

Original Research Article

Analysis of Start Time Delay in Operation Theatre Lists

Mohinder Kumar¹, Suchitra Malhotra², Vishal Singla³, Kiran Bhatia⁴

¹Professor, Department of Surgery, MMIMSR, Mullana, Ambala, Haryana, India

^{2,4}Associate Professor, Department of Anaesthesia, SHKM GMC, Mewat, Haryana, India

³Senior Resident, Department of Anaesthesia, SHKM GMC, Mewat, Haryana, India

***Corresponding author**

Suchitra Malhotra

Email: malhotramfrs@yahoo.co.in

Abstract: The aims and objectives of our study are to analyse resources available in operation theatre (OT), improve teamwork dynamics and maximize the use of surgical capacity with ultimate goal to reduce the pre-operative stay in hospital and decreases the burden on hospital and human resources. Present prospective study was piloted at measurement of two OTs start-time delays during 100 working days and was completed over four months. The variable chosen was the delay in starting up of first case from the benchmark time. The data was collected, compiled and analysed. In our set up in surgery OT analysis of starting time of 100 cases it was found that 33% were within the benchmark time of 9.20 AM, rest 67% were late. The most common reason for the delay was Surgeon related factors (32%), and second most common reason being the patient factors (18%), Anaesthetist factors (7%) also contributed to the delays. While hospital administrative reasons contributed 10%. While in orthopaedics operation theatre analysis of 100 cases it was found that 56% case began on time and only 44% cases were delayed, Hospital related (15 %) reasons were the most important reason or the delays in the OT. Surgeon related (8%) and anaesthetic related (7 %) reasons contributed to the time delays. Patient related reasons were 14%. Study established that morning tardiness should be reduced and there is much scope in improvement in surgeons' related delay in starting up first case in surgery OT. Obviously, some delays are unavoidable. But if those problems that can be easily fixed are attended to, valuable time can be saved, which will ultimately keep the surgeries on schedule throughout the day. Opportunities to improve theatre efficiency were identified.

Keywords: Operation, Operation theatre, Efficiency, Start Time, Delays

INTRODUCTION:

Operation theatre (OT) is an expensive department of the hospital; it constitutes at least one third of hospital budget. Managing operating theatre efficiently is essential as hospitals are pressurized to maximize outcomes with limited resources. Operating rooms starting on time involve team effort of different disciplines and are a true test of Acronym TEAM which means "Together Everybody Achieves the Maximum". Good rapport, good communication skills of OT in charge, dedicated, professionally trained staff, appropriate services, equipment's and layout are the crucial elements in the efficient use of OTs. Start time delays are defined as delays due to failure of process and failure of equipment. Delays in starting first case not only have financial implications but have social implications as it can lead to late cancellation of scheduled operations and can prolong waiting list for hospitals. Start time delay is avoidable issue with

limited influence by external factors if taken care can easily improve OT utilisation.

AIMS AND OBJECTIVES

The aims and objectives of our study are to analyse resources available in OR, improve teamwork dynamics and maximize the use of surgical capacity.

METHODOLOGY

This study was conducted in a 500 bedded tertiary care hospital main OT complex. Start times of morning OT lists of surgery and orthopaedic OTs were recorded. Routine OT timings are from 9.am to 3pm. Nursing, technical, and other supporting staff posted in morning shift works from 8.30am to 3.30pm.

It is a Prospective study spread over four months from August 2015 to November 2015 with a sample size of 200 patients, 100 each in surgery operation theatre and orthopaedics operation theatre for

100 working days. All patients posted for surgery the day before on the OT list and emergency surgeries during elective working hours were included. All surgeries done after 3pm up to 9am on working days were excluded Sundays and public holidays were also excluded As there is no dedicated emergency OT emergency surgeries are conducted in the respective routine OTs. All patients posted for surgery on the day are admitted one night before and are transported in the morning of surgery latest by 9.00 am in the preop holding area. Pre-anaesthetic check-up is done for every patient one day prior to surgery. As the study was part of the quality improvement project ethical clearance was not required. Start time was recorded when first patient was wheeled inside OT by the faculty member of anaesthesia department posted in the respective OT. The first case benchmark time has been taken as 9:20 am as it is the time taken for the OT staff to prepare OT instruments and equipment for the surgeries .Patients wheeled in OT beyond the benchmark time of 9.20 am were considered as delay and the concerned anaesthetist had to assign a reason for the delay. Surgery list finish time was also recorded .Routine list continuing beyond 3.20 pm was considered overrunning of OT. Last minute cancellations in both OTs were noted which was due to lack of OT time .Various data was collected and analysed using MS Excel 2007.

