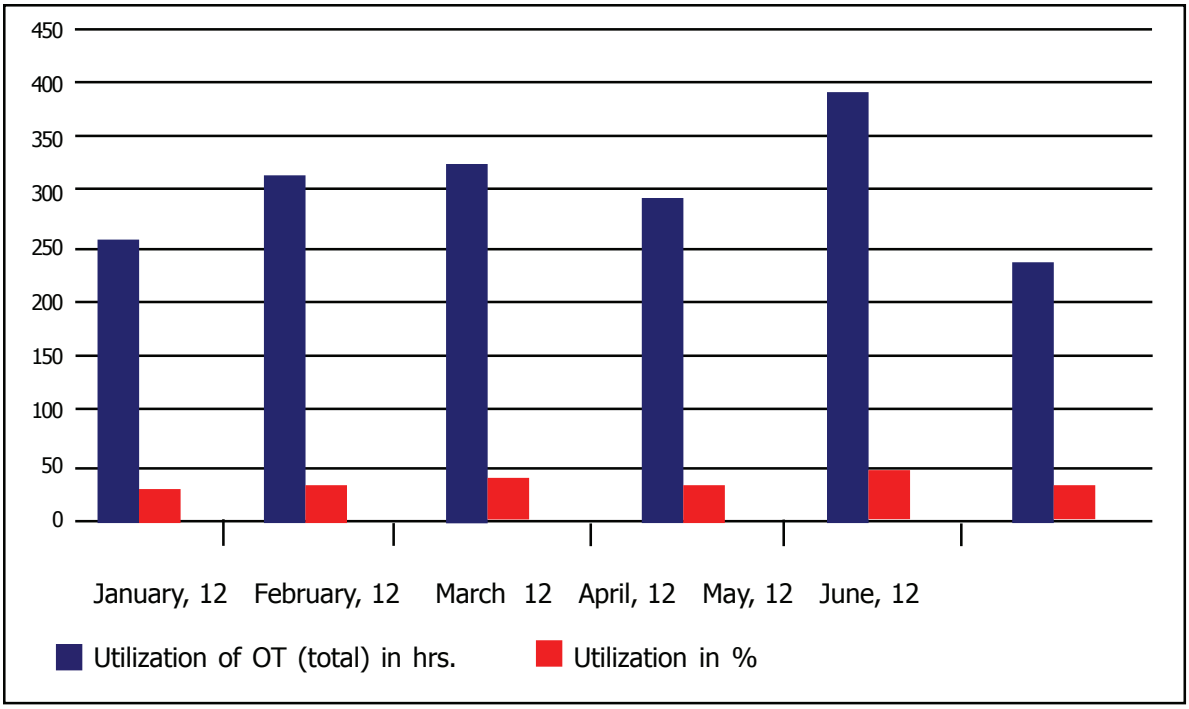
The hospital records from January to June 2012 were studied to understand the utilisation of all ORs. The details of major and minor surgeries performed in each ORs are specified in the Table no. 2. The record shows a significant increase in terms of surgeries performed in the month of May 12. A graph showing the OR wise trend of surgeries performed from January to June 2012, is explained in Graph no. 2. Average Cases per month is calculated as 157.33 and average cases per day are 6.3, considering twenty five surgery days in a month.

Surgeries are divided as major and minor based on the opinion of three surgeons of the hospital including the head of the Anaesthesia. The parameters for categorising the same include type of anaesthesia, complexity of the case & time taken in the surgery.

Graph 2:- OR wise no. of surgeries performed between Jan. To June 2012



Graph 3:- Actual and % utilization of ORs (All ORs) between Jan to June 2012



The graph no. 3 depicts the level of utilisation in terms of surgery hours and in percentages between January to June 2012. Maximum utilisation was in the month of May 2012 and lowest utilisation was in the month of June 2012. February and March 2012 showing almost similar utilisation pattern.

