SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Joy *et al*., 2026
doi: 10.21276/SSR-IIJLS.2026.12.2.6

Original Article

open access

Operation Theatre Preparedness and Time Utilization to Enhance Turnaround Time and Theatre Outcome in Elective Surgeries: A Prospective Observational Study

Holy Joy[1], Neha S Adhyapak[2]*, Rakshitha R[1], Bharathi Ganar[3], Narasimha Reddy B[4]

[1]3rd year Post-graduate, Department of Anesthesia, The Oxford Medical College and Research Centre, Bangalore, India

[2]Assistant Professor, Department of Anesthesia, The Oxford Medical College and Research Centre, Bangalore, India

[3]Professor, Department of Anesthesia, The Oxford Medical College and Research Centre, Bangalore, India

[4]Professor and Head, Department of Anesthesia, The Oxford Medical College and Research Centre, Bangalore, India

***Address for Correspondence:** Dr. Neha S Adhyapak, Assistant Professor, The Oxford Medical College and Research Centre, Bangalore, India
E-mail: holyjoy2024@gmail.com

Received: 01 Nov 2025/ Revised: 18 Dec 2025/ Accepted: 24 Feb 2026

ABSTRACT

Background: The operating theatre (OT) complex is one of the most important and expensive parts of the hospital infrastructure, contributing to patient care and revenue of the institution. Poor OT use, delays, and last-minute cancellations negatively influence patient satisfaction, resource management, and the entire performance of the hospital. To assess OT preparedness and time management, define the reasons and causes behind delays and cancellations of elective surgeries, and determine the variables that influence the overall efficiency of OT.

Methods: This prospective observational clinical audit was conducted at the OT complex of The Oxford Medical College, Hospital and Research Centre from 01/01/2025 to 15/04/2025. A total of 150 elective anaesthetic cases were included, while emergency cases were excluded. Data were collected daily using a structured audit pro forma assessing OT preparedness, delays, cancellations, and intraoperative factors. Descriptive statistics were applied, and results were expressed as frequencies and percentages.

Results: The most significant reasons for delay were the patient not being shifted off the ward (14 cases), not being optimized (8 cases), and the surgeon reporting late (9 cases). Non-insurance approval turned out to be the most significant reason to cancel the elective case (12 cases). Prolonged OT time was associated with intraoperative factors like peripheral nerve block (8 cases) and hard airway/spinal control (7 cases). There were no patient identity lapses.

Conclusion: OT inefficiency was mainly associated with avoidable preoperative and administrative factors. Optimization of patients, administrative clearance, equipment preparation, and multidisciplinary coordination can be strengthened to effectively enhance OT utilization, decrease cancellations, and improve the efficiency of the institution.

Key-words: Operating Theatre Efficiency; Elective Surgery Delays; Surgical Cancellations; Clinical Audit; Operating Room Management

INTRODUCTION

The operating theater (OT) complex is an expensive component of a hospital environment. The OT complex of a hospital requires optimum cost utilization.

How to cite this article
Joy H, Adhyapak NS, Rakshitha R, Ganar B, Narasimha RB. Operation Theatre Preparedness and Time Utilization to Enhance Turnaround Time and Theatre Outcome in Elective Surgeries: A Prospective Observational Study. SSR Inst Int J Life Sci., 2026; 12(2): 9337-9345.

Access this article online
https://iijls.com/

The operating theater is considered the major source of revenue generation in a hospital, with an estimated 50 to 60% of revenue generated from this complex. Various activities and personnel should be efficiently managed for high-level and complete utilization of OT [1]. The efficiency of these assets must be optimized. The most crucial concern is the cancellation of a scheduled operation at the last moment. Late cancellation of an operation is a major concern for the inefficient usage of operating room time and inadequate resources [2]. Life-saving surgical procedures or life-improving processes

