

Intersurgeon variations in postoperative length of stay after video-assisted thoracoscopic surgery lobectomy



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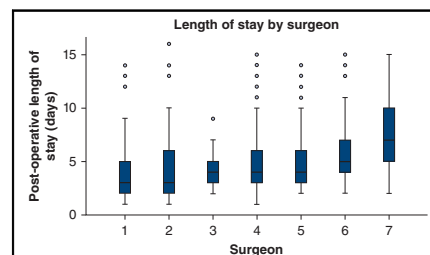
ABSTRACT

Objectives: To identify factors associated with prolonged postoperative length of stay (LOS) after VATS lobectomy (VATS-L), explore potential intersurgeon variation in LOS and ascertain whether or not early discharge influences hospital readmission rates.

Methods: We conducted a retrospective analysis of patients who underwent VATS-L at a single academic center between 2018 and 2021. Each VATS lobectomy procedure was performed by 1 of 7 experienced thoracic surgeons. The primary end point of interest was prolonged LOS, defined as an index LOS >3 days.

Results: Among 1006 patients who underwent VATS lobectomy, 632 (63%) had a prolonged LOS. On multivariate analysis, the factors independently associated with prolonged LOS were: surgeon ($P < .001$), patient age (odds ratio [OR], 1.03; 95% CI, 1.02-1.06), operation time (OR, 1.01; 95% CI, 1.01-1.01), postoperative complication (OR, 3.60; 95% CI, 2.45-5.29), and prolonged air leak (OR, 8.95; 95% CI, 4.17-19.23). There was no significant association between LOS and gender, body mass index, coronary artery disease, prior atrial fibrillation, American Society of Anesthesiologists score >3, and prior ipsilateral thoracic surgery or sternotomy. There was no association between LOS ≤ 3 days and hospital readmission (20 [5.3%] vs 39 [5.9%]; OR, 0.88; 95% CI, 0.50-1.53).

Conclusions: An intersurgeon variation in postoperative LOS after VATS-L exists and is independent of patient baseline characteristics or perioperative complications. This variation seems to be more closely related to differences in postoperative management and discharge practices rather than to surgical quality. Postoperative discharge within 3 days is safe and does not increase hospital readmissions. (JTCVS Open 2024;18:253-60)



Intersurgeon variation in postoperative length of stay (in days).

CENTRAL MESSAGE

Intersurgeon differences in postoperative management play a pivotal role in determining length of stay after VATS lobectomy. Early discharge remains a safe and feasible approach for patients.

PERSPECTIVE

This study underscores that intersurgeon variation in postoperative management and discharge practices significantly influence length of stay following VATS lobectomy, independent of patient baseline characteristics or perioperative complications. Moreover, discharging patients within 3 days postoperation is a safe practice that doesn't elevate hospital readmission rates.

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The Institutional Review Board of the Research Center du Centre Hospitalier de l'Université de Montréal approved this study (CRCHUM IRB#: 22.104; July 28, 2022) and waived the need for informed consent.

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Abbreviations and Acronyms

ASA	= American Society of Anesthesiologists
BMI	= body mass index
CHUM	= Research Center du Centre Hospitalier de l'Université de Montréal
COPD	= chronic obstructive pulmonary disease
ERAS	= enhanced recovery after surgery
FEV1	= forced expiratory volume in 1 second
LOS	= length of stay
VATS-L	= video-assisted thoracoscopic surgery lobectomy

Lung cancer is the leading cause of cancer-related deaths worldwide.^{1,2} Video-assisted thoracoscopic surgery lobectomy (VATS-L) has emerged as among the preferred surgical techniques over traditional open thoracotomy due to its minimally invasive nature and associated lower complication rates and postoperative pain.^{3,4} The direct operative cost of VATS-L has been shown to be higher when compared with open lobectomy, whereas the overall cost per patient operated has been shown to be less expensive with VATS-L, largely influenced by shorter length of stay (LOS) and lower readmission rate.⁵⁻⁹ For surgical patients, hospital LOS is the most critical component of hospitalization cost.¹⁰ Hence, to obtain the total cost advantage related to VATS-L, it is important to optimize LOS.

