

Study on Operation Theater Utilization

By

Anshu Saxena

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2016-2018



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Mrs Anshu Saxena** student of MBA Hospital and Health Management from **The IIHMR University, Jaipur** has undergone internship training at **Bhagwan Mahaveer Cancer Hospital and Research Center, Jaipur** from **12 Feb 2018 to 12 May 2018**.

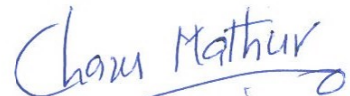
The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.



Dr. Ashok Kaushik
Dean, Academics and Student Affairs
The IIHMR University, Jaipur



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Bhagwan Mahaveer
Cancer Hospital & Research Centre
(Managed By K.G. Kothari Memorial Trust)

BMH/HRD/2018/388

Date: 17.05.2018

TO WHOM SO EVER IT MAY CONCERN

The certificate is awarded to **Mrs. Anshu Saxena** in recognition of having successfully completed her internship in **Quality Department** and has successfully completed her project on "Effective Utilization of Operation Theatre" from **12th Feb 2018 to 12th May 2018**, from **Bhagwan Mahaveer Cancer Hospital and Research Centre, Jaipur.**

We wish her all the best for future endeavors.

Bhattacharya
Tapti Bhattacharya
Head- HR & Training



THE IIHMR UNIVERSITY, JAIPUR**CERTIFICATE BY SCHOLAR**

This is to certify that the dissertation titled Study on Operation theatre utilization of **Bhagwan Mahaveer Cancer Hospital and Research Center, Jaipur** and submitted by **Mrs Anshu Saxena** Enrollment No. IIHMR-U/01/2016-18/0389 under the supervision of **Dr. Charu Mathur** for award of MBA in Hospital and Health of the University carried out during the period from **12 Feb 2018 to 12 May 2018** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.

**Signature**

ANSHU SAXENA

Abstract

To evaluate the utilization of operation theatre at Bhagwan Mahaveer Cancer Hospital and Research Center, Jaipur.

Introduction –

The operation theater (OT) services is one of the vital part of hospital, a key area of significant cost to the hospital and therefore requires efficient utilization.

Improper utilization not only results in loss of revenue, but effects patient treatment resulting in low level of patient satisfaction. This has a major bearing on the overall image of the hospital.

Improving efficiency will lead to higher productivity and yield considerable saving of the resources. Enhancing the efficiency of operation theatre has always been a challenging process; especially in a dynamic healthcare sector with increased complexity of patient care.

Operational Definition-

OT time of a case is defined as the time from when a patient enters an OT until he or she leaves it.

Turnover time is the time from when one patient exits an OT until the next patient on that day's OT schedule enters the same OT.

OT workload for a service is its total hours of cases including turnover times.

Objective -

1. To find out the OT utilization rate at Bhagwan Mahaveer Cancer Hospital and Research Center, Jaipur.
2. To find out bottlenecks in the system, for proper and efficient utilization of OT.
3. To suggests the remedial measures to improve the OT utilization.

MATERIAL AND METHODS

Study Design -

Prospective, Observational study.

Setting-

BMCHRC Operation Theater complex (OT1, OT2, OT3, OT4), Jaipur.

Duration of Study -

February to March 2018

Sample Size-

203 cases

Data Collection Procedure-

Primary data collected from observation and information gathered by discussion with staff.

Secondary data collected from OT register and OT schedule.

Data Analysis Procedure -

Microsoft Excel

Conclusion

On the whole it has been observed that the hospital has a very low OT utilization rate. Detail below is a thorough analysis of the same. There is a need to urgently address some of the pressing underlying issues that can be resolved by using simple management techniques listed below –

1. Implement automated scheduling mechanism,
2. Train the surgical staff in the time management techniques,
3. Introduce the concept of Key performance indicators on real time basis and train the staff to respond to them by taking corrective measures.
4. Evaluate the progress in weekly and monthly meetings on the progress of improvements in Key performance indicators.

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Here at this prestigious hospital I was supported in my study by a very helpful and cooperative members of the senior management staff,

Dr. Atul Adani, Managing Director,
Kajol Shah, Quality Executive.

They not only shared their experiences from their daily working of the hospital but also helped me understand the practical side of the hospital management. So also all the other doctors, operation theater staff that I interacted with daily.

This whole project would not be possible without the able academic guidance provided by my mentor

Dr. Charu Mathur, Asst. Professor

I here in would especially like to thank here my parents, my in-laws who understood my time constraints and very graciously took over the responsibility of running my household, leaving me free to focus on my dissertation.

My husband who brain stormed with me on every aspect of this dissertation and my son who calmed me down with his bear-hugs when the anxieties got the better of me.

Thank you this would not have been possible without you all.

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1. Introduction

As the homo-sapiens evolved from their early primitive societies into modern day sophisticated, progressive, hyper connected societies of various hues. It is well documented that those societies that nurtured their primal institutions such as that for law and order, economy, defense, education and health have progressed at much faster pace.

Hospital contribute massively in the general health and wellbeing of a society. It is common knowledge that healthier the society more would be the per-capita output of the society.

Health care today is a sophisticated institution. Modern day health care is a sum total of several specialized streams such as Laboratory, Radiology, and Surgery etc. each dealing with a specific aspect of the health care.

“Surgery by definition, is the art, practice, or work of treating diseases, injuries, or deformities by manual or operative procedures.”

Surgeries are carried out in special enclosures called as the operating theaters. These are special quarantined enclosures that are equipped with a lot of very expensive lifesaving equipment's and instruments used to perform the procedures on human bodies; besides employing some very specialized technicians performing these procedures.

Thus the amount of investment that a hospital makes in the building this space is substantial. One of the basic principles of economy states that something that is scarce is costly. Hence the necessity to maximize the utilization of the available resources that have been invested in building and maintaining this space.

This becomes more critical when we are providing healthcare where the number of patient needing health care outstrip the availability of such facilities. In the Bhagwan Mahavir Cancer Hospital this is especially true as it is one of the few hospitals of its kind, which provides cancer treatment in the state of Rajasthan, India.

Thus management of this hospital that has invested in more than one Operation Theater is very conscious of their maximum utilization. Operation theater utilization becomes a very a critical management KPI for the good and efficient management of these specialty hospital.