doi: 10.21276/SSR-IIJLS.2026.12.2.6

are carried out by expert surgeons in an OT complex, and invasive methods are performed under controlled aseptic conditions. This promotes recovery and healing with safety, comfort, and economy [3]. The efficiency of an OT complex can be evaluated in different ways. This refers to the capability for conversion of available operating time into productive clinical output. Utilization is a simple process and potentially measures the efficacy of OT for revenue generation, which increases with time. Donham *et al.* defined the utilization of OT, which is referred to as the quotient of hours of OT time that is used during the elective resource hours and the total number of elective resource hours available [4]. One of the most significant hospital areas is the OT complex, as it contributes to workload, revenue, and expenditure. It covers 50%, almost half of the total health-care seekers. Maximum utilization of the time of OT leads to benefits from high cost, few incidents of cancelled cases, reduction in the waiting list, improvement in the patient satisfaction, disciplined staff, and institutional efficiency and sustainability [5]. Some teaching care institutes perform an audit for the functioning of an OT complex, which helps to detect the areas of improvement for more efficient utilization of the duration of the operating theatre. The audit for assessing the utilization of OT time helps to evaluate the reasons behind OT delays, case cancellations, and the requirement for improvement [6].

In the case of a hospital, the OT cancellation can result in underutilization of the resources, including the equipment, staff, and operating rooms, which can increase the cost burden. Cancellation of OT can impact the reputation of the hospital and its credibility. The reported case cancellation rates range from 10% to 40% [7]. There are multiple reasons for the cancellation of cases in OT, depending on the facilities. The reasons may include, patients related, Anesthesia related, related to surgeons or it can be Operational factor or related to the hospital. The factors can be case conduct for institutional and government protocols, like duration, infrastructure, and the available resources [8].

MATERIALS AND METHODS

Research design- This research was an observational prospective clinical audit, carried out in the Operating Theatre (OT) complex of the Oxford Medical College, Hospital and Research Centre under the department of Anesthesiology. The audit was conducted within three and a half months between 01/01/2025 and 15/04/2025. The main aim was to assess the use of OT, determine the reasons for delays and cancellations, and determine the efficiency of OT functioning in general. The study involved 150 patients who had undergone elective surgery and were administered anesthesia within the period of the audit.

Inclusion and exclusion criteria- The inclusion criteria included all patients who were going to undergo elective surgical procedures under anesthetic care within the audit period. All patients of any age, male, and female, were eligible to join the study as long as their cases were mentioned in the regular elective list of the OT schedule. All the surgeries that were conducted under general anesthesia, regional anesthesia, or monitored anesthesia care were eligible. Cases that were posted and recorded in the final OT list only were used in the study to compare similar parameters of OT utilization.

The emergency surgeries did not form part of the audit since emergency surgeries are unpredictable and urgent, thus would complicate the evaluation of planned OT efficiency and turnaround time. Even minor operations that did not need to be scheduled by a professional OT or were conducted in another complex were not included. The cases that were not taken into consideration were cancelled before the final OT list preparation because the audit was created on the basis of evaluating the operational inefficiencies when the schedule is already fixed. The criteria were used to guarantee that the population of the study was an accurate representation of elective OT workflow and resource utilization.

Data collection and study procedure- The audit process started by creating a systematic audit proforma that was specially designed to record relevant parameters concerning OT preparedness, delays, cancellations, and intraoperative factors influencing time utilization. The proforma was standardised to ensure consistency in data collection and to minimize inter-observer variability.

Data were collected prospectively daily by the audit team. For each planned elective case, key time points were documented, including scheduled start time, actual start time, anesthesia start time, time of surgical incision, procedure completion time, and time of shifting the

doi: 10.21276/SSR-IIJLS.2026.12.2.6

patient out of OT. Turnaround time between cases was also observed where applicable.

OT preparedness was assessed before the commencement of each case. Parameters evaluated included confirmation of patient identity, surgical site marking, review of pre-anesthetic check-up (PAC), availability and checking of the anesthesia workstation, preparation of surgical instruments and equipment, and completeness of informed consent documentation. Any deficiencies identified were systematically recorded.

Delays were defined as deviations from the scheduled start time beyond the accepted institutional buffer period. In instances of delay, the primary cause was documented after discussion with the concerned team members. Causes were categorized as patient-related (e.g., lack of optimization, delayed shifting from ward), administrative (e.g., non-approval of insurance, non-availability of OT slot), logistical (e.g., staff shortage, delay in laboratory reports, non-availability of blood products), and technical (e.g., equipment or instrument malfunction).

Reasons for cancellation of elective surgeries were recorded when applicable. Common causes included non-approval of insurance, non-admission of the patient, emergency case prioritization, inadequate patient optimization, and non-availability of OT slot. The timing of cancellation and its potential avoidability were also reviewed during audit discussions

Statistical Analysis- The collected data were tabulated and analyzed using Microsoft Excel. Descriptive statistical methods were applied, and findings were presented as frequencies, percentages, and proportions to identify the most common causes of OT delays and cancellations. The analysis helped identify key problem areas and supported the development of corrective and preventive measures to improve OT efficiency and optimal utilization of hospital resources.