Several factors are known to influence postoperative LOS after lung cancer surgery, including patient characteristics, the extent and location of the tumor, surgical technique, and postoperative complications.¹¹ However, intersurgeon differences in perioperative care and discharge preferences may also play a role in LOS variation.

Thus, the primary objective of this study was to identify the factors associated with prolonged postoperative LOS after VATS-L and evaluate the influence of intersurgeon variation on LOS. In addition, we also aim to evaluate the association between early postoperative discharge and hospital readmission rates.

Enhanced recovery after surgery (ERAS) protocols, which aim to improve patient recovery and standardize postoperative patient management,^{12,13} have been shown to reduce LOS and cost of hospitalization while improving quality of life and patient satisfaction in various surgical specialties, including colorectal surgery, gastric surgery, and orthopedic surgery.^{12,14,15}

Our hypothesis is that nonstandardized peri- and postoperative care pathways may result in prolonged LOS and intersurgeon variations in LOS. This study is novel and is conducted as a quality improvement initiative to demonstrate the need for standardized care pathways in our institution.

MATERIALS AND METHODS**Ethics**

The Institutional Review Board of the Research Center du Centre Hospitalier de l'Université de Montréal (CHUM) approved this study (#22.104; July 28, 2022) and waived the need for informed consent.

Design and Population

This study is a single-center retrospective analysis of consecutive adult patients who underwent VATS-L at the CHUM, an academic center in Montreal, Québec, Canada, between 2018 and 2021. The data were reviewed from a prospectively maintained thoracic surgery database. Inclusion criteria comprised adult patients (aged 18 years or older) who underwent VATS-L for lung cancer between 2018 and 2021 at the CHUM. Our study also included patients who underwent neoadjuvant chemotherapy or immunotherapy. Patients who underwent other types of lung resections, such as bilobectomy, pneumonectomy, sleeve resection, chest wall resection, segmentectomy, and wedge resection, were excluded from the analysis. Patients who were converted to open thoracotomy were also excluded from the study.

Outcomes

The study's primary outcome measure was prolonged LOS, which we defined as an index postoperative LOS exceeding 3 days following VATS-L surgery. In determining a prolonged LOS as >3 days, we were guided by the real-world performance of 2 surgeons in our study group. These surgeons consistently achieved a median LOS of 3 days without any observed compromise in patient outcomes. Whereas the study's overall median LOS was 4 days (interquartile range [IQR], 3-6 days), we posited that the 3-day benchmark set by these surgeons represents a practical and achievable standard for optimizing patient care and turnover. Our secondary outcome measure was hospital readmission within 60 days after discharge. We specifically investigated the influence of prolonged LOS on hospital readmission rates during this time frame. We chose a more severe definition of readmission (60 days as opposed to the conventional 30 days) to encompass a broader range of potential readmissions and to avoid underestimating readmission rates pertinent to the short length of stay cohort.

Associations

The main associative variable under investigation was the surgeon who performed the VATS-L procedure. All surgeries were conducted by 1 of 7 Board-certified thoracic surgeons. In addition, we considered various patient demographic and clinical data, including sex, age, body mass index (BMI), chronic obstructive pulmonary disease (COPD), heart failure, prior atrial fibrillation, coronary artery disease, American Society of Anesthesiologists (ASA) class >3 and forced expiratory volume in 1 second (FEV1). We also recorded any history of previous ipsilateral thoracic surgery or previous sternotomy.

During the perioperative period, we collected data on conversion to open thoracotomy (yes/no), operative time (in minutes), and whether blood loss exceeded 400 mL. Finally, we gathered postoperative information such as hospital length of stay (in days), the presence of any postoperative complication and the occurrence of prolonged air leak, which we defined as the presence of chest tube drainage for a duration of 5 days. The definition of prolonged air leak in this study is ≥ 5 days.

