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Original Article

Effect of length time to surgery on postoperative hospital length of stay among neurosurgical patients

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ABSTRACT

Background: In most hospitals, inpatient urgent surgery is triaged based on the degree of urgency and time of surgical booking. A longer wait for semi-urgent surgery due to sharing resources between specialties might impact the postoperative course. The objective of this study is to determine the effect of length time to semi-urgent surgery on postoperative hospital length of stay among neurosurgical patients.

Methods: A retrospective cohort study was conducted included all admitted adult patients placed on semi-urgent University of Alberta Hospital surgical list between 2008 and 2013. Linear and logistic regression analyses were performed. The main exposure variable was time from surgical booking to the time of surgery, and the outcome variable was time from surgery to discharge.

Results: A total of 1367 neurosurgical cases were included in the study. The mean age was 54.3 years. The mean length of time in the hospital before and after surgery was 1.2 and 12.5 days, respectively. Overall, the time from booking to surgery did not affect the time from surgery to discharge. Increased age, higher ASA score, and surgeries performed after 24 h from booking in the group of patients who were discharged to another facility were associated with a longer postoperative stay.

Conclusion: Neurosurgery patients booked for surgery to be done within 24 h waited longer to have their procedure completed. Overall, there was no significant association between length of time waiting for surgery and postoperative stay, although there was an increase in postoperative stays among patients who were discharged to another facility and had their surgeries performed after 24 h.

Keywords: Early surgery, Hospital length of stay, Late surgery, Postoperative stay, Waiting time

INTRODUCTION

In most Canadian hospitals, inpatient urgent surgery is triaged based on the degree of urgency and time of surgical booking. Hospitals have various systems whereby surgeons specify the former. These typically include three tiers: emergent (must be done within 1 h), urgent (must be done within 4–8 h depending on the institution), and semi-urgent (must be done within 24 h). The "life or limb threatened" nature of the first tier ensures that they are done within the specified hour.

A longer wait for semi-urgent surgery due to sharing resources between specialties might impact postoperative course: as an example, patients harboring active surgical infections such

as abscesses for a longer period of time might require longer to clear the infection and to recover from the effects of an infection, longer periods of mandated bed rest for certain conditions such as fractures could result in an increased risk of venous thromboembolism. As a result, they may ultimately have a worse clinical outcome, increased length of postoperative stay, and overall increased cost related to their presenting condition.[2,4,7]

In a system with fixed health-care resources, it is important to invest in both effective and cost-effective methods.[3] While surgery is expensive, the burden of inpatient stay and its associated cost may be increased due to restricted access to semi-urgent surgical cases. To date, this has not yet been demonstrated conclusively; if it was, it might bring with it significant budgetary implications within the Canadian health-care system.

This objective of this study is to determine the effect of length time on semi-urgent surgery on postoperative hospital length of stay for neurosurgery patient.

MATERIALS AND METHODS

A retrospective cohort study was conducted included all admitted patients over age 17 placed on semi-urgent (E24) University Hospital emergency surgical list, Edmonton, Alberta, between 2008 and 2013. The main exposure variable was time from surgical booking to time of skin incision in hours, and the outcome variable was mean time from surgery to discharge. The potential confounders age, sex, procedure type, and patient comorbidities (ASA class) were included in the study.

Data were obtained from combining the surgical database (date of the booking, date of surgery, procedure type, surgical time, age, sex, and ASA class) and admissions database (date of discharge and discharge disposition). Time to surgery of 5 days or longer was unusual and thus graded into a single category.

Linear and logistic regression analyses were performed, with the dependent variable being the time from surgery to discharge. Subgroup analysis by age, ASA score, and discharge disposition were also performed.

RESULTS

There were 1367 neurosurgical cases, which constitute 7.22 % of all surgical specialties' cases; Figure 1 shows the type of procedures. The mean age was 54.3 years, and 57% of patients were male. The mean length of stay after surgery was 12.5 days (SD = 23), which breakdown based on waiting time before surgery [Table 1].

There were 351 patients (26%) who were transferred to an acute care facility, 208 (15%) to continuing care facility, 111 (8%) to home with help, and 695 (51%) to home with no help. The mean length of stay after surgery was 6.78 days if the patient discharged home and 21.23 if discharged to another facility [Figure 2].

In the regression model, including all patients, overall, the time from booking to surgery did not affect the time from surgery to discharge [Figure 3]. Increased age and a higher ASA score were associated with a longer postoperative stay ($P < 0.001$). Subgroup analysis showed that surgeries performed after 24 h from booking associated with a longer postoperative stay in the group of patients discharged to another facility [Table 2].

