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Operating Room Delays between "Time-in OT" and Skin Incision During Spine Surgery at a Tertiary Care Hospital

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ABSTRACT

Background: The operating room is a very important component of any tertiary health-care institution. An adequately managed operating room results in increased surgical turnover as well as patient satisfaction. Delay in surgery start time is surgery starting later than the scheduled time. Delay in starting scheduled surgical procedure is a reflection of operating room inefficiency. **Objective:** To determine the frequency of surgical delays among patients undergoing spine surgeries and various factors causing operating room delays in spine surgeries between 'time-in OT' to skin incision. **Material and Methods:** This is a cross-sectional study done at Orthopedics department, Doctors Hospital, Lahore from 15 May 2023 to 15 November 2023. Patients' aged 12 to 75 undergoing elective spine surgeries were included. Data collection involved noting 'time-in-OT' upon patient entry and recording the duration of various preparatory steps, including IV line securing, monitor attachment, anesthesia induction, and patient positioning. Delays due to staff or equipment unavailability were also documented. The total time from OT entry to skin incision was then calculated and recorded. Data was analyzed in SPSS. **Results:** The mean age of 46.5 years (±15.5) and an age range of 21 to 75 years. Delays in the operating room were observed in 47% of patients, with the mean time from entering the OT to skin incision being 65.2 minutes (±30.5). Key factors contributing to delays included missing paperwork (7.4%), lack of patient preparation (8.5%), staff unavailability (8.5%), surgeon unavailability (20.2%), and anesthetist unavailability (12.8%). Other significant causes of delay were on-table review (11.7%), airway assessment (18.1%), time required for attaching monitors (9.6%), intubation (48.6%), acquiring additional venous access (26.6%), maintaining arterial line (50.0%), and patient positioning (64.9%). **Conclusion:** The conclusion of the study, that Operating room delays in spine surgeries were common, primarily due to missing paperwork, preparation, and equipment setup. No significant differences were observed across age, BMI, or ASA groups, indicating these are systemic issues requiring improved coordination and processes.

INTRODUCTION

Operation theatres are an integral part of the hospital and represent a huge investment of healthcare establishment (-30% of all hospital costs). Operating room time is also very expensive estimated to be $15 per minute. It has also been established that approximately 40% of the hospital revenue is generated by the operating rooms of the hospital. Perioperative managers and hospital directors are under pressure to make the most of their hospital resources. There is an increasing interest to provide an 'efficient' anesthetic and surgical service and make the operating room a cost effective source of income for the hospital.[1-6]

A surgical delay is defined as an operation which does not start on scheduled time causing an increase in surgical wait times, number of cancelled cases, costs and time under anesthesia. Sources of surgical delay are multifactorial; there could be issues related to equipment, instruments and supplies. Other factors causing surgical delay include issues regarding patients and staff, communication gap, non-availability of operating tables, issues of administration, environmental events and intraoperative complications.

Efficiency in the operating room is increasingly used as a marker of quality of surgical care and all type of surgical delays cause a decrease in efficiency of operating room. As a result, efforts to improve hospital efficiency and quality of care are often focused on reducing preventable surgical delays in operating room and frequency with which they occur can help prevent delays by proper

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planning and hence improve the efficiency of operating room.[3, 7-9]

Perioperative surgical delays include delays getting to the operating room till the operation is complete. It also includes time for induction of anesthesia. In the past various studies have been conducted regarding perioperative delays during various surgical procedures. Cox et al described that around 88% of cases were delayed a while Hicks et al noted that 55 % of first cases were delayed.[10, 11]

Wright et al., noted that most frequent cause of delays was due to lack of availability of anesthesiologist (24%), lack of patient preparedness (23%) followed by non-availability of surgeon (21%). Panni et al found common delay trends in decreasing order including surgeon unavailability (19%), missing paper work (16%), schedule changes (14%) and anesthesia delay (11%). The most common cause of delay is related to a delay in related to a delay in a previous case. Wong et al showed if first case is delayed then there are significantly more delays in second and third case. Does et al made a study and showed that first case started an average of 40 minutes late.[7, 12-14]

Spine surgeries include an additional step of turning the position in prone position on the operating room table which consumes further time and manpower and studies involving operating room delays in spine surgeries are lacking.