Statistical Analysis

Statistical analysis was performed using SPSS statistical software, version 27 (IBM-SPSS Inc). Descriptive characteristics are presented as median and IQR for continuous parameters and frequency distributions (number and proportion) for categorical parameters for all patient

demographic and baseline characteristics. A univariate model was used to identify risk factors significantly associated with prolonged LOS. Multivariate logistic regression was used to explore the independent association between these parameters and LOS. The development of the multivariate models followed a systematic approach that included the use of bivariate analyses for the identification of potential associations. Variables showing a noteworthy statistical association, or important clinical associations, as indicated by a more than 2-fold difference with respect to the accuracy distribution, were included in the multivariate models. Stepwise selection methods will be used to develop the final frameworks. Models with the lowest Akaike Information Criterion values are selected.

RESULTS

Patient Characteristics

Amongst 1006 adult patients who underwent VATS-L between 2018 and 2021, the overall median LOS was 4 days (IQR, 3-6 days). Patients were classified into 2 groups based on their postoperative LOS: 374 (37%) who stayed ≤ 3 days and 632 (63%) who stayed > 3 days. Baseline clinical characteristics stratified by LOS are shown in Table 1.

The median age and BMI of the patients was 68 years (IQR, 61-73 years) and 27 (IQR, 24-30), respectively. The study included 593 (59%) female patients. Female sex and BMI were not significantly associated with postoperative LOS. Patients with a prolonged LOS were significantly older than those with an LOS ≥ 3 days (69 years; IQR, 63-74 years) versus 66 years (IQR, 59-72 years), respectively; ($P < .01$).

Comorbidities such as coronary artery disease were present in 125 (12%) patients, prior atrial fibrillation in 79 (8%) patients, heart failure in 11 (1%) patients, and ASA class > 3 in 4 (0.5%) patients. There was no significant

difference in incidence of these comorbidities between patients with an LOS ≤ 3 days and those with a prolonged LOS. However, 357 (36%) of the patients had COPD, among whom 251 (40%) had prolonged LOS compared with 106 (28%) who had an LOS ≤ 3 days ($P < .01$). Patients with prolonged LOS also had a lower FEV1 than those with an LOS ≤ 3 days (91% vs 95%, respectively; $P = .01$). Rates of prior sternotomy and prior ipsilateral thoracic surgery were similar between the 2 groups and not significantly associated with postoperative LOS.

Surgical and Postoperative Data

Surgical and postoperative data stratified by LOS are presented in Table 2. The median duration of the operation was 101 minutes (IQR, 80-133 minutes), with patients with an LOS of ≥ 3 days having a longer operation duration than those with an LOS of ≤ 3 days (109 vs 90 minutes; $P < .01$) (see Table 2). Two hundred thirty-nine (32%) patients lost > 400 mL blood, with the incidence of this complication being significantly higher in cases where the LOS was of > 3 days (171 [26%] vs 68 [18%]; $P < .01$). Postoperative complications occurred in 373 (36%) patients, affecting 315 (47%) patients with a prolonged LOS and only 58 (16%) of patients with an LOS of ≤ 3 days ($P < .01$). The complication rates varied significantly between surgeons ($P < .01$) (see Table 3). Finally, prolonged air-leak occurred in 262 (26%) of the patients, with a significantly higher incidence in patients with an LOS of > 3 days (254 [40%] vs 8 [2%], respectively; $P < .01$).

TABLE 1. Clinical characteristics of patients undergoing video-assisted thoracoscopic surgery lobectomy according to length of stay (LOS)