DISCUSSION

This study showed that neurosurgery patients booked for surgery to be done within 24 h waited longer to have their procedure completed. Overall, there was no significant association between length of time waiting for surgery and postoperative stay after adjusting for confounders, although the subgroup analysis revealed an increase in

Table 1: The mean length of stay after surgery breakdown based on waiting time before surgery.

Time to surgery (days)	Number of patients	Meantime to discharge (days)	Standard deviation
0	9040	14	24
1	6758	11	22
2	1921	11	19
3	689	11	19
>3	518	13	22

Table 2: Subgroup analysis using age, ASA score, and discharge disposition show the effect of waiting time before surgery on postoperative hospital stay.

Variable	Sig.	Odds ratios
Age	<0.001	1.008
ASA 1	Reference	
ASA 2	<0.001	2.694
ASA 3	<0.001	9.559
ASA 4	<0.001	34.459
ASA 5	0.999	20.52
Discharged home		
Surgery performed within 24 h of booking	Reference	
Surgery was not performed within 24 h of booking	0.151	0.929
Transferred to another facility		
Surgery performed within 24 h of booking	Reference	
Surgery was not performed within 24 h of booking	<0.001	1.541

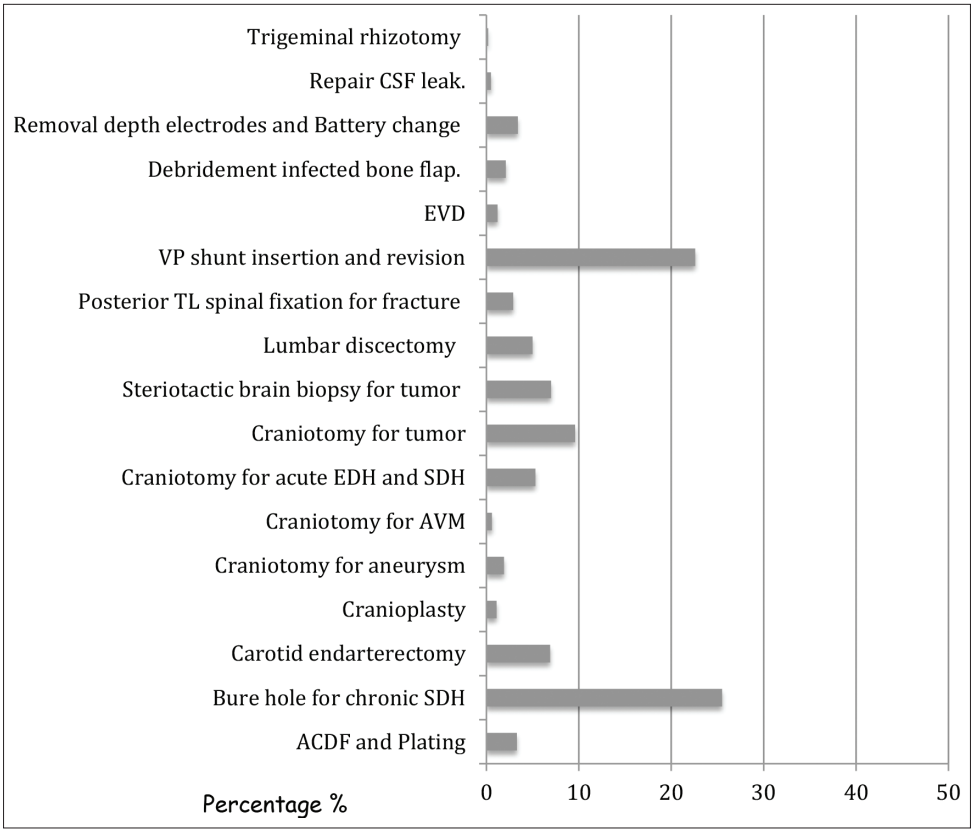

Figure 1: Distribution of neurosurgical procedures booked as semi-urgent E 24.