RESULTS

Table 1 illustrates the deficiencies that were found in the preparedness of operating theatres among the audited surgical cases. The results demonstrate that the identity confirmation of patients was sufficiently stable in all the cases, and no lapses were reported. However, other important safety parameters had minor gaps. In 5 cases, there was no surgical site marking, and in 6 cases each, there were no anesthesia workstation checks, pre-anesthetic check-up (PAC) review, and instruments/equipment checks. Moreover, there were cases of incomplete or absent consent reported in 3 cases.

Table 1: Operation theatre preparedness

S.No	Parameter	No of surgeries
1	Patient identity confirmation	Nil
2	Surgical site marking	5
3	Anesthesia workstation check	6
4	PAC review	6
5	Instruments/Equipment check	6
6	Consent	3

Fig. 1 shows the deficiencies that are observed in operating theatre preparedness during the audit period. The most frequent deficiencies were associated with anaesthesia workstation checks, PAC review, and instrument/equipment checks, which represented 6 cases (23%). The surgical site marking shortcomings were observed in 5 cases (19%), and incomplete or missing consent was observed in 3 cases (12%). Notably, patient identity was not reported to have been compromised (0% deficiencies), which is important to note as this is a highly essential safety parameter.

Table 2 presents the different causes of delay in the operating theatre schedule in the audit period. The majority of cases were due to failure to transfer patients out of the ward on time (14 cases) and to surgeons' late reporting and OT unavailability (9 cases each). Clinical factors involving the patient, like failure to optimize (8 cases) and inaccessibility of blood products (8 cases), were also major causes of delays. Other notable factors included logistical and administrative issues, such as staff unavailability to wheel in trolleys (8 cases), delayed specific lab reports (7 cases), and equipment or instrument unavailability (6 cases). There were fewer cases of delays attributed to not having taken consent (4 cases) and the lack of attenders or caregivers (2 cases).