Data was collected from the two OTs and then descriptive analysis was done and causes of delays were found to be surgeon related; anaesthetist related; patient related or hospital related.

Average start time delays in both OTs is shown in Table-1

Table-1: Average start time delay

	Surgery OT	Orthopaedics OT
Average start time delay (in minutes.)	12.14	10.15
Standard Deviation	13.01	15.61

RESULTS

In our set up in surgery OT 33% was within the benchmark time of 9.20 AM, 77% were late. The most common reason for the delay was Surgeon related factors (32%), and second most common reason being the patient factors (18%), Anaesthetist factors (7%) also contributed to the delays. While hospital administrative reasons contributed 10%. Causes of delay in starting surgery OT are shown in Figure 1.

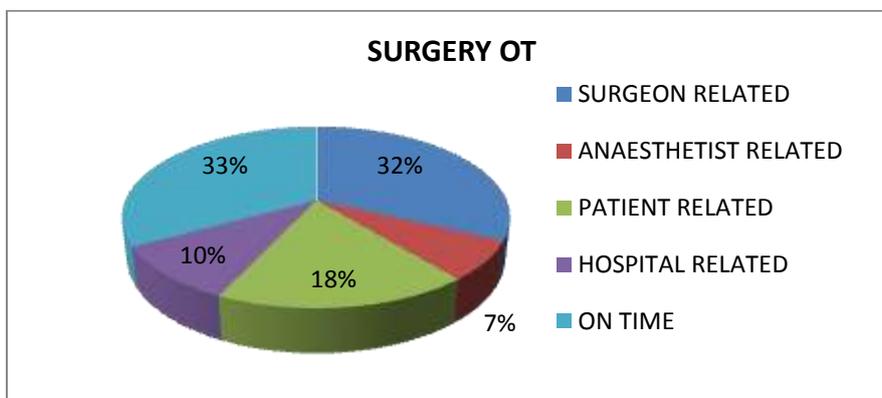


Fig 1: Causes for delay in Surgery OT

While in orthopaedics operation theatre 56% case began on time. Hospital related (15 %) reasons were the most important reason or the delays in the OT. Surgeon related (8%) and anaesthetic related (7 %)

reasons contributed to the time delays. Patient related reasons were 14%. Causes of delay in starting orthopaedics OT is shown in Table -2.

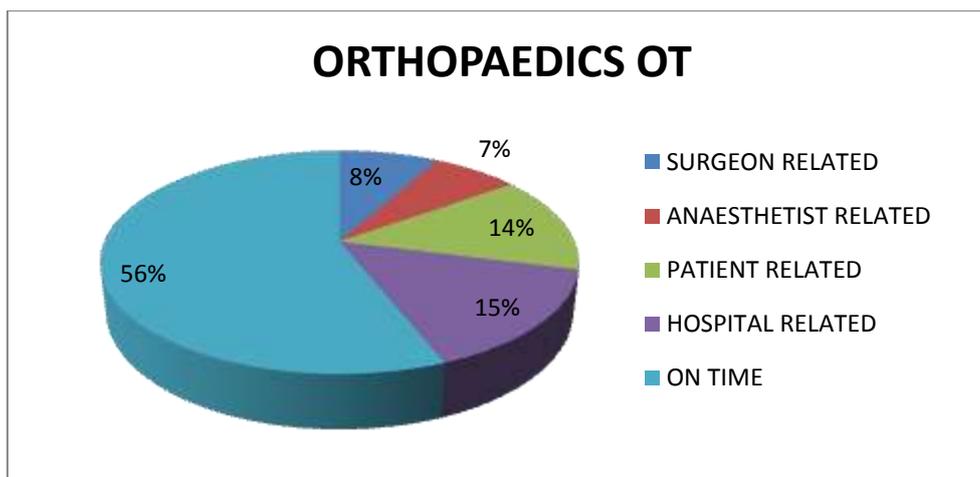


Fig 2: Causes for delay in Orthopaedics OT

Analysis of 200 cases of combined surgery & ortho OTs revealed that first Cases were started late after benchmark time of 9.20 am on 55.5% of days as there was a delay in shifting first case in OT. The causes of delay were;

- Surgeon related-20%
- Anaesthetist related-7%.
- Patient related-16%.
- Hospital related-12.5%
- Surgeon related factor was the most common reason for the delay i.e 20% which were due to:
 - Unavailability of Surgeon [23]
 - Scheduling error --- [6].
 - Equipment related problems---[8]
 - Waiting for senior surgeon in difficult surgeries--- [3].
- Patient related factors--16% was related to:
 - Pre-anaesthetic check-up noncompliance of PAC
 - Patient not being fully optimized--