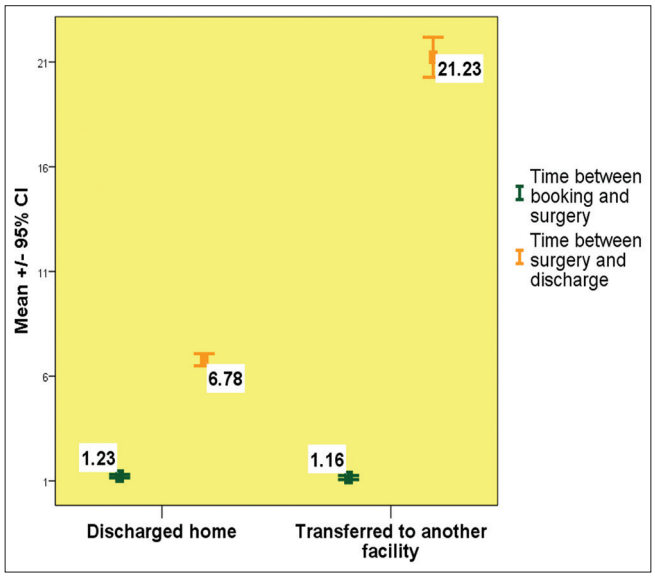

Figure 2: The mean length of stay after surgery breakdowns based on discharged home versus to another facility.

postoperative stays in the group of patients who were discharged to another facility if their surgery was delayed more than 24 h. Few studies have investigated the effect of delay in surgery on postoperative outcomes. Munster *et al.* noted a significant decrease in hospital LOS for burn care as a function of more aggressive and urgent surgical closure of the burn wound.[6] Another study investigating the effect of early excision and grafting (defined as within 24 h of admission) found a shorter LOS without adverse effects on clinical outcome.[8] In the orthopedic literature, delay to hip fracture surgery has been repeatedly shown to profoundly increase mortality. For example, Bellelli *et al.* found a nearly six-fold increase in 12-month mortality for patients with a disability who waited for more than 48 h for surgery.[1] One report investigating the economic impact of "untimely surgical intervention" found delays in 251 out of 342 cases that were solely due to lack of access to the OR. They estimated the avoidable cost of unnecessary hospital stay and prolonged intravenous antibiotics to be approximately NZ $195,000.[5]

One of the aims of the study was to identify factors that are associated with longer hospital stays to potentially target them as a cost-saving measure. However, time to being ready for discharge is an important variable to include in future studies and that could precisely determine the actual postoperative length of stay needed.

Certain procedures, higher ASA class, and increase age were significantly associated with longer postoperative stays.

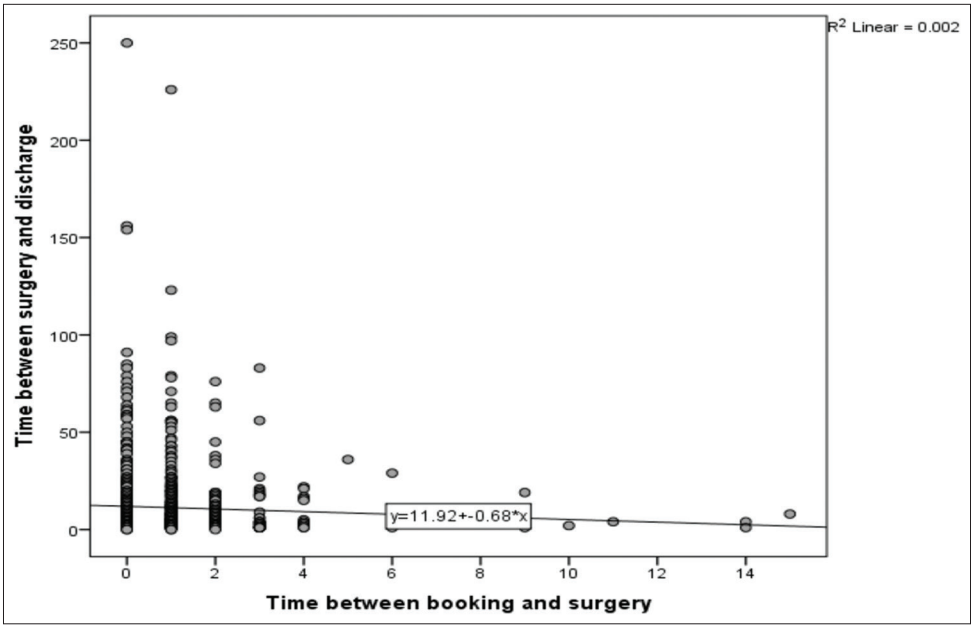

Figure 3: Linear regression model, including all patients, is studying the effect of waiting time before surgery on the postoperative hospital stay.

CONCLUSION

Neurosurgery patients booked for surgery to be done within 24 h waited longer to have their procedure completed. There was no significant association between length of time waiting for surgery and postoperative stay, although there was a significant increase in postoperative stays in the group of patients who were discharged to another facility and had their surgeries performed after 24 h. Higher ASA class and increase age were significantly associated with longer postoperative stays.

Declaration of patient consent

Institutional Review Board (IRB) permission obtained for the study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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