

Original article:

Reasons for delay in turnover time in operating room- an observational study

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Abstract

Background: Operating room (OR) like casualty room is the most productive area of a hospital. Turnover time although is a non-productive time in the operating room, yet it is important. Its efficient utilisation require multidisciplinary team work especially supporting services which play a major role in reducing turnover time in the operating room. Since present medical college where study was being conducted is still in its evolving stage, it was considered desirable for its quality improvement to study various factors which are contributing in turnover time delay so that appropriate measures can be taken to prevent the undue turnover time delay. **Materials and methods:** Present prospective observational case study aims at measurement of turnover time delays during 100 working days which were completed over four months for two operation theatres. The variable chosen was the delay of turnover time from the benchmark time taken. The data were collected, compiled and analysed. **Results:** In orthopaedics OR 77% of turnovers were found within benchmark limits. Only in 23% cases turnovers were delayed. 47% of times hospital related issues were responsible. In surgery OR 79% of turnovers were within benchmark limits. 21% cases were delayed; of this hospital related problems caused delayed turnovers in 53% cases. **Conclusions:** The study concluded that reasons for delays centred on multifactorial reasons which were unavoidable and unpredictable. 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 and will prevent cancellation of elective cases. The utilization of OT complex can be optimized by team effort, multitasking and parallel processing.

Keywords: Operating Room efficiency; turnover time; delays

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Introduction

Maximizing utilization of Operating Room (OR) time is aim and dream of any hospital administration and other stake holders⁷. Utilization rates are dependent on many factors and one of them is quick turnovers. Turnover time (TOT) is calculated as duration of time between one patient leaving the OR and ends when the next patient enters the OR also includes time taken for setting up and cleaning of OR^{1,2}. Cleaning in-between the cases is essential for reducing environmental contamination³. These tasks are usually completed in six to ten minutes in maximum number of cases. More technically difficult cases warrant extra time as

additional equipment needs to be cleaned, removed or replaced⁴. Undue haste on the day of surgery solely for the purpose of reducing turnover times, can not only be dangerous and stressful but may be counterproductive as such endeavors can compromise patients safety⁵. Benchmarking performance as suggested by Macairo not only has financial benefits but improves quality and teaches us doing right things in right ways. Macairo categorizes TOT (mean time from previous patient out of the OR to next patient in) into poor performance as >40 minutes; medium performance as 25-40 minutes and high performance as <25 minutes⁵. Prolonged turnovers are defined as

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turnovers >or equal to more than 15 minutes beyond average turnover time excluding those >60 minutes². Well- functioning ORs should ideally have less than 10% of prolonged turnovers (delays) which are longer than one hour.⁵

Aims and Objectives

The aims and objectives of our study is to evaluate reasons for delay in turnover times in operating rooms and give recommendations which will be enable us to maximise the optimum use of OR with help of active involvement of stake holders.