doi: 10.21276/SSR-IIJLS.2026.12.2.6

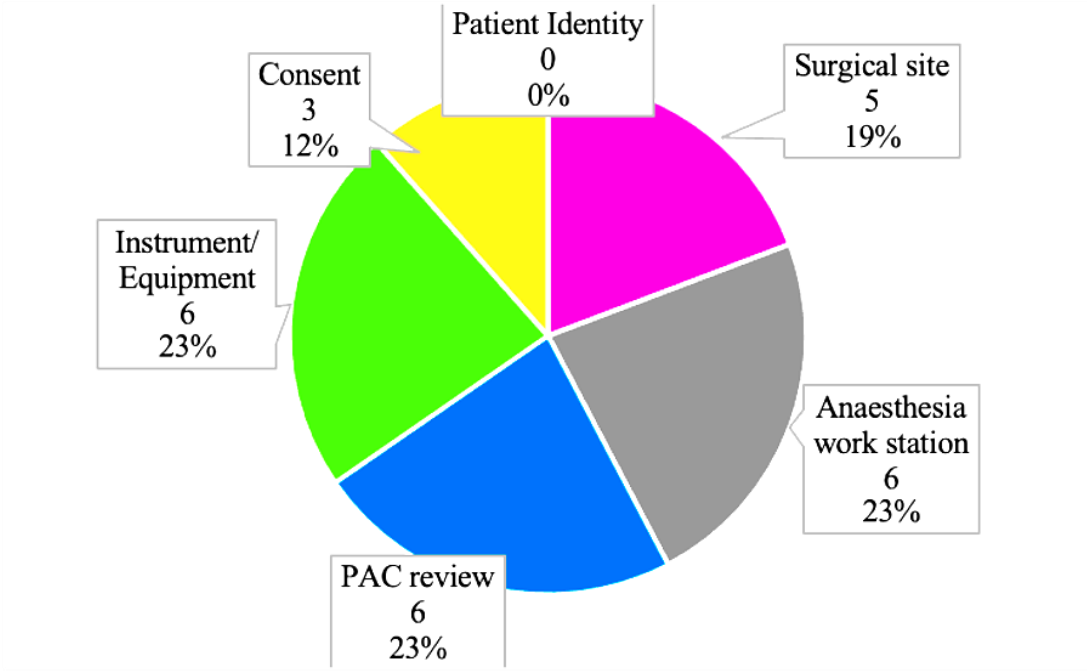

Fig. 1: Deficiencies in OT preparedness

Table 2: Causes of Delays in Operating Theatre Schedule

S.No	Reason	No of surgeries
1	Patient not shifted from the ward	14
2	Patient not optimized	8
3	Consent not taken	4
4	Non-availability of equipment/ Instrument	6
5	Delay in specific lab reports	7
6	Surgeon reporting late	9
7	Staff availability to wheel in the trolley	8
8	Non-availability of attenders/caregivers	2
9	OT non-availability	9
10	Blood products	8

Table 3 summarizes the reasons why the elective surgical cases were cancelled during the audit period. Non-approval of insurance was the most prevalent reason behind cancellation, with 12 cases, meaning that there is a serious administrative hurdle influencing the scheduling of surgery. Clinical factors related to the patients, such as the absence of preoperative optimization, resulted in 7 cancellations, and failure to admit patients before the actual procedure resulted in 3 cancellations. Emergency cases have been added; 2 elective case cancellations have been made, which is the effect of surgery urgency on the program. The cause of OT slot non-availability was the least frequent, and it was reported only in 1 case.

doi: 10.21276/SSR-IIJLS.2026.12.2.6

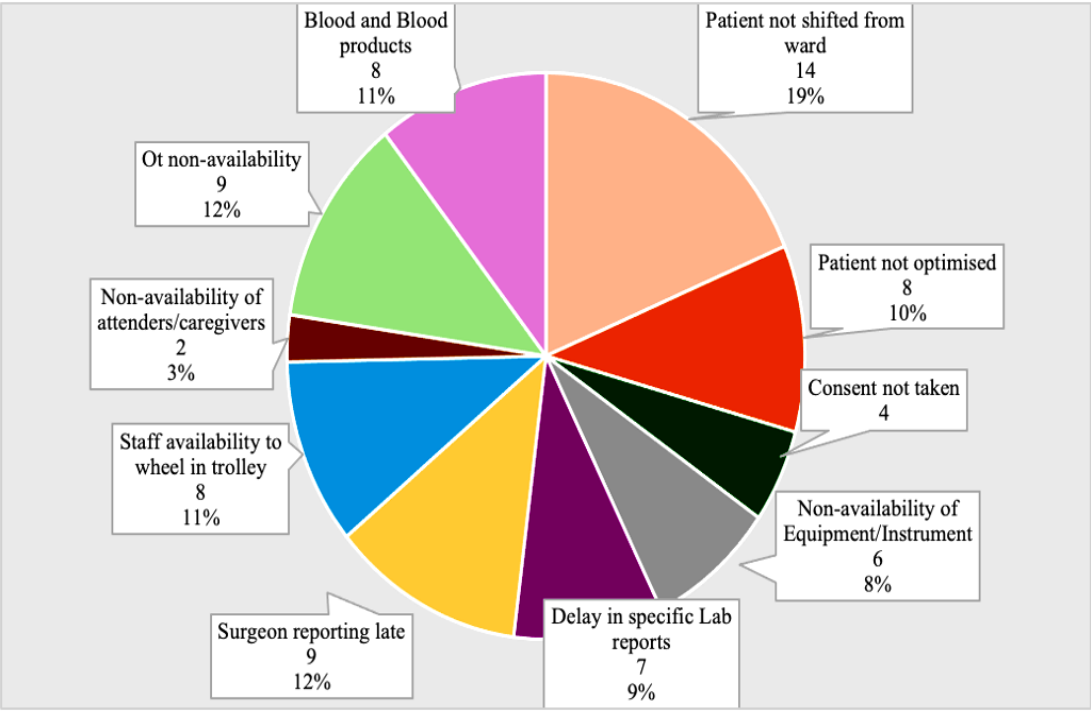

Fig. 2: Reasons for delay in OT

Table 3: Reasons for Cancellation of Elective Surgeries

S.No	Reason	No of surgeries
1	OT slot non-availability	1
2	Patient not admitted	3
3	Emergency case added	2
4	Patient not optimized	7
5	Non-approval of insurance	12