Patient having rhonchi, fever, respiratory tract infection, ECG to be reviewed, hypertension as antihypertensive dose not given in the morning - [6]

- Patients not willing to sign consent form—[4]
- Patient not reporting on the day of surgery— [2],
- Patient wanted to talk to family/surgeon—[2].
- Medical problems required second opinion of other specialist [3].
- ECG,X-rays investigations were either found abnormal, missing, or awaited [3]
- Adequate blood arrangement had also to be confirmed prior to surgery—[2].
- patient not fasting or in washroom—[2]

Hospital related delays--(12.5%) were due to:

- Infrastructure problems i. e. CSSD, air-conditioning, power supply, water supply, laundry, linen [8].
- Last night emergency going on—[3].
- Fumigation done the night before as infected case (HIV, HBsAg ÷ve) operated last night [2].
- staff on contractual basis, sanitation staff went on strike-[3]
- Delay in shifting patient-[2]
- Equipment failure (cautery/C-arm)—[2].
- OT dress not available—[1].
- Communication gap [3].
- Lack of timely OR preparation by staff [1].
- Anaesthetist related factor was responsible for delay--7% of the time.
- For paediatric patients senior anaesthetist was required[2]
- Anaesthetist unavailability[2],
- Equipment problems such as paediatric endotracheal tube of appropriate size not available, workstation problem, and oxygen cylinder not available [4].
- High risk patient ASAIII/IV was posted as first case [2].
- , Invasive monitoring, or patient with difficult airway needing fiberoptic intubation [3]
- Review PAC by senior anaesthetist also accounted for delay [1].

From anaesthesia point of view we observed that simple short procedures preferably ASA1 or 11 did not cause delay in starting OT list for e.g hernia, lower extremity nailing, plating in young adults.

Avoidable causes of delay were

- Surgeon unavailability,
- Scheduling error,
- Anaesthetist unavailability,
- Delay in shifting patients,
- Supporting staff unavailability,

- Communication gap,
- Blood unavailability,
- Informed consent given night before surgery,
- Compliance of PAC orders,
- Patient apprehension problems
- Availability of lab reports.

Further, our study has shown that delaying of the first case in OT led to stretching of the OT list and thus hampering the emergency services. It has been shown that when the OT list started considerably late, that led on to the case cancellations. Case cancellations adversely affect the reputation of the hospital and the doctors. Also it leads to putting extra burden on already overcrowded wards.

In surgery OT, when the case started by 9:20 am, the OT list finished on time except on 3 occasions and there were no cancellations due to time factor. When the first case started between 9:20 and 9:40 am, there was delay in completion of the OT list for 15 days out of 41 days and also there was cancellation of the last case due to time factor for 3 days out of 41 days. When the first case started between 9:40 and 10:00 am, there was delay in completion of the OT list for 16 days and also there was cancellation of the last case due to time factor for 7 days out of 23 days. When the first case started after 10:00 am, there was cancellation of the last case due to time factor on all the 3 days. Distribution of start-up time in Surgery OT is shown in Figure -3

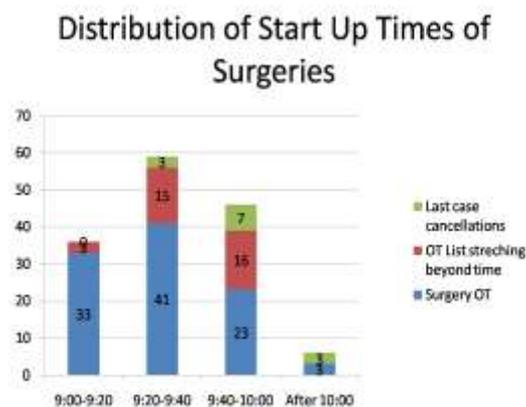


Fig 3: Time wise distribution in Surgery OT

In orthopaedics OT, when the case started by 9:20 am, the OT list completed on time except on 5 days and there was 1 cancellation due to time factor. The first case started between 9:20 and 9:40 am, there was delay in completion of the OT list for 9 days and also there was cancellation of the last case due to time factor for 1 day out of 19 days. When the first case

started between 9:40 and 10:00 am, there was delay in completion of the OT list for 15 days and also there was cancellation of the last case due to time factor for 7 days out of 22 days. When the first case started after 10:00 am, there was cancellation of the last case due to time factor on all the 3 days. Distribution of start up time in Orthopaedics OT is shown in Figure 4