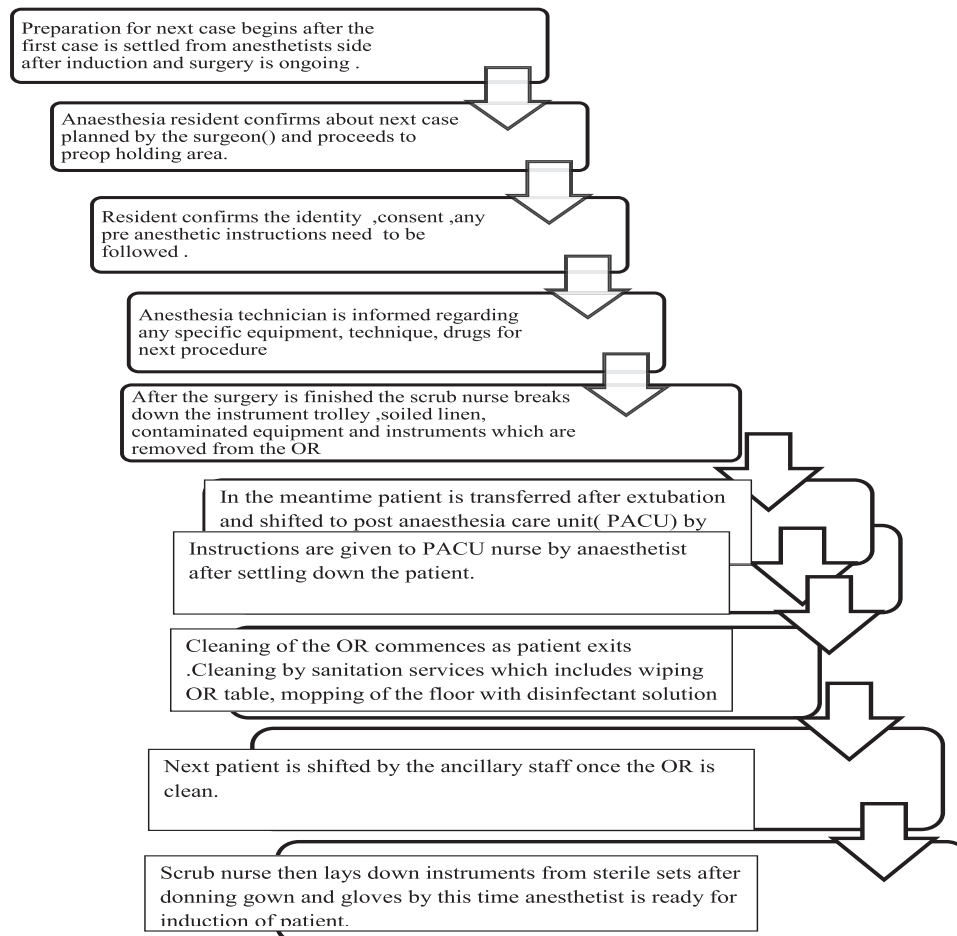
Methodology

It is a prospective observational study conducted over 100 working days from August 2015 to November 2015. As it was part of the quality improvement project so ethical clearance was not required. Turnover time was noted by concerned anaesthesia faculty member of Major OT 1 and Major OT 2. However due to our upcoming tertiary care hospital and medical college being in its first phase of development there

is sharing of operating rooms among different specialties. We have yet to have an emergency operating room, hence emergency surgeries are carried out in the respective speciality operating rooms during working hours. Operating rooms have routine elective lists from 9AM to 3 PM. from Monday to Saturday All six days of the week major OT 1 is allocated to surgery department. Major OT2 has orthopaedic (ortho) department. Operating room staff allocated to each OR are 1 scrub nurse, 1 floor nurse, 1 OR technician, 1 Anaesthesia technician, 3 housekeeping staff (porters) between 2 ORs 3 members of sanitation services (cleaners) between 2 ORs, 2 Faculty members and one junior resident of anaesthesia department manage one OR. 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 pre-operative holding area. Pre-anaesthetic check-up for elective surgeries was usually done one day prior to surgery.

A total of 273 surgeries were performed in surgery

The following are stages of turnover which are being followed



*Except for the process of cleaning the OR all other tasks are done in parallel.

operating room and 231 surgeries were done in ortho OR over 100 working days.

Inclusion Criteria: All cases including emergencies performed within the routine working hours of given day were included in the study.

Exclusion Criteria: Firstcases of given day were excluded from the study.

Observations: Time recorded was between Wheel out and Wheel in denoting turnover time in surgery

OR and in Ortho OR were studied in 173 and 131 patients respectively. In our study 20 minutes was taken as benchmark turnover time. Extension of turnover time beyond 20 minutes was considered delay and the reporting anesthetist had to assign the reason for delay. Delay beyond 1hour as rounded to 1hour for sake of convenience. Average turnover time (TOT) in Surgery and Orthopedics OR is shown in table-1.

Average Turnover Time (Tot) Table-1

	Average Tot	Std Deviation	Range
Surgery Or	15.5 Min	7.26	4-48 Min
Orthopaedics Or	17.36 Min	11.53	5-60 Min

.In surgery OR 30% of turnovers were completed within 10 minutes.49%of turnovers were done in 20 minutes so 79%of turnovers were within benchmark limits. 21%were delayed, of these in 53%cases hospital related problems caused delayed turnovers. (Figure 1a & 2a)

In orthopedics OR 33%of turnovers were completed within 10 minutes 44%of turnovers were done by 20 minutes thus we had 77%of turnovers within benchmark limits. Only 23% turnovers were delayed 47% of times hospital related issues were responsible(Figure1b &2b)