Baseline patient characteristic	All patients (N = 1006)	LOS ≤ 3 d (n = 374)	LOS > 3 d (n = 632)	P value
Age (y)	68 (61-73)	66 (59-72)	69 (63-74)	$< .01$
Female sex	593 (59)	219 (59)	374 (60)	.85
Body mass index	27 (24-30)	27 (24-30)	27 (23-30)	.23
Coronary artery disease	125 (12)	40 (11)	85 (13)	.20
Chronic obstructive pulmonary disease	357 (36)	106 (28)	251 (40)	$< .01$
Prior atrial fibrillation	79 (8)	21 (6)	58 (9)	.04
Heart failure	11 (1)	1 (0)	10 (2)	.04
Forced expiratory volume in 1 s (%)	93 (80-105)	95 (83-105)	91 (78-105)	.02
American Society of Anesthesiologists score > 3	4 (0)	0 (0)	4 (1)	.15
Prior sternotomy	38 (4)	9 (2)	29 (5)	.08
Induction therapy				.80
None	970 (96)	358 (96)	611 (97)	
Radiation	3 (0)	1 (0)	2 (0)	
Systemic therapy*	32 (3)	14 (4)	18 (3)	
Chemoradiation	2 (0)	1 (0)	1 (0)	

Values are presented as median (range) or n (%). LOS, Length of stay. *Systemic therapy includes chemotherapy or patients who received chemotherapy with or without immunotherapy as part of a clinical trial.

TABLE 2. Surgical and postoperative parameters of patients undergoing video-assisted thoracoscopic surgery lobectomy according to length of stay (LOS)

Surgical and postoperative data	All patients (N = 1006)	LOS ≤3 d (n = 374)	LOS >3 d (n = 632)	P value
Operation duration (min)	101 (80-133)	90 (72-115)	109 (87-143)	<.01
Blood loss >400 mL	219 (22)	67 (18)	152 (24)	.02
Any postoperative complication	354 (35)	57 (15)	297 (47)	<.01
Prolonged air-leak	262 (26)	8 (2)	254 (40)	<.01

Values are presented as median (range) or n (%). LOS, Length of stay.

Intersurgeon Variations in Postoperative LOS

The number of cases per surgeon is presented in Table 4. Due to privacy considerations, additional details about the surgeons are not provided. We found significant variability ($P < .01$) in postoperative LOS following VATS-L across the 7 surgeons. The distribution of postoperative LOS for each of surgeon is also presented in Table 4. The median postoperative LOS ranged from 3 to 7 days across the 7 surgeons, indicating substantial intersurgeon variation in postoperative care pathway. Furthermore, the IQR for postoperative LOS also varied greatly among the 7 surgeons. The surgeon with the greatest IQR spanned 5.25 days (from 5 to 10.25), indicating the greatest variation in LOS post-VATS-L. Conversely, the surgeon with lowest IQR spanned 2.5 days (from 3 to 5.5), demonstrating greater consistency in their patients LOS post-VATS-L. The percentage of patients with an LOS >3 days ranged from 37% to 92% across the 7 surgeons ($P < .01$).

Multivariate Analysis

Multivariate analysis was conducted to identify factors that were independently associated with prolonged hospital LOS following VATS-L surgery for lung cancer. The factors, their respective odds ratios (OR) and 95% CI of experiencing prolonged LOS are depicted in Table 5.

The surgeon performing VATS-L was independently associated with prolonged LOS. Four surgeons had significantly lower odds of operating on patients who experienced prolonged hospital LOS than those operated on by the referent surgeon (Figure 1). The surgeon with the lowest

odds of treating patients with prolonged LOS had an OR of 0.08 (95% CI, 0.04-0.18). However, patients of 2 of the surgeons did not show significantly lower odds of prolonged LOS than those of the referent surgeon, as indicated by their ORs of 0.41 (95% CI, 0.17-1.01) and 0.49 (95% CI, 0.22-1.10).

Increasing age was independently associated with prolonged hospital LOS, with an OR of 1.04 (95% CI, 1.02-1.06) per year increase in age. In contrast, respiratory comorbidities such as COPD and FEV1 showed no independent association with prolonged LOS, as evidenced by their OR of 1.10 (95% CI, 0.77-1.59) and 0.98 (95% CI, 0.92-1.06), respectively. Our analysis also showed that operation duration (OR, 1.01; 95% CI, 1.00-1.01 per minute increase in operation time), the presence of any postoperative complications (OR, 2.85; 95% CI, 1.92-4.24) and prolonged air leak (OR, 17.65; 95% CI, 8.30-37.55) were all independently associated with prolonged hospital LOS. However, blood loss > 400 mL showed no independent association with prolonged LOS, as evidenced by an OR of 1.24 (95% CI, 0.80-1.93).