Table 3: Specificity wise Utilization Operation Rooms (All ORs)

OR Utilization Category	Percentage Utilization
ENT	8.7
G. Surgery	20.13
Guyne. & Obs.	31.78
Ophthalmology	4.03
Ortho	13.14
Pl. surgery	4.03
Urology	13.97
Other	4.47

The above table (no. 3) shows that maximum number of gynaecological surgeries were performed in the period of six months i.e. January to June 2012. Out of total surgeries, 31.78 % were gynaecological in nature followed by general surgery (20.13 %), Urology (14%) orthopaedics (13.14 %) and ENT (8.5%).

CONCLUSION

It is observed that around 113 major cases/month and 43 minor cases/month were performed during the study period. Maximum surgeries were performed in the month of May whereas the month of June had the least surgeries. The findings of the study showed that there is an established process in the activities of the operating room. Although the ORs are assigned to different surgical specialities but the surgeries do occur in the non-assigned ORs as well. There is no separate room for anaesthesia. The utilisation level fluctuates between 30% – 40% and remains idle most of the time. Also out of total utilised time more than 50% of the time is used in actual surgery. Other supportive services accounts for remaining 50% time. Shift wise utilization was also calculated and observed that shift 1, shift 2 and shift 3 were utilized 66.94%, 40.39% and 2.95 % respectively. Thus, it is evident that ORs are utilized maximum in the morning shift (8:00am-3:00pm).

During study period, many scheduled cases were delayed due to various factors. Reasons were analysed for the cases which got delayed. These reasons were explained in the table no. 3. According to the standards of Hospital, a delay is defined when the surgery is delayed by more than 45 minutes. Nearly half of the occasion, it external factors like, late coming of the patient and TPA approval causes the delay

Table 3 : Various reasons of delay in surgeries

Different reasons for Delay	Percentage share
Patient late	33.33 %
TPA approval delay	14.29 %
Equipment busy in other surgery	14.29%
Surgeon related delay	9.52 %
Delay in shifting the patient from ward	9.52%
Others	19.05%

At the end, the management & doctors can jointly make effort to increase the OR utilization. It is not just the better organization of activities but the management should also develop a strategic road map to increase the no. of cases and utilisation of ORs.

REFERENCES:

Ahmad Jan Farooq, Tabish Syed.A., Qazi Shigufta, Atif M.S. (2003) Time Utilization of Operating Rooms at a Large Teaching Hospital. *Journal of Academy of Hospital Administration*. Vol. 15, No. 1 (2003-01 - 2003-06), Academy of Hospital Administration, India

D'sa Rudolph Ravi (2011), A study on Utilization of Major Operation Theatre in Father Muller Medical College Hospital, Rajiv Gandhi University of Health Sciences, Karnataka.

Hartley Ricketts.D,.J, Patterson.M, Harries.W, Hitchin.D (1994): *An orthopaedic TheatreTtiming Survey*. Ann R Coll Surg Engl; 76(3): 200-4.

Joshi D.C& Joshi Mamta (2008) *A book on Hospital Administration* (1st edition). Jaypee brothers publication. Chapter 32- The Operation theatre.

Kumar Reena, Sarma R.K. (2001), Operation Room Utilization at AIIMS, a Prospective Study. *Journal of Academy of Hospital administration*. Vol. 15, No. 1, Academy of Hospital Administration, India

Sakharkar.B.M (1998), *Principles of Hospital Administration and Planning*. First edition. Jaypee Bros, New Delhi; 14; 197-207.

Vinukondaiah.K, Ananthakrishnan.N, Ravishankar.M (2000): Audit of Operation Theatre Utilization in General Surgery. *National Medical Journal India,* All India Institute Medical Science 13(3): 118-21,

National Accreditation board Board for Hospitals and Healthcare providers (NABH). (2011). Matrix for measuring quality indicators. 3rd edition, Nov.

Shukla, Sonal (December 2008). Express Healthcare: Streamlining OT accessed at www.expresshealthcare.in