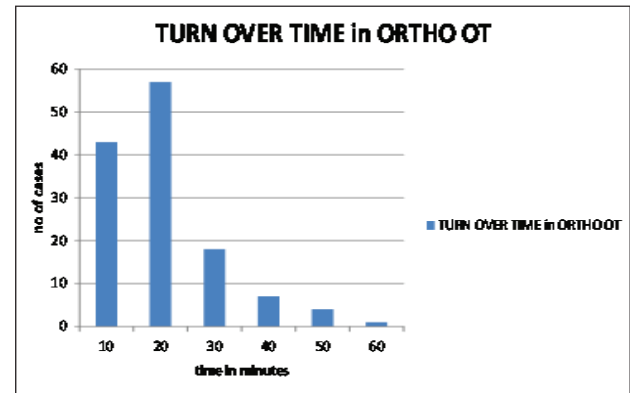


Figure 1b : Turn over time in Surgery OR

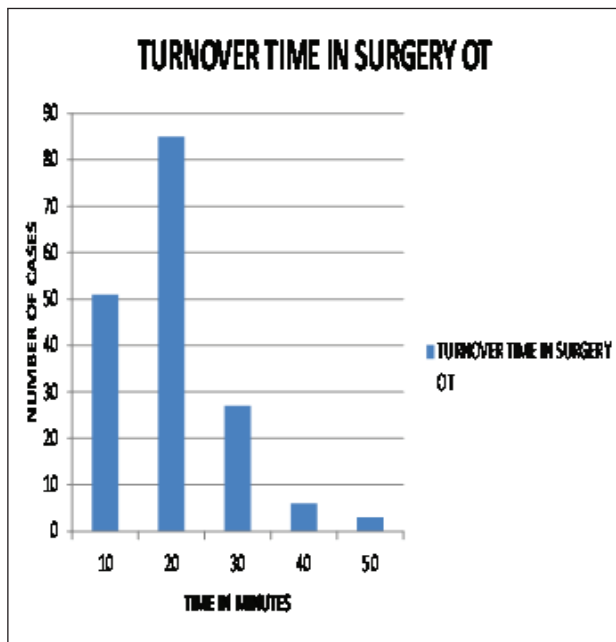


Figure 1a : Turn over time in Surgery OR

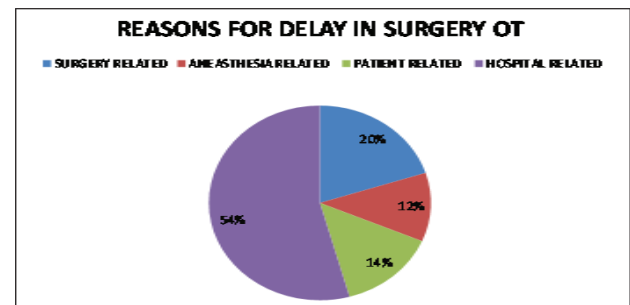


Figure2a: Reasons for Delay in Surgery OR

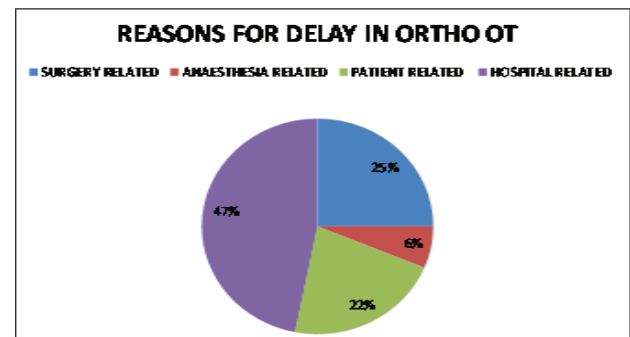


Figure2b: Reasons for Delay in Surgery OR

Causes for delayed turnover in both ORs were (22% or 68 cases). Delays were broadly classified into 1. Surgery related 2. Anaesthesia related 3. Patient related and 4. Hospital related (Table-2)

Table 2: Causes Of Delayed Turnovers

Causes Of Delay	Surgery Or+Ortho Or
Surgeon related	22.5% (15 cases)
Anaesthetist related	9% (6 cases)
Patient related	18% (12 cases)
Hospital related	50.5% (35 cases)

- Surgeon related factors responsible for prolonged TOT in Surgery and Ortho OR was found in 22.5% (15 cases). In 2 cases delay was due to non-availability of surgeon in OR. Scheduling error or change of plan like other case to be taken up first was responsible in 2 cases. Equipment or Instrument related issues like non-availability of implant from the supplier in time lead to delay in 2 cases. Preparation for laparoscopy and complex surgery was found responsible in two cases. Senior Surgeon help was required for the 2 cases which lead to delay in TOT. Change of surgeon & speciality were responsible for delay in 5 cases.
- Anaesthetist related factors 9% (6 cases) were mainly due to technical reasons like: Preparation for complicated case (ASA III, IV), difficult airway and invasive monitoring.
- Hospital related factors which was main cause for prolonged TOT in our setup was found in 50.5% (35 cases). In six cases it was non-availability of Supporting staff like porters, cleaners, nursing, technicians. Delay in shifting patients from ward to OR complex pre-operative room, from pre-operative to OR, OR to recovery was responsible in 6 cases. Emergency operations in routine OR lead to prolonged TOT in 8 cases. Infected cases were responsible in 5 cases. Infrastructure Problems like (CSSD, Laundry, Linen) caused delay in 2 cases. Equipment failure-cautery not working, C-arm not working was observed in 2 cases. OT dress was not available in one case. Communication gap and Lack of timely OR preparation by staff was responsible in 5 cases.
- Patient related factors 18% (12 cases) which lead to prolonged TOT was due to non-availability of informed consent in 2 cases. Delay in availability of lead to prolonged TOT in 1 case. Medical problem like patient having rhonchi requiring nebulisation, antihypertensive not given, fever,