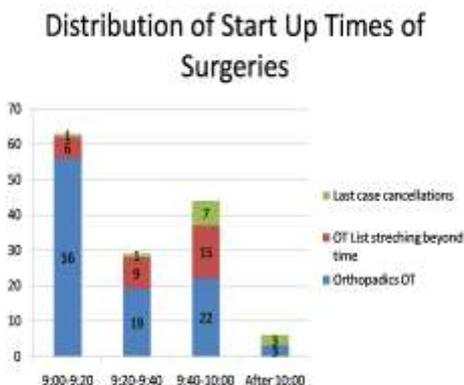


Fig 4: Time wise distribution in Orthopaedics OT

Thus when the OT lists commenced on time overall in both OTs, over running was observed in 10% of cases and cancellation rate of the last case was 1% due to time factor. However when the first case of the day was wheeled in OT after benchmark time of 9.20 am the last case in OT finished after 3.20 pm i.e. Overran 50% of the time and 25% of the time when the OT list extended beyond 3.20 pm last case was cancelled due to time factor.

DISCUSSION

It has been found that one of the most common causes of conflicts between operating team members is delay in starting of first case in OR [2]. According to proposed benchmark or recommendations of Association of Anaesthetists of Great Britain and Ireland (AAGBI) case is considered late if start up delay is more than 10 minutes [1]. Ciechanowicz *et al.*; in their study found that starting up of first case within 15 minutes of scheduled time which was considered normal and only in 22% cases were delayed [3]. Vinukondaiah *et al.*; [4] study revealed that only 56.4% of the cases started within scheduled time. In our study 44.5% of days the OT list commenced on time. The main reason for delay in 55.5% of days in our study beyond 9.20 am are attributed to surgeon related factors (20%). 50% of the time the OT list extended beyond finish time when it started late and on 25% of the days of late starts there were last minute cancellations. In a study by Talati *et al.*; [5] tardiness in transfer of patients from ward to OT accounted for delay in 44.6% cases in contrast to 1% (2 cases) in our study. They also reported that insufficient OT time caused last minute cancellation in 78.1% cases. Overdyk *et al.*; [6] cited surgeon unavailability as most common reason to start morning OT list (9.4%), our study also shows similar results whereby surgeon delay was responsible for late starts in 23 cases (11.5%). Garg *et al.*; found that in 59.7% of cases, cancellation was due to time factor [7].

Pandit *et al.*; also found that OT lists extending beyond routine working hours led to last minute cancellations [8]. In our study when the first patient was wheeled in after 9.20 am 50% of the time the OT list extended beyond 3.20 pm and 25% of the time last case was cancelled due to time factor. In contrast when patient was in time the OT list stretched 10% of the time and cancellation rate was 1%. Studies have shown that thorough pre-anaesthetic check-up prior to day of surgery is effective in reducing first case delays as well as last minute cancellations [9]. In our study noncompliance of pre anaesthetic assessment was another reason for tardiness (6 cases).

Preparing for minimally invasive surgery takes time. Hsiao *et al.*; [10] suggested having of dedicated

minimally invasive OTs to reduce delay. Faulty or inadequate numbers of equipment are important causes of delay in commencement of OT lists [7]. In our study 14 cases started late due to equipment problems (surgical, anaesthetic, OT equipment).

The UK NHS Confederation has recommended varying the start times of different theatres [11] to avoid delays, and greater use of weekends for elective surgery. Pandit *et al.*; advocate that resources spent in trying to achieve on time starts, [12] is not justifiable as on time start has minimal impact on efficiency. Instead, judicious scheduling of OT lists is more important. Just as the list can be completed by over-running [13] 'start time' does not deserve merit. Accurate list scheduling [14] and finish time of the OT is better indicators of efficiency.

Avoidable delays can be taken care of (e.g. scheduling errors, equipment shortages, communication failure, and transport problems, surgeon unavailable and inadequate preoperative evaluation) compared to unavoidable delays (e.g., emergency surgery during the elective schedule, unexpected changes in the patient's ASA grading) in OTs. A study has reported that scheduling short procedures first has a positive impact on efficiency [15]. In our study simple, short procedures under spinal anaesthesia in young fit ASA I or II patient was effective in improving on time starts in OT.

Recommendations:

The following recommendations will try to overcome start time delays in OT.