2. Literature Review

Operation theaters are not only a location of significant cost, but also a source of revenue for the hospital. As such it is important that we utilize them in an efficient and effective manner to maximize the revenues and lower the costs.

2.1 Scheduling

It is one of the main challenges that every OT manager faces while managing the OT operations. Scheduling is defined as “defining the sequence and time allocated to the activities of a medical procedure. It is the construction of a detailed timetable that shows at what time or date jobs should start and when they should end.”

The literature review of Magerlein and Martin on surgical demand scheduling and distinguished between advance scheduling and allocation scheduling. Advance scheduling is the process of fixing a surgery date for a patient, whereas allocation scheduling determines the operating room and the starting time of the procedure on a specific day of the surgery. Both these scheduling features form an essential part integral to scheduling process.

2.2 Understanding Utilization

The utilization rate of the operating theatre should be maximized as underutilized OT represent costs, which can be avoided. On the other hand an OT that is fully planned with cases and without any time buffers is very unstable and exhibits large uncertainty costs. The slightest change (Eg. a surgical procedure that takes longer than planned) may cause high costs like staff overtime costs and patient deferrals. Many studies elaborate on this trade-off and evaluate procedures based on the OT efficiency, which is a measure that incorporates both the underutilization and the overutilization of the OT.

“Utilization refers to the workload of a resource, whereas under time or overtime includes some timing aspect”. Hence it is possible to have an underutilized OT complex although overtime may occur in some of the operating rooms. Underutilization and under time and overutilization and overtime are grouped separately. In order to determine the extent of underutilization or overutilization, a target utilization level has to be defined.

Although this target level is mostly assumed to be 100%, Van Houdenhoven et al. indicate that this is a strategic decision that may vary between hospitals to hospitals.

2.3 OT Start Time

A study on starting on time operation theatre Koenig et al. have demonstrated that it does not matter whether ‘start time’ refers to the ‘start of anesthesia’ or the ‘start of surgery’ because if one of these is fixed then the other follows automatically as a probabilistic estimate. All that is important is that a clear pre-determined definition exists within hospital management, surgical teams and

Prompt starts would seem important. If a list starts late, it should be expected to finish late. With late starts, the scheduled time (which has been budgeted in advance) will be wasted and with late finishes, un-budgeted overtime costs are incurred, with the added risk of unplanned patient cancellation.

Pandit JJ, Abbott T, Pandit M, Kapila A, Abraham R. ‘starting on time’ is useful. Start times are monitored routinely and are used both as local ‘key performance indicators’ to guide planning and occasionally to pressurize individuals or teams to change behavior, attitudes or policies.

Garg R, Bhalotra AR, Bhadoria P, Gupta N, Anand R. Reasons for cancellation of cases on the day of surgery -Cancellation of scheduled operations is a major cause of inefficient use of operating-room time and a waste of resources. The decision to postpone surgery in a patient after admission for surgery has psychological, social and economic implications, and is not only based on clinical considerations.

2.4 Dashboard

Leveraging real time data captured from automated workflow allows the use of analytics to measure, sustain & improve surgical efficiency in predicting staff requirements of equipment’s and supplies and clinical quality as well as quantify success against key performance indicators such as – Block utilization, Prime time utilization, cancellation rates, first and subsequent on time start, turn over time, patient safety metrics.

The operating room dashboard a research review by Kyung W park, states an emerging best practice among leading best hospital is OR Dashboard an enabling management tool that present objective information to OT decision maker.

The dashboard funnels information from diverse sources and display key performances metrics in a limited space. The data is the dashboard is relevant and meaningful for eg, the OT manager if seeks to reduce the first case delay it is important to have consensus on what constitute the start time and the source data should reflect that. A Dashboard is effective in facilitating improvement in process and outcome. Dashboard display information intuitively that helps in grasping quickly the variations outliers and significant trends.

3. Methodology

The most suited methodology to understand the utilization rate of the OT was thought to be the “observational method”; the mitigating factor for choosing this methodology was as follows –

1. Time available for this study was only one month of data collection which began in middle of one month and ended in the middle of the other month,
2. The variables such as scheduling, staff allocation was not under the control of the researcher,
3. Since the operational theater rate needs to be calculated the study is statistical in nature.

3.1 Data Collection

The data for the observed period of 1 month or 23 working days was collected on the excel sheet by recording the following values for each of these variables.

Date
 Ward
 Name of the Patient
 Operation Theater # (in which the procedure is to be performed)
 Pre-Operation Theater Arrival Time
 Wheel-In Time
 Wheel-Out Time
 Status (Completed/Postponed/Cancelled)

This raw data collection by the researcher was followed by the cleaning and validating of the same with the various data recorded in the hospital.

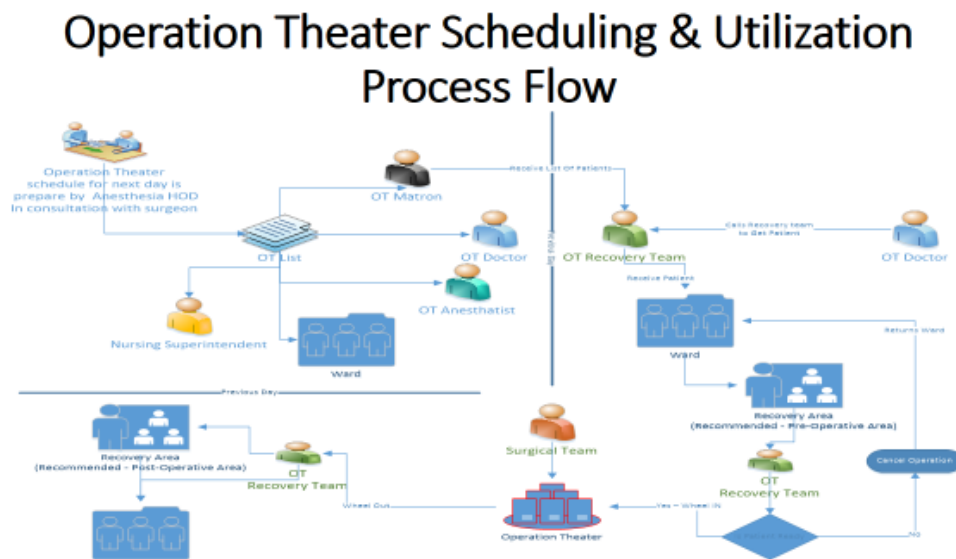
The data was then collected into the groups of OT's, Operations performed. Various time intervals were then calculated on the same excel sheet. The time intervals so calculated were –

Total operating hours
 Delayed start
 Early close
 Overtime hours.