respiratory tract infection, ECG to be reviewed lead to delay in 6 cases. Patient apprehension and consultation with family and surgeon led delay in 2 cases and one case was delayed because of non-availability of lab reports.

Thus our study had 68 delayed turnovers beyond 20 minutes out of total of 304 .i.e.22% of turnovers were delayed, 78% of turnovers were within benchmark time of 20 minutes, of which 31.5% occurred within 10 minutes. Of the delayed turnovers 14.5% occurred in 30 minutes, 5% in 40 minutes and 2% in 50 minutes, 0.5% in one hour.

Avoidable delays were:

- surgeon unavailability,
- scheduling error ,
- unavailability of supporting staff,
- delays in shifting patients,
- infrastructure problems,
- equipment failure,
- communication gap,
- untimely OR preparation by staff ,
- OT dress unavailability.
- Blood unavailability,
- antihypertensive not given,
- consent not given,
- Awaited lab reports.

Discussion

Masursky et al⁶ demonstrated that surgeons usually overestimate the amount of time it takes to turnover an OR over but that anesthesiologists were overall unbiased. In our study anesthesiologists were noting down turnover time. Sultan et al reported that ORs are used for surgery only 54% of the time while the remaining time is used for anesthesia, prepping and draping, and delays/turnover.⁷ Opinion of hospital administrators is that time with no surgical activity occurring, contributes to inefficiency and waste.⁸ The turnover involves multiple interrelated and interdisciplinary tasks which ideally should be done simultaneously to improve efficacy though factors like less number of cleaners and different varieties of instruments needed in different surgeries may be impeding factor.⁹ Avila et al¹⁰ observed that turnover time was dependent on duration of surgery but on the contrary review by Jericó and others published in 2011 suggested cleaning of OR duration is neither dependent on size of OR, period of the day nor on duration of surgery as previously thought.³ Vitez and

Macario⁸ observed that lesser turnover time is one of the traits of good anaesthesiologists and administrators and surgeons also favour this as it improves surgical output and finishing of OR in time. This was also observed and possible in our setup. It was observed by Tyler and others that by reducing turnover time may extra short case but may not be of any help where long cases are posted in OT list.¹¹ Adams et al. in 2004 suggested “Six Sigma” measures for improving efficiency, proper utilisation of and for reducing turnover.¹² Reasons of the delays related to TOT gives a broader picture of the contributing factors that affect OR efficiency.⁶ Cost reduction from reducing turnover times can only be achieved if OR staffing are reduced.¹³ Though theoretically by providing more staff to clean OR we may be able to reduce turnover, but this can jeopardize patient safety by not giving adequate time for sterilizing instruments for the next case. An audit showed a modal turnover time of 30 minutes, which is considered quite a long time for an ophthalmic theatre was reduced to 5-10 minutes¹⁴ with additional theatre nurses, to handle cleaning/sterilizing the instruments and preparing materials for the next case on the list.¹⁴

The availability of surgeons in the OR also affects turnover time positively as surgeons were observed to motivate and assist staff with their duties.³ Soliman et al noted that active involvement of surgeon in patients changeover has surely improved OR efficiency and reduced TOT¹⁵. A organized team of stake holders can remodel multidisciplinary process which can bring desired results of reducing turnover time.¹⁰ It is common practice to use same OR teams throughout the day and same was practiced in our setup also. This practice has resulted in lower preparation and turnover times. Similarly, Avery and Matullo demonstrated that dedicated orthopedic circulators and scrub technicians improve operative efficiency.¹⁶ Furthermore; standardization of instruments also reduces turnovers. Data by Mariano et al had observed that one additional joint arthroplasty could be done if turnover time is reduced by 18%.¹⁷ Marjamaa et al decoupled anesthesia induction phase from the surgery and observed reduction in non-operative time.¹⁸ Friedman advocated parallel processing where next patient is induced while previous surgery is still ongoing. Concurrent operative care reduces non-operative time and improves OR efficiency.¹⁹ In our study parallel processing also helped reduce turnover time to less than 10 minutes as all the preparation for next case was done much earlier in the side room except cleaning of OR which was done during