1. The night shift nursing and technician team should make all necessary arrangements for timely start of OT lists.
2. A dedicated Emergency OT will help to avoid disruption in morning OT lists.
3. Standardize preoperative orders and testing.
4. Call the patient the day before to clarify instructions, the time to arrive and first case should be in house night before surgery.
5. On the morning of surgery, a patient must be shifted to OT at least half an hour before the scheduled start time.
6. First-case patients should have preanaesthetic testing done.
7. The anaesthetist should be notified of all first-case patients.
8. All chart work complete by day before surgery, labs on chart, consults on chart, anesthesia review, H&P on chart and consents completed
9. Adequate trolleys for shifting the patients should be available.
10. Accountability should be fixed for any delay.

Limitations

The present observational study was performed in a teaching hospital; results may differ from those in nonteaching hospitals. As the anaesthetist was involved in recording the start times in the OT element of Hawthorne effect cannot be ruled out. Further even though there is coincidence between late starts and overrunning of OTs leading to last minute cancellations many a times the OT lists were overbooked and case duration predictions were also inaccurate.

CONCLUSION:

This audit highlights that most causes of delays in starting OT lists are preventable all staff concerned should be punctual to ensure OT lists commence on time. It is the duty of the theatre in charges to ensure that there is no wastage of time or cancellations. Any cancellation of surgery should be justified. Prior information regarding surgeon unavailability allows the OT administration to allocate that time for another surgeon so that precious OT time is not wasted. Thus our study shows that we could achieve only 44.55% of cases starting on time. Delayed starts in rest of the cases caused overrunning of OT in 50% of cases and last minute cancellations due to time factor in 25%. Further improvements in human resource management is urgently required if specific focus to reduce last time cancellations of the OT list is to be prioritised. The majority of the delays are systems and process related, which are correctable, particularly surgeon tardiness. Having a proactive approach to decrease delays can improve efficiency and save money. Regular audit are necessary to improve performance.

Conflict Of Interest: Nil

REFERENCES

1. Theatre efficiency. Association of Anaesthetists Great Britain and Ireland 2003.
2. Ward M, Sanders M; Section 13.4: Efficient Use of Planned Operating Lists. In Colvin JR (Ed.). Raising the standard: a compendium of audit recipes for continuous quality improvement in anaesthesia 2006; 2nd edn. London: RCOA.
3. Ciechanowicz S, Wilson N; Delays to Operating Theatre Lists: Observations from a UK Centre. The Internet Journal of Health. 2010; 13(1).
4. Vinukondaiah K, Ananthkrishnan N, Ravishankar M; Audit of Operation Theatre Utilization in General Surgery. The National Medical Journal of India, 2000; 13(3).
5. Talati S, Gupta A K, Kumar A, Malhotra SK, Jain A; An analysis of time utilization and cancellations of scheduled cases in the main

- operation theater complex of a tertiary care teaching institute of North India. J Postgrad Med 2015; 61:3.
6. Overdyk FJ, Harvey SC, Fishman RL, Shippey F; Successful strategies for improving operating room efficiency at academic institutions. AnesthAnalg 1998; 86: 896–906.
7. Garg R, Bhalotra AR, Bhadoria P, Gupta N, Anand R; Reasons for Cancellation of Cases on the Day of Surgery—A Prospective Study. Indian J Anaesth 2009; 53:35-9.
8. Pandit J, 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; 67(8):823-832.
9. Ferschl MB, Tung A, Sweitzer BJ, Huo D, Glick DB; Preoperative Clinic Visits Reduce Operating Room Cancellations and Delays. Anesthesiology 2005; 103:855-9.
10. HsiaoKC, Machaidze, Pattaras JG; Time management in the operating room: an analysis of the dedicated minimally invasive surgery suite. Journal of Society of Laparoendoscopic Surgeons 2004; 8:300-3.
11. Clinical Response to the Downturn. NHS Confederation 2011.
12. Faiz O, Tekkis P, McGuire A, Papagrigoriadis S, Renni J, Leather A; Is theatre utilization a valid performance indicator for NHS operating theatres? BMC Health Services Research 2008; 8: 28.
13. Abouleish AE, Hensley SL, Zornow MH, Prough DS; Inclusion of turnover time does not influence identification of surgical services that over- and underutilise allocated block time. Anesthesia and Analgesia 2003; 96: 813–8.
14. Pandit JJ, Tavare A; Using mean duration and variation of procedure times to plan a list of surgical operations to fit into the scheduled list time. European Journal of Anaesthesiology 2011; 28: 493–501.
15. Lebowitz P; Schedule the short procedure first to improve OR efficiency. AORN J. 2003; 78(4):651-659.