Fig. 3 shows the proportional distribution of factors that cause cancellations of elective surgery within the audit period. The most dominant cause was not approval of insurance (12 cases, 48%), which is the predominant reason, and the main obstacle to going ahead with planned surgeries was administrative and financial clearance. Patient-related issues, especially the absence of preoperative optimization (28% of the cancellations), ranked second among the causes. It was found that 3 cancellations (12%) and 2 cancellations (8%), respectively, occurred due to failure of patient admission before the scheduled surgery and addition of emergency cases, respectively, which reflects the effect on the elective lists of urgent surgical priorities. The least prevalent cause was OT slot non-availability, with only 1 case (4%).

doi: 10.21276/SSR-IIJLS.2026.12.2.6

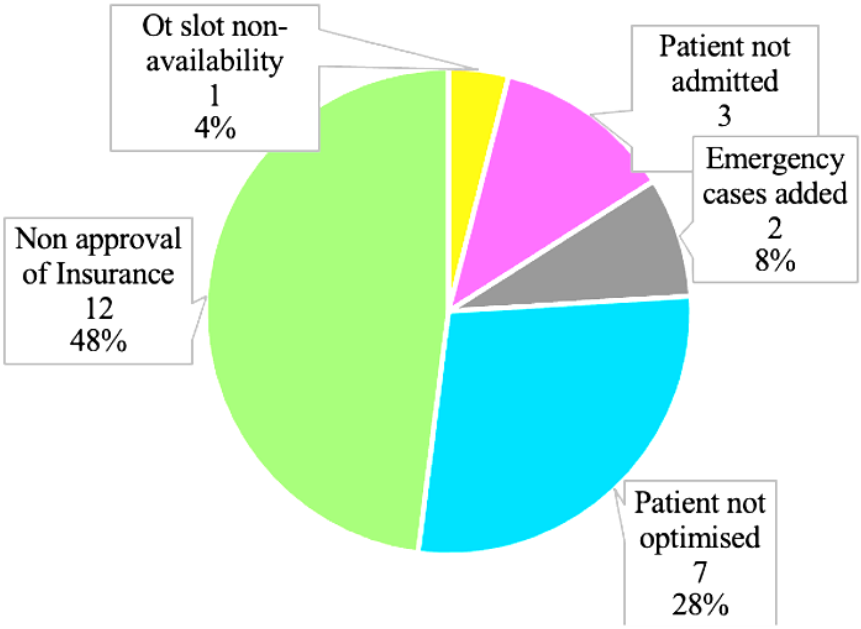

Fig. 3: Distribution of reasons for cancellation of elective surgeries

Table 4 summarizes intraoperative factors that led to a longer duration of surgeries in the audit period. The 8 cases for administration of peripheral nerve blocks were the most common, as it is an indication of the extra time it takes to administer the regional anaesthesia methods. In 7 cases, it was found that there was a difficult spinal or airway management, which signalled the problem of anatomical or clinical peculiarities of the patients. In 5 cases, procedures performed by trainees were associated with long OT time, and this could be explained by the learning curve and supervised training in an ultrasound (teaching institution. Less common were delays associated with inaccessibility of the USG machine in 2 cases and equipment or instrument problems in another 2 cases.

Table 4: Intraoperative factors that prolong the OT time

S.No	Reason	No of surgeries
1	Difficult spinal/ airway	7
2	Procedure done by a trainee	5
3	Peripheral nerve block	8
4	USG machine on availability	2
5	Equipment/ Instrument	2

Fig. 4 illustrates the proportionality of intraoperative factors that cause a long operating theatre time during the audit period. The most frequent factor was the administration of peripheral nerve blocks (8 cases (34%), which was the additional time of administration to perform procedures in the form of regional anaesthesia procedures. Hard spinal or airway handling was noted in 7 cases (29%), suggesting that the patient posed some technical difficulties, which prolonged anaesthesia duration. The 5 cases (21%) incurred during the procedures done by the trainees are in line with what would be expected due to the extra time placed in a teaching institution setting. Other, less common causes were non-availability of the USG machine and equipment/ or instrument-related; 2 cases each (8%).