turnover. TOT were prolonged in ORs in which patients routinely required invasive monitoring.² The amount of contamination of the operating theatre during ‘clean’ and ‘septic’ cases definitely varies hence cleaning after emergency surgeries takes more time as there is a higher probability of patients being more sick, more infected. A separate OR for emergency surgeries is the need of the hour in our setup. It has been observed that surgery specific packs can be prepared and stored closer to OR in cases where standardized procedures are done by surgeons.⁴ It was observed in our study that TOT was prolonged as OR staff had to spend time to collect necessary instruments before patient was brought to OR. Communications between the anesthesiologist, nursing and technical staff improved turnovers at no extra cost.²⁰ Short preoperative briefings decrease the frequency of communication breakdowns.²⁰

Turnover time, is influenced by patient comorbidities (ASA class), preceding surgery, succeeding surgery, time of surgery, and order of OR cases²¹. ASA Class 1 and Class 2 patients had significantly shorter turnover times than ASA Class 3 patients²¹. Similarly, surgeons who incentivized OR staff, such as providing lunch²¹ also observed shorter turnovers. Attending, effective communication and team work are vital to improving OR efficiency. In our study anticipating and preparing for succeeding case during preceding surgery helped to improve turnover time as suggested in studies by Cendán & Good.²² Surgeries preceded by an emergency surgery, also typically score badly. In our study emergency surgery was the prime reason for delayed turnovers. Change of surgeon was an important contributing factor. Anesthetic induction in ASA III /IV patients needed more time for reassessment, high risk consent, procuring emergency stock of drugs, equipment for anesthesia. Surgeons sometimes schedule the longest and/or most complicated case of the day as the last case to avoid patient delays with shorter cases, and this may explain why turnover times are longer before the last case.²³ In our study turnovers before commencement of the last case happened to be of longest duration as, complicated or “dirty” cases are left at the end of the day.

Recommendations

Hospital should consider making use the following recommendations are of benefit in reducing turnover time or idleness in OR.

1. Surgeons, Anesthetist, OR staff and hospital administration should form a team and

clearly identify roles which will determine which activities may be safely carried out simultaneously without compromising the safety of both patients.

2. Stringing of surgical instruments at the end of a case, whereby they are aligned on U-Shaped tools to allow for more efficient transport, cleaning, counting and assembling reduces set up time.
3. Mopping in between cases on “bloodless” cases may be discontinued.
4. Preparation of more procedure specific sets better option rather than surgeon specific sets.
5. Using a More Efficient Cleaning Agent that had a faster dry and kill time. Bleach disinfectant required a 10 minute contact time and damaged equipment .On the contrary sporicidal hydrogen peroxide/ peroxyacetic acid disinfectant has a five-minute contact time.
6. Anesthesia technologists are now responsible for cleaning the anesthesia machine and equipment between cases.
7. Displaying Dash Boards: Early communication to the hospital’s turnover team when a room is about to be turned over so that all involved are ready to do their part.
8. Using disposable room turnover kits/hampers and point-of-use cleaning carts and tools.

Limitations- The present observational study was conducted in a teaching medical college where

medical students and residents are taught and trained so results are bound to be different from those observed in nonteaching hospitals setting. Possibility of improved turn over times temporarily because of Hawthorne effect cannot be excluded as stake holders were well aware that they are being measured.

Conclusion

The study concluded that reasons for delays centred around add on emergency cases, complex surgeries, high risk ASAIII-IV cases and change of surgeon. The utilization of OT complex can be optimized by team effort multitasking and parallel processing. Anticipation and requirement of resources must be kept in mind to make these turnovers most effective. The OR management should standardize setup and cleanup protocols by specialty type and by case type. Cleaning staff load should focus on time of day when many cases are being performed. Have extra turnover teams. Make sure sufficient equipment is in stock without reprocessing. Encourage parallel processing to save valuable time. In our study only 22%of turnovers were delayed beyond benchmark time, mainly attributed to hospital related causes such as shortage of supporting staff, absence of functional emergency OR. Avoidable delays in turnover time can be overcome by multifaceted approach with all turnover team members working towards a common goal of patient welfare thereby minimizing inefficiencies.

Conflict of Interest: None declared.

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