Another statistical figure that need to be calculated was the number of operations that were either cancelled or postponed.

3.2 Process Flow

Before we could even attempt to identify the bottlenecks in the process involved; we have to understand the process flow itself. The best way to understand the process is to conduct the interviews of all the stake holders in the process. As such detail interviews were conducted by the researcher to understand the process actually implemented in the hospital. Based upon these interviews a detailed process flow diagram was drawn.



Dig # 1. Process Flow

This process flow diagram was later validated by the operations manager for its authenticity.

After which the study was conducted to relate various elements of the process and the statistical data collected.

It was felt to accurately gauge the discrepancies, it would not be proper to just use the central tendencies such as averages but also median values. Averages is a quantity that represents or approximates an arithmetic mean, where as a median is a middle number that tends to reveal the value in the center of the distribution for an array of data. Which means the most likely occurring value.

4. Results

As detailed previously the raw data collected on the excel sheet was then arranged in various tables to better understand its implications and its significance.

Overall the hospital had 4 operation theater for which the observations were made and data was collected. The total number of days for which the data was collected was for the 23 working days. The total number of observations across the different OT's thus added up to 92 total observations.

4.1 OT Utilization

First table that was derived from the raw data was a table that was used to calculate the various time intervals and the data was arranged in a single row per observational day per OT.

		First Oper. Hrs Utilized	Second Oper. Hrs Utilized	Third Oper. Hrs Utilized	Fourth Oper. Hrs Utilized	Fifth Oper. Hrs Utilized	Total Operatin g Hours	Total Working Hours	Delayed Start Hours	Early Close Hours	Overtime Hours	Turnover Time Hours	Control	Total No of Operatio ns
OT1	15/02/201	2:25	5:40				8:05	8:00			0:10	0:05	8:00	2
OT1	16/02/201	1:45	1:06	4:39			7:30	8:00	0:35		0:15	0:10	8:00	3
OT1	17/02/201	2:20	1:20	5:55			9:35	8:00	1:10		3:05	0:20	8:00	3
OT1	19/02/201	3:29	4:05				7:34	8:00	0:29		0:20	0:17	8:00	2
OT2	15/02/201	7:55					7:55	8:00	0:45		0:40		8:00	1
OT2	16/02/201	2:59					2:59	8:00	0:50	4:11			8:00	1
OT2	17/02/201	4:19	2:13				6:32	8:00	0:56	0:07		0:25	8:00	2
OT2	19/02/201	7:46					7:46	8:00	2:29		2:15		8:00	1
OT3	15/02/201	2:15	2:40				4:55	8:00	0:30	1:25		1:10	8:00	2
OT3	16/02/201	2:16	0:25	5:44			8:25	8:00	1:01		1:40	0:14	8:00	3
OT3	17/02/201	5:10	1:10				6:20	8:00	1:10	0:20		0:10	8:00	2
OT3	19/02/201	5:30					5:30	8:00	0:30	2:00			8:00	1
OT4	15/02/201	6:50					6:50	8:00	0:30	0:40			8:00	1
OT4	16/02/201	4:50					4:50	8:00	1:00	2:10			8:00	1
OT4	17/02/201	4:25	1:30				5:55	8:00	1:20	0:15		0:30	8:00	2
OT4	19/02/201	2:45					2:45	8:00	1:20	3:55			8:00	1

Table # 1 Organized by Operation Theater

The above data is just a sample of the complete set of the data. The arrangement data in the table was the operation theater followed by the date of observations, OT time used for each operation conducted in that particular OT and the various time intervals observed for that instance. A control column was used to make sure that all the values added up to the correct time duration.

This table was used to segregate the overtime in each OT as the OT utilization methodology prescribes that only the regular working hours be considered while calculating the OT utilization rate.

Now to calculate the total OT utilization rate we need to first calculate the number of hours the OT was used. As on any given day the number of operations performed would vary, hence the effective utilization of the OT would be the sum total of all the hours used for performing the operation in that OT within the prescribed working hours.

$$\text{Effective working hours} = \int_1^n (\text{wheelIn Time} - \text{Wheelout Time})$$

This is followed by calculation of the calculation of 3 types of the OT utilizations rates

In the 1st method is the cumulative OT utilization rate and is calculated by using the following formulae.

$$\text{OT Utilization} = (\text{Total Effective Working hours} / \text{Total working hours}) * 100$$

In the 2nd method is the average OT utilization calculation in which an average OT utilization on observed period is calculated by using the following formulae.

$$\text{OT Utilization} = (\text{Avg. Effective Working hours} / \text{Total working hours}) * 100$$

3rd method is the median OT utilization calculation in which OT utilization rate is calculated using median effective working hours for the observed period, this is used to arrive at a most probable utilization rate for an OT in the observed period on any given day.

$$\text{OT Utilization} = (\text{Med. Effective Working hours} / \text{Total working hours}) * 100$$

The three different methods were used for following reasons as stated. The cumulative OT utilization was used to justify the data validity by arriving on the rate of utilization similar to that calculated by the hospital.

The second method was used to understand the cumulative effects the early close and delayed starts have if we reduce the observed period to a single working day.

Whereas the median utilization rate is used to ascertain if the most probable utilization hours would be lower or higher than the average utilization hours. As the average would typically consider the aberrational observations such as high utilization of working hours on any given day or an observation of minimal utilization, but is usually not the case.

4.2 Time Seepage Calculation

Another important observation on the data after it was tabulated as above is that; across the board, there was either a delayed start or early close in every OT observation irrespective of the observational day. Hence it necessitated another data view as detailed below.

In this data set a consolidation of various time intervals into separate blocks is done. The reason for the creation of this data view was to get an overall understanding of the hours being lost under each time interval in relation to the OT individually or the hospital as a whole.