doi: 10.21276/SSR-IIJLS.2026.12.2.6

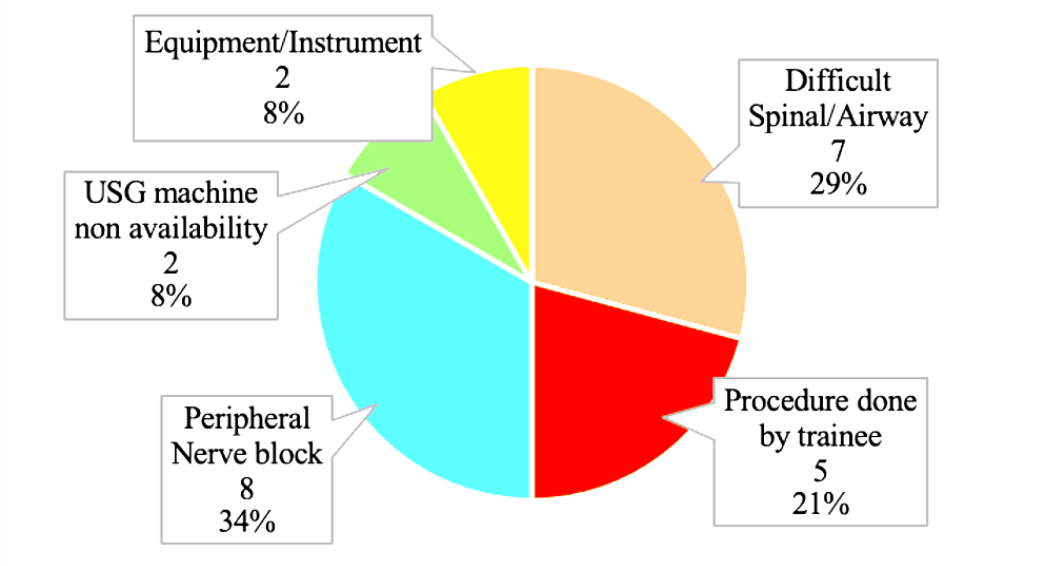

Fig. 4: Distribution of intraoperative factors that prolong the OT time

Fig. 5 shows the total percentage distribution of factors that influence the operating theatre efficiency, such as preparedness lapses, delays, cancellations, and intraoperative challenges. Patient not optimized (10%), patient not discharged off the ward (9.3%), and issues with instruments/equipment (9.3%) were the most prominent contributors, which means that preoperative preparation and logistical coordination were the largest sources of OT inefficiency. Other administrative issues, like non-approval of insurance (8%) and OT non-availability (6.7%), also had a significant effect on the scheduling. The moderate contributors were the surgeon reporting late (6.0%), administration of peripheral nerve block (5.3%), staff availability to wheel in a trolley (5.3%), and blood and blood products (5.3%). Other causes such as late in certain laboratory reports (4.7%), consent problems (4.7%), PAC review (4%), checking of anesthesia workstation (4%), trainee performed the procedure (3.3%), marking of the surgical site (3.3%), emergency cases added (1.3%), unavailability of attenders/caregivers (1.3%), and unavailability of the USG machine (1.3%) had a relatively smaller influence. It is worth noting that there were no lapses in checking patient identity (0%).