MATERIAL AND METHODS

This is a Randomized controlled Trial. Study was conducted at the Orthopedic & Spine Department, Doctors Hospital and Medical Centre Lahore, Pakistan from 15 May 2023 to 15 November 2023. A sample size of 200 was calculated with confidence level 95% and margin of error 7% and frequency of delay of 55%.[11] Non- Probability Random sampling technique was used. All the patients between 12 and 75 years of age either gender undergoing elective spine surgeries were included. Patients who do not give consent to be included in the study and patient's undergoing emergency surgery were excluded.

After taking approval from ethical review board and obtaining verbal informed consent, data was calculated from 20 patient. 'Time-in-OT' was noted as soon as the patient enters the operating room. Then the total time required for the following steps, he noted including the start time and end times: Securing lV line (if not already secured in pre, Attaching Monitors & lV Fluids, induction of anesthesia and intubation, Securing ETT & bite block, securing additional lV line/Arterial line/central line, Attaching the neuromonitoring equipment including BIS (if monitored),catheterization, patient positioning (including detachment & re attachment of monitors & fluids) and painting & draping the patient. Further delays including the non-availability of surgeons, non-availability of operating room staff, non-availability of anesthetist and non-availability of equipment was also be noted. The time of skin incision was noted and the total time from the time-in OT to skin incision was documented. Statistical Package for Social Sciences version 22 will be used for data entry % analysis. For categorical variables (name, gender, ASA status) delay and factors causing delay frequencies and percentages were calculated. For quantitative data (age, weight, height, BMI), mean and standard deviation were calculated. Data was stratified for age, gender, ASA and BMI. Post-stratification chi-square test was applied taking $p \leq 0.05$.

RESULTS

Total 200.0 cases were included. The mean age of the patients was 46.5$\pm$15.5 year with minimum and maximum value of 21.0 and 75.0 (Table: 1). There were 144(72.0%) male and 56(28.0%) female. The mean height of the patients was 1.71$\pm$0.10 with minimum and maximum value of 1.52 and 1.88. The mean weight (kg) of the patients was 75.4$\pm$11.03 with minimum and maximum value of 50.0 and 96.0. The mean BMI (kg/m^2) of the patients was 25.7$\pm$4.23 with minimum and maximum value of 19.0 and 35.8.

Out of 200 patients, 98 (49.0%) were classified as ASA I, while remaining 102 patients (51.0%) were classified as ASA II. 47 (23.5%) had spinal fusion, 45 (22.5%) had other spine procedures, 58 (29.0%) underwent laminectomy, and 50 (25.0%) had a discectomy (TABLE 2). The mean OT time to incision (min) of the patients was 64.9$\pm$30.5 with minimum and maximum value of 15.0 and 120.0.

Out of 200 patients, 94(47.0%) experienced a delay, while 106(53.0%) did not develop a delay. Causes of delay are given in table 3.

There was no significant difference between the BMI group and patient preparedness , staff unavailability, surgeon, non-availability of trained anesthetists for induction, anesthesia delay due to on-table review of the patient, on-table assessment of the patient, on- time required for attaching the ASA standard monitors, anesthesia delay due to on- time required for intubation, on- time required for acquiring additional venous access, occurrence of anesthesia delay due to on- time requires for maintaining arterial line, anesthesia delay due to patient positioning ($P>0.05$).

Except surgeon unavailability, there was no significant difference between the ASA group and missing paper, patient preparedness, surgeon, non-availability of trained anesthetists for induction, anesthesia delay due to on-table review of the patient, on-table assessment of the patient, on- time required for attaching the ASA standard monitors, anesthesia delay due to on- time required for intubation, on- time required for acquiring additional venous access, occurrence of anesthesia delay due to on- time requires for maintaining arterial line, anesthesia delay due to patient positioning ($P>0.05$).