Delayed Start					Early Close					Turnover Time					No. Of Operations				
OT1	OT2	OT3	OT4		OT1	OT2	OT3	OT4		OT1	OT2	OT3	OT4		OT1	OT2	OT3	OT4	
0:00	0:45	0:30	0:30		0:00	0:00	1:25	0:40		0:05	0:00	1:10	0:00		2	1	2	1	
0:35	0:50	1:01	1:00		0:00	4:11	0:00	2:10		0:10	0:00	0:14	0:00		3	1	3	1	
1:10	0:56	1:10	1:20		0:00	0:07	0:20	0:15		0:20	0:25	0:10	0:30		3	2	2	2	
0:29	2:29	0:30	1:20		0:00	0:00	2:00	3:55		0:17	0:00	0:00	0:00		2	1	1	1	
1:23	1:07	1:00	0:50		0:45	3:19	2:40	0:35		0:56	0:00	0:00	0:10		2	1	1	3	
1:00	0:34	0:30	0:20		0:00	2:00	1:30	0:45		0:25	0:25	0:25	0:25		2	2	2	2	
1:10	1:05	1:25	0:10		2:20	3:20	1:00	0:00		0:25	0:05	0:50	0:00		2	3	2	1	

Table # 2 Time Interval Blocks

Another view on the time interval seepage was created this time grouped by individual OT's. This was to understand which OT was getting most effected by which form of time seepage.

	Operation Theater 1				Operation Theater 2				Operation Theater 3				Operation Theater 4		
	Delayed	E. Close	TurnAround		Delayed	E. Close	TurnAround		Delayed	E. Close	TurnAround		Delayed	E. Close	TurnAround
Hours	2.2	6.3	0		12.32	12.19	0		2.3	4.4	0		5.53	9.15	0
1 Operations	1	1	1		1	1	1		1	1	1		1	1	1
No of Instances	4	4	4		10	10	10		3	3	3		7	7	7
Hours	6.24	6.1	7.53		4.05	2.17	2.3		8.1	10.05	4.23		2.15	1	1.4
2 Operations	2	2	2		2	2	2		2	2	2		2	2	2
No of Instances	10	10	10		5	5	5		13	13	13		5	5	5
Hours	4.25	0.1	5.35		5.33	5.2	2.51		2.16	0	2.37		6.15	2.5	8.09
3 Operations	3	3	3		3	3	3		3	3	3		3	3	3
No of Instances	8	8	8		6	6	6		3	3	3		9	9	9
Hours	0.3	0	0.2		2.07	0.1	3.46		1	0	3.45		0.5	0	0.4
4 Operations	4	4	4		4	4	4		4	4	4		4	4	4
No of Instances	1	1	1		2	2	2		3	3	3		2	2	2

Table # 3 Operation Theater consolidated blocks

During the course of data consolidation the researcher observed that the time seepage seemed to more dependent on the number of operations being performed in a particular OT.

Another observation was that delayed start was one of the persistent factor effecting the overall performance of some OT, but it was not necessarily the only or dominant factor for the other OT's. This meant that making a sweeping assumption across the OT's would not be correct. This established the fact that different time seepage were responsible for loss of time in a working day in different OT's and problems were systemic rather than aberrational phenomenon.

Hence another view was created to observe how many operations were primarily performed in a theater on a day and which time seepage was most likely to effect this OT under different scenarios of the number of operations performed in a day.

	OT1		OT2		OT3		OT4	
	Delayed Start	Instances Of Operation	Delayed Start	Instances Of Operations	Delayed Start	Instances Of Operations	Delayed Start	Instances Of Operations
1	2.2	4	12.32	10	2.3	3	5.53	7
2	6.24	10	4.05	5	8.1	13	2.15	5
3	4.25	8	5.33	6	2.16	3	6.15	9
4	0.3	1	2.07	2	1	3	5	2
	OT1		OT2		OT3		OT4	
	Early Close	Instances Of Operation	Early Close	Instances Of Operation	Early Close	Instances Of Operation	Early Close	Instances Of Operation
1	6.3	4	12.19	10	4.4	3	9.15	7
2	6.1	10	2.7	5	10.5	13	1	5
3	0.1	8	5.2	6	0	3	2.5	9
4	0	1	0.1	2	0	3	0	2
	OT1		OT2		OT3		OT4	
	TurnAround	Instances Of Operation	TurnAround	Instances Of Operation	TurnAround	Instances Of Operation	TurnAround	Instances Of Operation
1	0	4	0	10	0	3	0	7
2	7.53	10	2.3	5	4.23	13	1.4	5
3	5.35	8	2.51	6	2.37	3	8.09	9
4	0.2	1	3.46	2	3.45	3	0.4	2

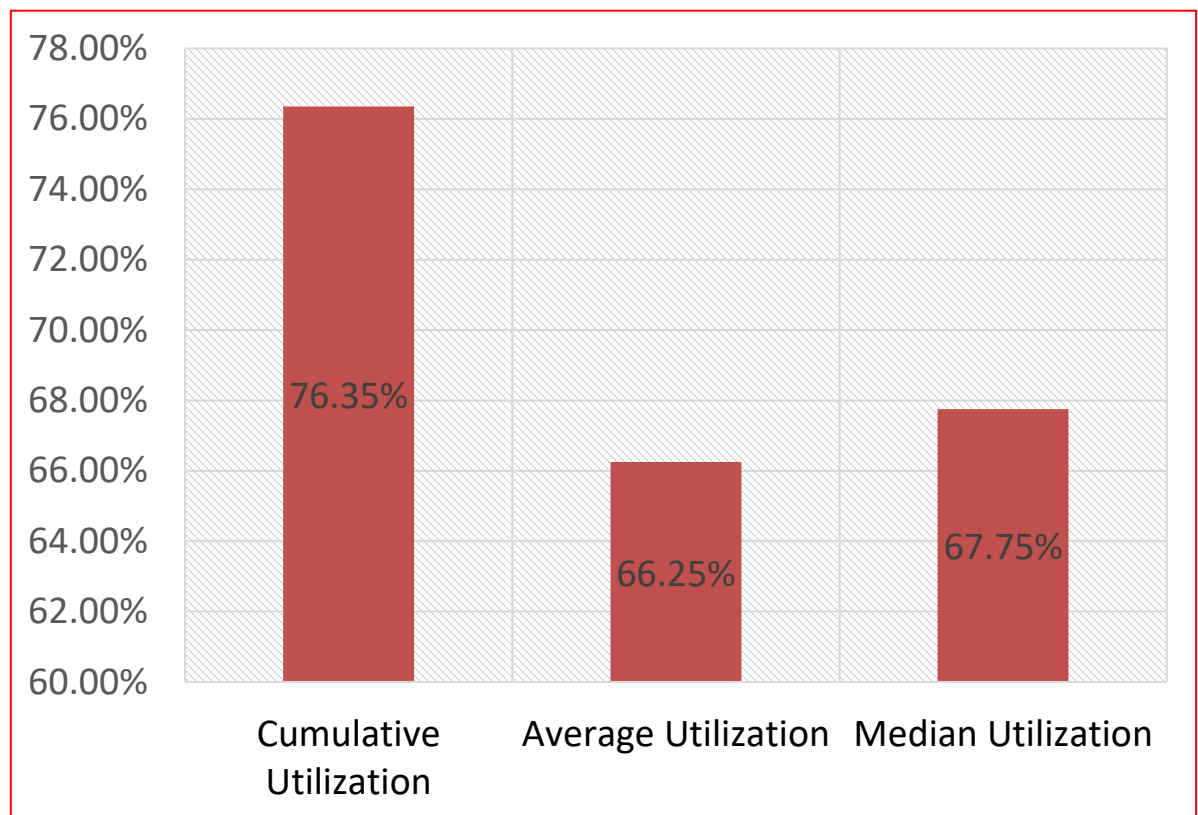
Table # 4 Instances of operations Per OT