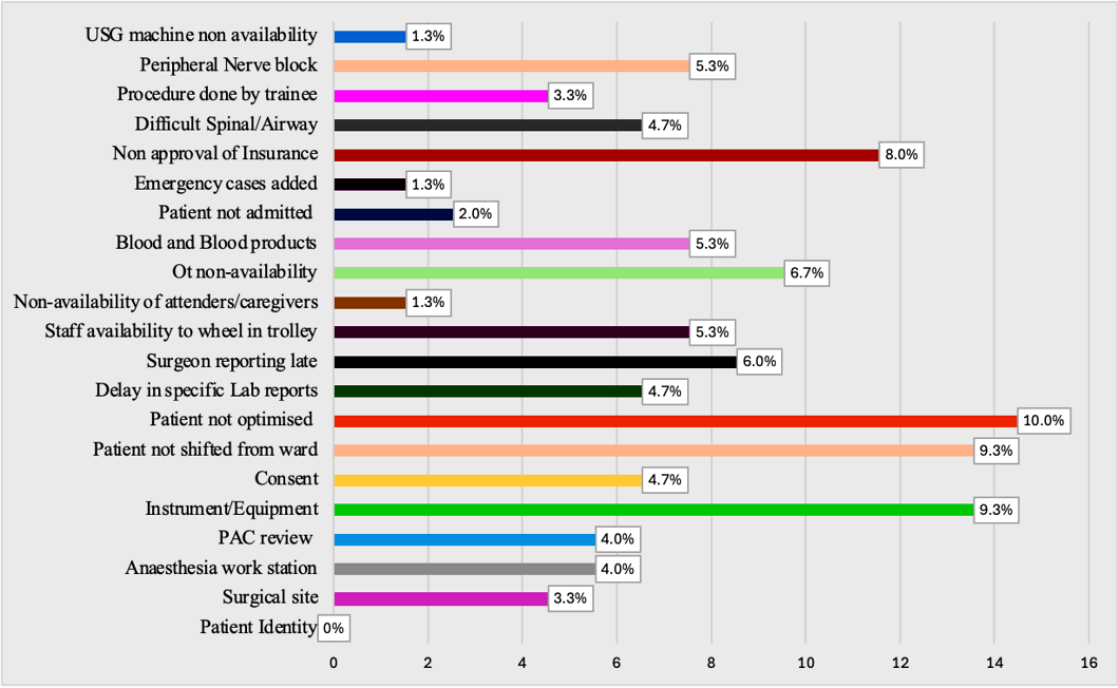

Fig. 5: Distribution of overall factors the effect the efficiency of OT

doi: 10.21276/SSR-IIJLS.2026.12.2.6

DISCUSSION

The study demonstrated that the short median case times with variation in the duration of the procedure indicated inefficiency in the workflow. An optimization index of 100% suggested the potential ability to improve by structured scheduling and allocation of resources. The duration of the case was impacted by the controlled time of anesthesia, surgeon-controlled time and the time between cases, highlighting the interdependence of multidisciplinary teams. The long-term non-operative interval resulted in a reduction in efficiency. The study findings indicated that delays are more process-related rather than procedure-related. The management strategy for a more data-centric operating room increases the overall performance of the operating theatre [9]. Another study demonstrated that the performance of the operating theatre is sensitive to the procedural configuration compared with the fixed capacity. Extension of the opening hours reduced elective deferrals and case overruns. Reduced opening hours increase the deferred cases with low efficacy gain. The most effective intervention is the low turnaround time, which eventually improves the utilization, while reducing the delay. Pooling the emergency theatre did not impact the utilization, but effectively reduced the emergency waiting time of patients. The optimized targeted procedure provides more benefit than expanding the capacity. Valuable decision-making ability, access and flow of patients were provided by the simulation-based planning [10]. The study demonstrated that the delay in the turnaround time of the operating room indicated the effect of the efficacy of the operating room. Pareto analysis showed that the delays were constrained to a limited number of reasons. The scheduled operating room list is estimated to be one-third of delayed cases and contributed to 70% of the total duration of delay. The second most significant factor was the transfer from wards to the operating room. Comparatively rare factors were personnel and equipment. These findings indicated that the targeted interventions for proper scheduling and transport of patients can provide efficiency gains. Systematic documentation and the regulation of the turnaround processes are significant for the continuous improvement [11]. The continuous regulation of the performance indicators reflected the quality of the perioperative service during both the pre-COVID and COVID-19 periods. There was a marked transition from the elective to emergency and semi-emergency surgeries, indicating the adaptive resources. Despite the increase in the rise of the complexity, the modified anaesthesia plans and the adverse events of anesthesia reduced. No cases of anaesthesia-related mortality were noted, which reflected the regulation of patient safety and standards. High compliance with the accurate administration of prophylactic antibiotics was obtained. These findings demonstrated the resilience of anesthesia and surgical services to the disruption of healthcare. KPI tracking was done to identify the care gaps and the stability of the process. Continuous monitoring of CQI was required for quality and preparedness [12]. Constraint programming on the basis of the rescheduling of elective surgeries reduced the congestion of the post-anesthesia care unit. The model proposed in the study reduced the PACU load by 20 to 30%, or reduced the average duration of patient flow by 15%, which supported the improvement in the perioperative efficiency and planning of resources [13].