Table 1

Demographics

Variables	Mean+/-SD
Age [years]	46.5+/-15.5
Height [metres]	1.71+/-0.10
Weight [kg]	75.4+/-11.03
BMI (kg/m^2)	25.7+/-4.23
Descriptive of Time in OT to incision (minutes)	64.9+/-30.5

Table 2

Nominal variables

Variables		N (%)
GENDER	MALE	144(72.0%)
	FEMALE	56(28.0%)
ASA-STATUS	ASA-I	98 (49.0%)
	ASA-II	102 (51.0%)

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TYPE OF SURGERY	spinal fusion	47 (23.5%)
	OTHER SPINE SURGERIES	45 (22.5%)
	laminectomy	58 (29.0%)
	discectomy	50 (25.0%)
DELAY	YES	94(47.0%)
	NO	106(53.0%)

Table 3

Causes Of Delay

Cause of Delay	N (%)
missing paper work in preop	7(7.4%)
Patient not prepared in preop	86(43.0%)
staff unavailability	8(8.5%)
surgeon unavailability	19(20.2%)
trained anesthetist was not available	2(12.8%)
on-table surgery review	11(11.7%)
on table airway assessment by senior	17(18.1%)
time needed to attach the monitors	9(9.6%)
time required for intubation	4(4.3%)
time required for acquiring additional venous access	25(26.6%)
time required for maintaining arterial line	47(50%)
patient positioning	61(64.9%)

DISCUSSION

Operating room delays between the time a patient enters the operating theater (OT) and the actual skin incision during spine surgeries can significantly impact patient outcomes and surgical efficiency. These delays often result from various factors including preoperative preparation, anesthesia induction, and the setting up of specialized surgical equipment.[15,16]

The time-consuming nature of these tasks can prolong the overall duration of surgery, potentially increasing the risk of infection, anesthesia-related complications, and overall healthcare costs.[17] Addressing these delays requires a coordinated effort from the surgical team to streamline processes, ensure timely availability of equipment, and improve communication among staff.[18-19]

Furthermore, operating room delays can also contribute to increased stress and fatigue among the surgical team, which may affect their performance and the quality of patient care. Prolonged waiting times can lead to a backlog of surgeries, disrupting the schedule and causing inconvenience to other patients awaiting surgery.[20]

Implementing strategies such as preoperative checklists, efficient anesthesia protocols, and real-time monitoring of operating room activities can help mitigate these delays.[21] Continuous training and process optimization are essential to enhance the overall efficiency of spine surgeries, ensuring timely skin incision and improving patient outcomes.[21-23]

The study included 200 patients undergoing spine surgeries, with a mean age of 46.5 years (±15.5) and an age range of 21 to 75 years. There were 72.0% males and 28.0% females. The mean height was 1.71 meters (±0.10), and the mean weight was 75.4 kg (±11.03), leading to a mean BMI of 25.7 kg/m² (±4.23). The patient classification according to the American Society of Anesthesiologists (ASA) included 49.0% classified as ASA I and 51.0% as ASA II. Regarding surgical procedures, 29.0% underwent laminectomy, 25.0% discectomy, 23.5% spinal fusion, and 22.5% surgery for disc herniation.

Delays in the operating room were observed in 94(47.0%) of patients, with the mean time from entering the OT to skin incision being 64.9 minutes (±30.5). Key factors contributing to delays included missing paperwork (7.5%), lack of patient preparation (43.%), staff unavailability (8.5%), surgeon unavailability (20.2%), and anesthetist unavailability (12.8%). Other significant causes of delay were on-table review (11.7%), airway assessment (18.1%), time required for attaching monitors (9.6%), intubation (48.6%), acquiring additional venous access (26.6%), maintaining arterial line (50.0%), and patient positioning (64.9%). There were no significant differences in delay factors across age, BMI, or ASA groups (P>0.05).

Perioperative surgical delays include delays getting to the operating room till the operation is complete. It also includes time for induction of anesthesia. In the past various studies have been conducted regarding perioperative delays during various surgical procedures. Cox et al described that around 88% of cases were delayed a while Hicks et al noted that 55 % of first cases were delayed.[10, 11]

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CONCLUSION

In conclusion, the study highlights significant operating room delays in spine surgeries, primarily attributed to factors such as missing paperwork, patient and staff preparation, and equipment setup. Addressing these factors through improved coordination, streamlined processes, and enhanced communication could reduce delays and improve surgical efficiency and patient outcomes.

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