5. Discussion

A comprehensive data analysis has yielded a cohesive argument that helps us justify our conclusion. It is common knowledge that it is much easier to elucidate our arguments using graphical representation and as such we discuss in this section what the researcher believes is the logical explanations.

5.1 OT Utilization Rate

This is one of the major indicators used by the hospital management to ascertain the efficiency of the OT usage.



Diag # 2. OT Utilization

There are three bars each representing a mathematical computation for the operation theater utilization for understanding the current status accurately.

Cumulative Utilization – It is simple addition all the utilized hours against the available hours for the observed duration.

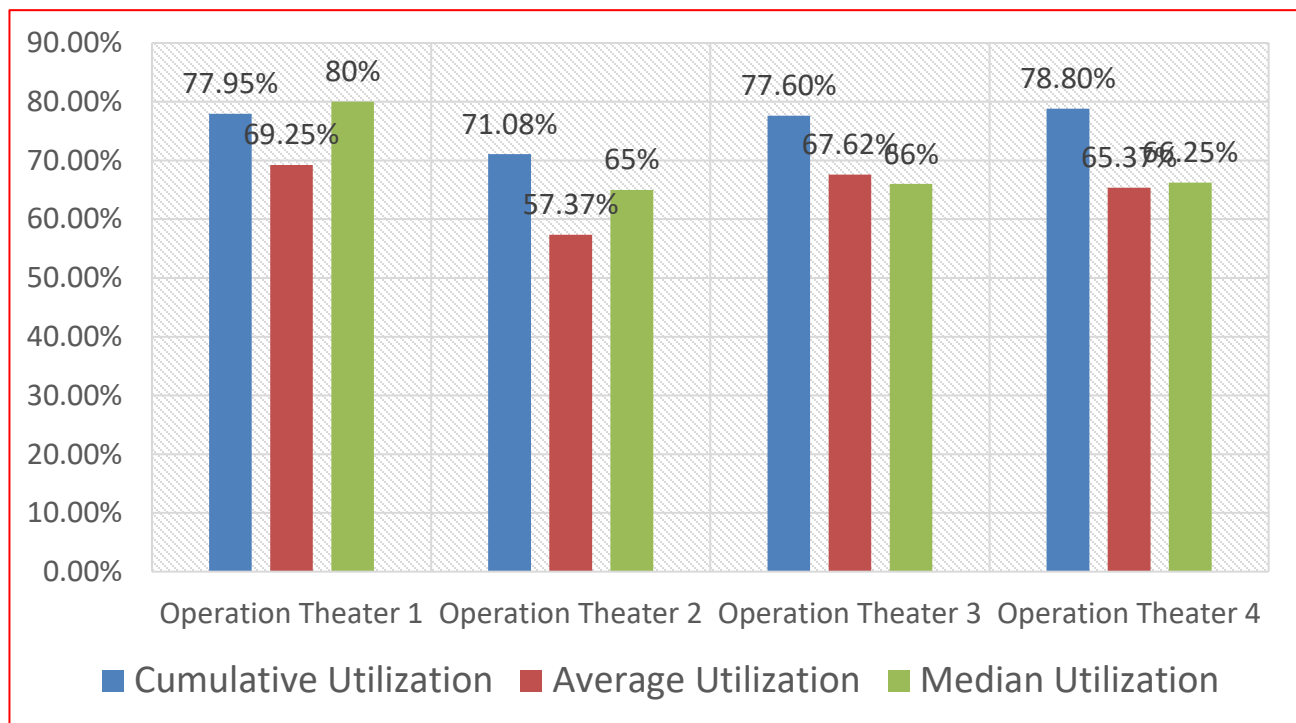
Average Utilization – It is an estimation to understand how many hours of operation theater was utilized in a day i.e. of eight hours available generally.

Median Utilization – It is an estimation that is done to remove the aberrations for the observed period. Aberrations for days when the utilization has been really low because of some practical reasons. But is not usually the case.

*Note – Overtime (OT utilized beyond working hours) is not considered for OT utilization computation.

5.1.1 Primary Discussions on Utilization

Each operation theater is utilized for an average of five and a half hour each-day. We have four functional theaters, so cumulatively we are not utilizing ten hours of Operation Theater a day. Which is similar to saying one Operation theater is not used each day.



Diag # 3. OT Utilization By Individual OT

The median value in the graph on previous slide is higher than the average value which means that “low utilization” cases are ignored while calculating median. Since the difference between average and median values is one and half percentage points. Of the ninety two overall observation only two observations were ignored as outliers.

Which brings us to believe that the problem is systemic and not an aberrational or one off. This also brings us to another very important juncture, where we need to investigate further as to what are the reasons in each OT for the low

OT efficiency. Also try to determine if the OT utilization pattern is same for all the OT's or is it different. In our quest to do so we create a similar but different OT utilization graph for each OT separately as shown above.