CONCLUSIONS

The study concluded that the major causes of ineffectiveness in operating theatres for elective surgeries are largely preventable at the preoperative and administrative stages, particularly poor patient optimization, delay in shifting from the ward, and non-authorization of insurance. Addressing these modifiable causes can positively impact OT utilization and turnaround time. This clinical audit showed that patient-related variables were the major determinants of delays, followed by logistical and administrative hindrances. Non-approval of insurance was the most common cause of cancellation among 150 elective surgeries, highlighting the importance of financial clearance before scheduling. Equipment and instrument issues, delays in laboratory reports, staff availability, and OT slotting also affected workflow efficiency. Intraoperative factors such as challenging peripheral nerve blocks, airway and spinal management, and the involvement of trainees in a teaching institution contributed to prolonged operative duration. Patient identity confirmation showed no shortcomings, indicating high compliance with safety protocols. However, minor deficiencies were noted in anesthesia workstation checks, PAC review, surgical site marking, and consent documentation, suggesting areas

doi: 10.21276/SSR-IIJLS.2026.12.2.6

for improvement. Regular auditing, improved multidisciplinary coordination, better scheduling, and enhanced preoperative planning are essential to improve OT efficiency, reduce cancellations, optimize resource utilization, and enhance patient satisfaction and institutional performance.

ACKNOWLEDGMENTS

The authors sincerely thank the Management and Administration of The Oxford Medical College, Hospital and Research Centre for permitting this study in the OT complex. We are grateful to the Department of Anaesthesiology, surgeons, nursing staff, OT technicians, hospital administrative personnel, and all participating patients for their cooperation. Special thanks to Dr. Neha S. Adhyapak for her guidance, coordination, and overall supervision of the study.

CONTRIBUTION OF AUTHORS

Research concept –Holy Joy
Research design –Holy Joy
Supervision- Holy Joy
Materials – Neha S. Adhyapak
Data collection – Bharathi Ganar
Data analysis and interpretation –Holy Joy
Literature search –Rakshitha R
Writing article –Rakshitha R
Critical review – Bharathi Ganar
Article editing –Neha S. Adhyapak
Final approval – Narasimha Reddy B

REFERENCES

[1] Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. Natl Med J India, 2000; 13: 118–21.
[2] Schofield WN, Rubin GL, Piza M, Lai YY, Sindhusake D, Fearnside MR, et al. Cancellation of operations on the day of intended surgery at a major Australian referral hospital. Med J Aust., 2005; 182: 612–15.
[3] Sonal S. Express health care: Streamlining. Occup Ther., 2008; 2: 12. Available at: http://www.johnson medical.com/ExpressHealthcareDec2008.pdf.
[4] Donham RT, Mazzei WJ, Jones RL. Association of anesthesia clinical directors' procedural times glossary: Glossary of times used for scheduling and monitoring of diagnostic and therapeutic procedures. Columbus (OH): Association of Anesthesia Clinical Directors; 1996.
[5] Vinukondaiah K, Ananthakrishnan N, Ravishankar M. Audit of operation theatre utilization in general surgery. Natl Med J India, 2000; 13: 118–21.
[6] Pakhare V, Gopinath R, Surya Dhanalakshmi SK, Nanda A, Kanojia N, Venu P. Audit of operation theater time utilization with perspective to optimize turnaround times and theater output. J Anaesthesiol Clin Pharmacol., 2022; 38(3): 399–404.
[7] El-Dawlatly AA, Turkistani A, Aldohayan A, Zubaidi A, Ahmed A. Reasons of cancellation of elective surgery in a teaching hospital. Internet J Anesthesiol., 2008; 15(2).
[8] Kumar R, Gandhi R. Reasons for cancellation of operation on the day of intended surgery in a multidisciplinary 500 bedded hospital. J Anaesthesiol Clin Pharmacol., 2012; 25: 66–69.
[9] Sukantarat N. Operating room efficiency and service time analysis in a secondary hospital in Thailand. Thai J Anesthesiol., 2025; 51(3): 167–76.
[10] Hassanzadeh H, Boyle J, Khanna S, Biki B, Syed F, Sweeney L. A discrete event simulation for improving operating theatre efficiency. Int J Health Plann Manage., 2023; 38(2): 360–379.
[11] Sharif H, Shehzad N, Farooqi J, Karim S, Akbar S. Bringing efficiency into practice: A quality improvement initiative to reduce operating room turnaround time. J Pak Med Assoc., 2016; 66(Suppl 3): S8–S11.
[12] Sharma K, Bhaskar R, Vinukondaiah K. Comparative study of key quality performance metrics in operating theatre utilization. J Anaesthesiol Clin Pract., 2015; 1(2): 43–47.
[13] Lyones JSF, Begen MA, Bell PC. Surgery scheduling and perioperative care: Smoothing and visualizing elective surgery and recovery patient flow. Analytics, 2023; 2(3): 656–75.