5.1.2 OT Efficiency of Each OT Analyzed

OT1 & OT2 show a differential between average and median equivalent to 10 - 8 percentage points. Where the median is higher; which means that number of outliers having low utilization is high and is not consistent. Hence when we calculate the average it is depressed.

OT3 shows Median is lower showing that high utilization is an outlier and happens some time as the difference between the two is just 1 percentage point and the OT is consistently underutilized and hence the median is lower than average.

OT4 shows that they are consistent in utilizing the OT but unfortunately underutilizing. So also there are no aberrations to this pattern which means they are pretty good with scheduling.

The above observations make it pertinent for us to dig in deeper, and try to understand where the loss of time is occurring. Hence we plot a bubble chart to quantify which are the instances where time seepage is most evident and which are the instances which need to be addressed on the priority basis. In the following bubble chart we put size of the bubble as the most number of operations performed; because those are the instances where the value of the time seepage becomes prominent.

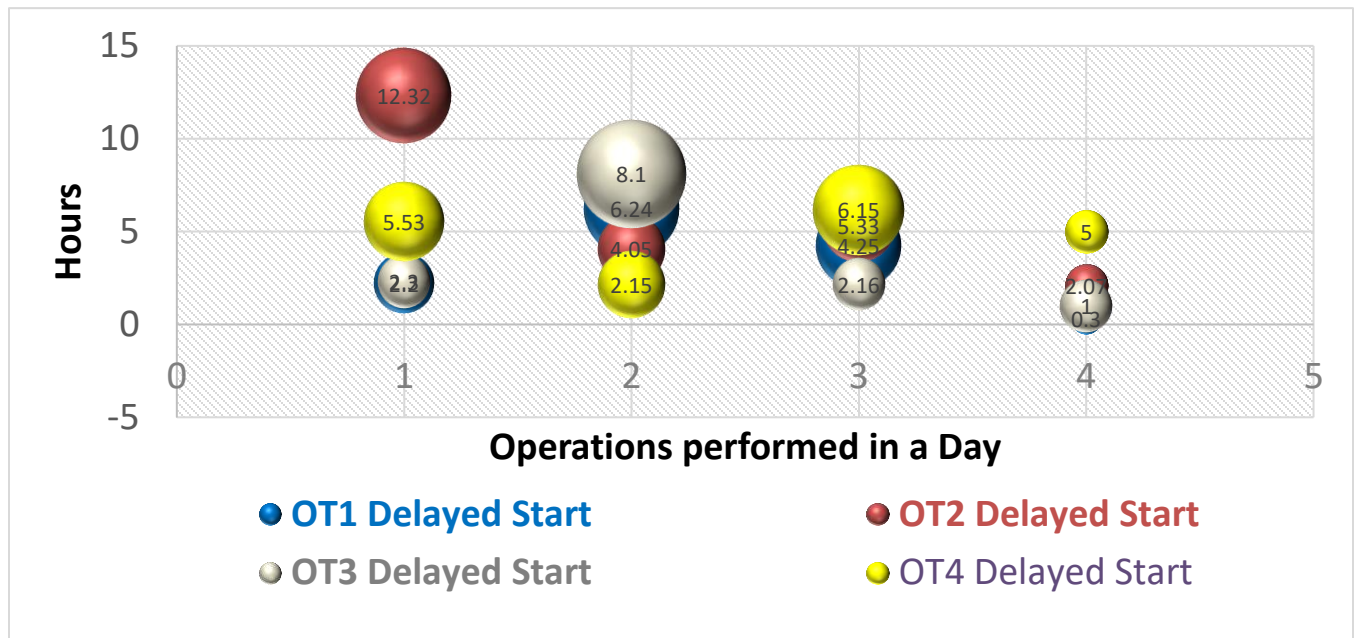
5.1.3 Delayed Start

OT1 has almost evenly distributed number of 2-3 operations scheduled for a day where the delayed start is effecting the overall performance.

OT2 has maximum number of 1 operations scheduled for a day where the delayed start is an issue.

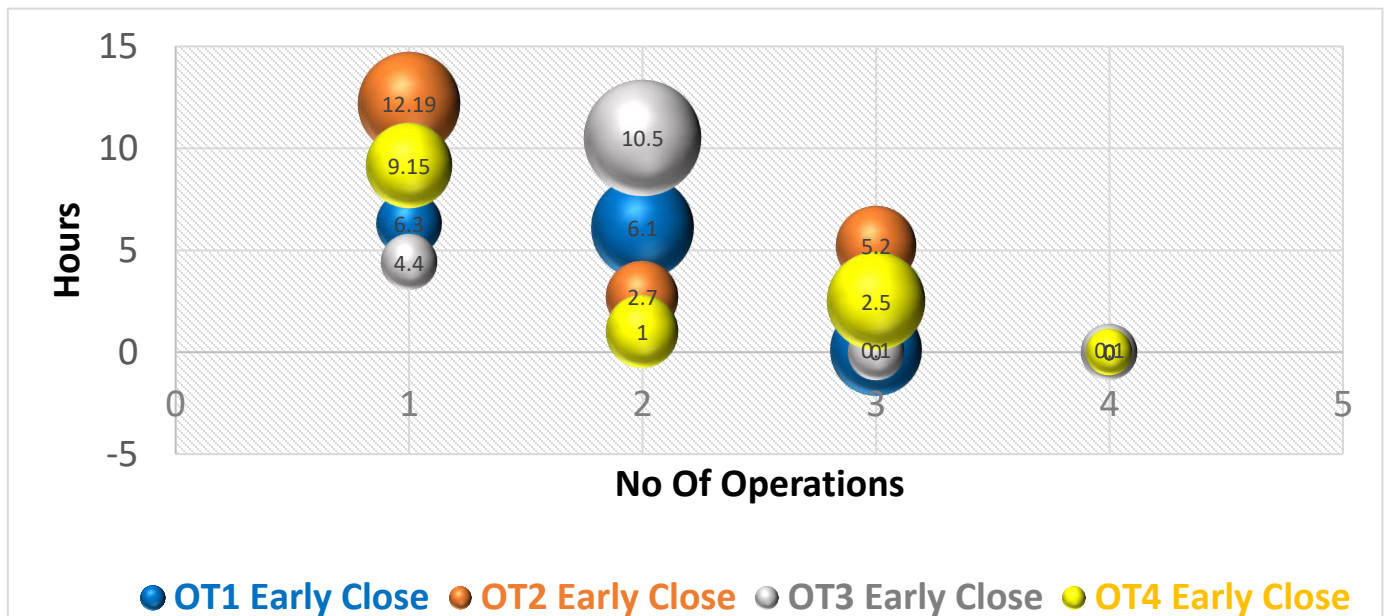
OT3 has maximum number of 2 operations scheduled in a day where delayed start is an issue.

OT4 has maximum number of 3 operations scheduled in a day where delayed start is an issue.



Diag # 4. Delayed Start

5.1.4 Early Close



Diag # 5. Early Close

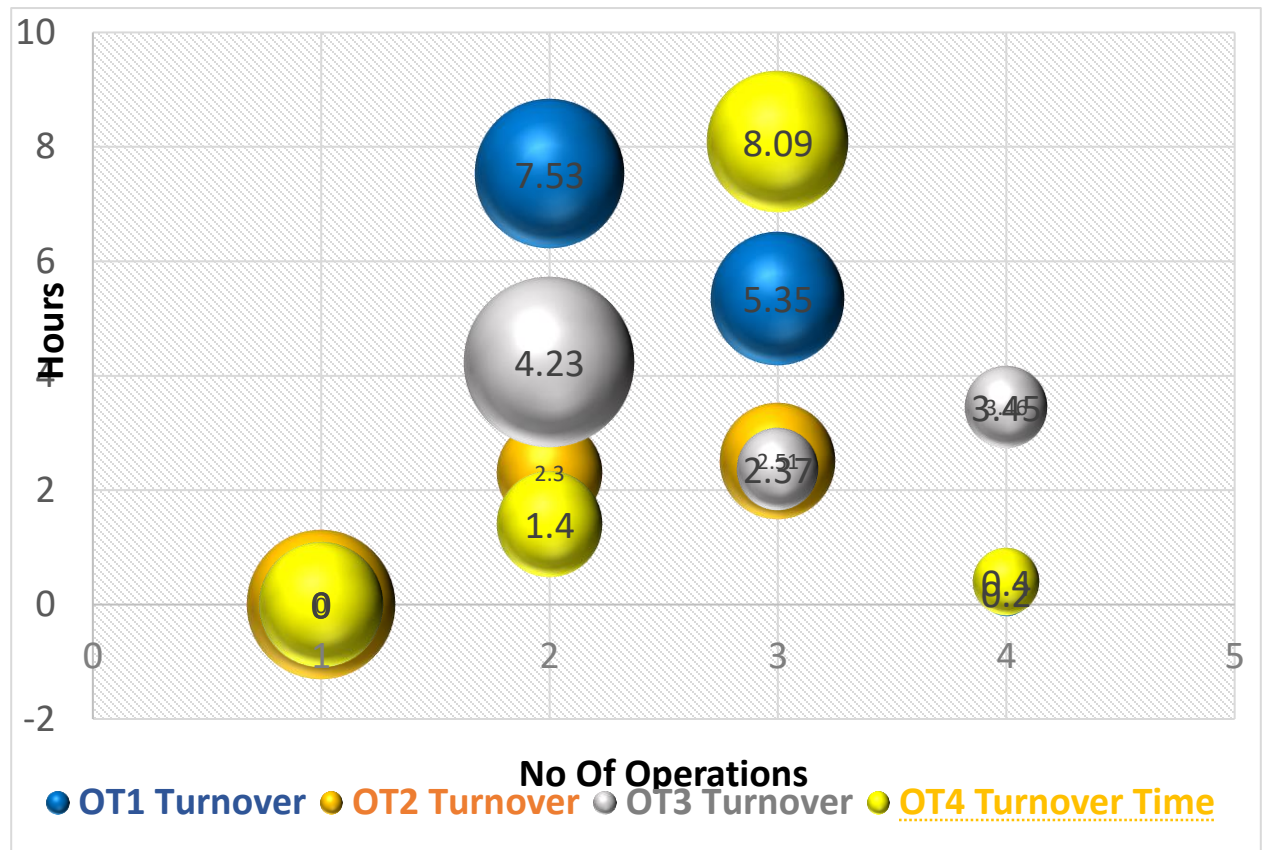
OT1 has almost evenly distributed number of 2-3 operations scheduled for a day but it is only when we have 2 operations that they are closing early and is effecting the overall performance.

OT2 has maximum number of 1 operations scheduled for a day where the early closing is an issue.

OT3 has maximum number of 2 operations scheduled in a day where early closing is an issue.

OT4 has maximum number of 3 operations scheduled in a day but it's whenever they have 1 operation scheduled they are closing early.

5.1.5 Turnaround Time Seepage

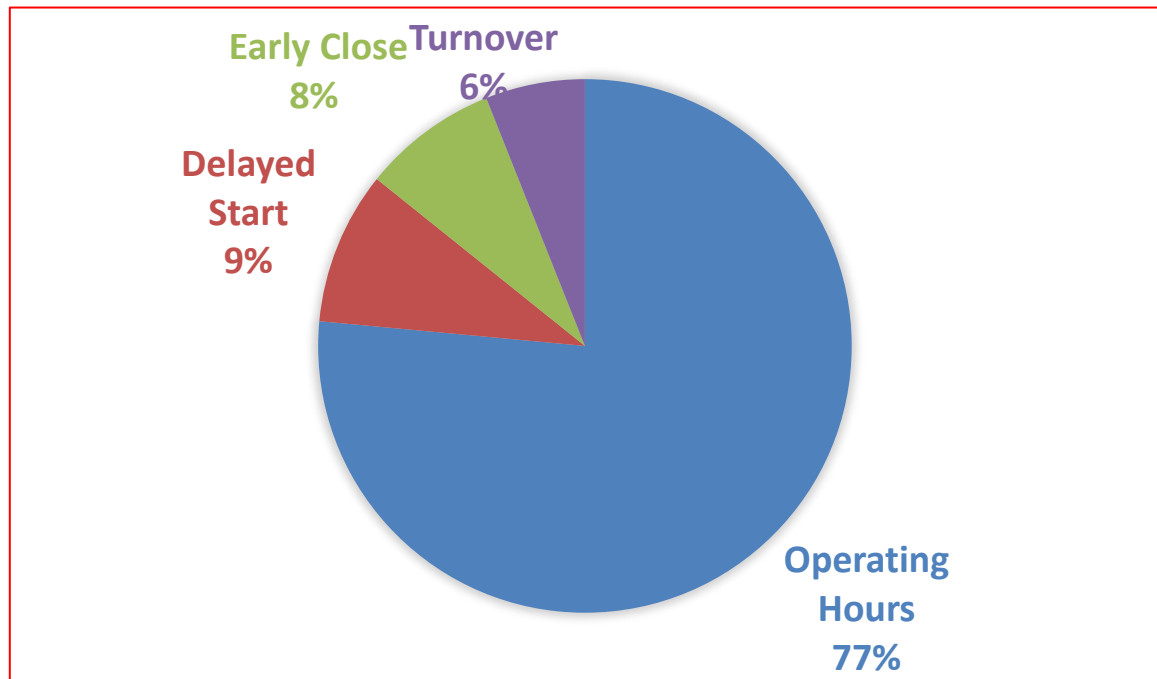


Diag # 6. Turnaround Time seepage

Turnaround time is the time needed to wheel out a patient, clean the operating theater and to wheel in the new patient. All the OT's show inconsistency in the amount of time taken between operations.

This is an issue which requires that operation theater and management staff need to brain storm and agree upon a period that should be consistently followed between the two operations.

To sum it all together let us try to now quantify, how much of overall all time is lost in various time seepages any given time duration.



Diag # 7. Overall Time seepage share

The following graph typically depicts the loss of hours due to various reasons in the daily operation theater working. To elucidate further, of the 736 working hours observed; we have not utilized total 173 hours for the various reasons. These will be discussed at length in the conclusion.

6. Conclusion

In the preceding section of this report we have systematically analyzed the data and presented the reasons for the low utilization of the OT in the hospital. It is safe to make following conclusions –

6.1 Time Management

The hospital seems to be grappling with the problem of trying to prioritize the between the overlap of academic studies with the operating schedules. This has resulted in the delayed starts for the procedures in the operating theater.

Hospital also follows a process of allotting OT's to individual doctors, which consequently means they are free to schedule the operations as per their convenience. This has resulted in slackness on the part of the doctors and anesthetists in scheduling of the operations. Resulting in early closes.

Hospital's operating staff and the management has to arrive at a consensus time being spent between the operating procedures where the operations are scheduled in succession on the same day.

Besides this there has to be a firm adherence to the policy of publishing the start time of an operation in advance so that the support staff have the complete understanding of by when they have to make the patient ready for the operation.

6.2 Electronic Scheduling

Currently scheduling process is undertaken is manual and suffers from several deficiencies. Such as –

1. competing anesthetist time between the two OT's,
2. availability of the assisting surgeons is an issue,
3. publishing of OT schedule list does not leave enough time for the support staff to take corrective action in case of some missing pre-requisites,
4. Emergencies are not factored in the scheduling process.

As such it is strongly recommended here in to adopt the following corrective measures.

6.3 Corrective measures

Implementing the Electronic scheduling will have compounding impact on the overall working of the operation theatres. Some of the high points are mentioned here in –

Variable OT room access (set aside time to accommodate historical add ons w/o disrupting elective schedule).

Accurate case duration estimates.

Visual dashboards in preoperative area enable real time patient tracking and status update.

Leveraging real time data captured from automated workflow allows the use of analytics to measure, sustain & improve surgical efficiency and clinical quality as well as quantify success against key performance indicators such as – Block utilization, Prime time utilization, and cancellation rates, first & subsequent on time start, turn over time, patient safety metrics.

Preoperative work ups including consultations, tests, and labs to be built in electronic check lists where items required to be completed before the day of surgery admission can be monitored for the completion. This eliminates the risk of day of surgery cancellations, staff can look for incomplete preops.

Time Management trainings for the doctors and OT staff. This will result in change in mind-set to highlight the importance of OT utilization.

Financial Orientation trainings for the doctors, surgical ward staff. This will make them aware and appreciative of the management austerity measures and the reasons for it.

Job oriented technical trainings for all ward staff / OT staff.

7. Supplementary

7.1 Bibliography -

- McIntosh, Catherine, Franklin Dexter, and Richard H. Epstein. "The impact of service-specific staffing, case scheduling, turnovers, and first-case starts on anesthesia group and operating room productivity: a tutorial using data from an Australian hospital." *Anesthesia & Analgesia* 103, no. 6 (2006): 1499-1516.
- Dextr F, Ledolter J, Wachtel RE. Tactical decision making for selective expansion of operating room resources incorporating financial criteria and uncertainty in subspecialties' future workloads. *Anesthesia & Analgesia*. 2005 May 1;100(5):1425-32.
- Magerlein JM, Martin JB. Surgical demand scheduling: a review. *Health services research*. 1978;13(4):418.
- Park KW, Smaltz D, McFadden D, Souba W. The operating room dashboard. *Journal of Surgical Research*. 2010 Dec 1;164(2):294-300.
- Gordon T, Paul S, Lyles A, Fountain J. Surgical unit time utilization review: resource utilization and management implications. *Journal of Medical Systems*. 1988 Jun 1;12(3):169-79.
- Pandit JJ, Abbott T, Pandit M, Kapila A, Abraham R. Is 'starting on time' useful (or useless) as a surrogate measure for 'surgical theatre efficiency'?. *Anaesthesia*. 2012 Aug 1;67(8):823-32.
- Garg R, Bhalotra AR, Bhadoria P, Gupta N, Anand R. Reasons for cancellation of cases on the day of surgery—a prospective study. *Indian journal of anaesthesia*. 2009 Feb;53(1):35.
- Marjamaa R, Vakkuri A, Kirvelä O. Operating room management: why, how and by whom?. *Acta Anaesthesiologica Scandinavica*. 2008 May 1;52(5):596-600.
- Jonnalagadda R, Walrond ER, Hariharan S, Walrond M, Prasad C. Evaluation of the reasons for cancellations and delays of surgical procedures in a

developing country. International journal of clinical practice. 2005 Jun
1;59(6):716-20.

- Przasnyski ZH. Operating room scheduling. AORN journal. 1986 Jul
1;44(1):67-8.