Influence of Prolonged LOS on 60-Day Readmission

Fifty-nine (6%) patients were readmitted to the hospital within 60 days after discharge following VATS-L. There was no significant difference in readmission rate between patients with an LOS >3 days and those with an LOS ≤3 days (39 [5.9%] vs 20 [5.3%], respectively; $P = .65$).

DISCUSSION

In this retrospective study, we demonstrated that there is a significant intersurgeon variation in post-operative LOS after VATS-L, even after accounting for baseline patient characteristics and perioperative complications (Figure 2). Additionally, our findings reveal that age, operation duration, postoperative complications and prolonged air leak are also factors independently associated with prolonged LOS following VATS-L. Lastly, discharge after VATS-L within the first 3 days of admission is not associated with increased 60-day readmission. These findings are relevant to clinical practice, providing important insights for develop preoperative risk stratification and surgical decision making in VATS-L surgery.

TABLE 3. Rates of postoperative complications per surgeon

Surgeons	Rates of complications	P value
1	68/213 (32)	≤.01
2	50/121 (41)	
3	18/89 (20)	
4	81/249 (33)	
5	38/121 (31)	
6	36/90 (40)	
7	63/123 (52)	

Values are presented as n/N (%).

TABLE 4. Intersurgeon variation in length of stay (LOS) (in days) of their patients

Surgeon	No. of patients (% of overall cohort)	Median (IQR) LOS (d)	Proportion of patients with LOS >3 d (%)	P value
1	213 (21)	3 (2-4.5)	78/213 (37)	<.01
2	121 (12)	3 (2-6)	57/121 (47)	
3	89 (9)	4 (3-5.5)	67/89 (75)	
4	249 (25)	4 (3-6)	159/249 (64)	
5	121 (12)	4 (4-6)	92/121 (76)	
6	90 (9)	5 (3-7)	67/90 (74)	
7	123 (12)	6.5 (5-10)	112/123 (91)	

LOS, Length of stay.

The finding that increasing age independently predicted a longer LOS is consistent with previous literature¹⁶⁻¹⁸ and suggests that older patients may require more time to recover and be discharged after surgery. Age is therefore a relevant factor to consider when devising postoperative care plans and stratifying risk post VATS-L.

Respiratory comorbidities, such as COPD and diminished FEV1 were not independently associated with prolonged postoperative LOS. However, this finding does not undermine the importance of optimizing respiratory function before surgery to minimize the risk of prolonged LOS.¹⁹ This conclusion diverges from previous studies. For instance, Wright and colleagues¹⁶ demonstrate that poor pulmonary function is a significant predictor of prolonged LOS following thoracic surgery. We suspect that this discrepancy is related to the fact that our model

considered COPD and postoperative complications, which were not considered in Wright colleagues' study. These factors may create a strong codependence with FEV1, possibly explaining why pulmonary function was not identified as significantly associated with LOS in our model.

Operation duration showed an independent association with prolonged LOS. As prior authors have demonstrated, prolonged operative time in VATS lobectomy is significantly correlated with post-operative complications,²⁰ and hence, efforts to minimize intraoperative time, may represent effective strategies for improving cost-effectiveness. Operation duration; however, may be a surrogate for complicated surgery and other factors that were not included in this analysis, which could be associated with longer postoperative recovery. Patient safety must remain a priority and shortening operative time or avoiding conversion should not compromise surgical quality or outcomes. As expected, the presence of postoperative complications was significantly associated with prolonged LOS, underscoring the importance of optimizing perioperative care.²¹

Our study also revealed significant intersurgeon variability in postoperative LOS following VATS-L. This variability was observed even after adjusting for baseline patient characteristics and perioperative complications. Differences in surgeon practice patterns, personal choice of perioperative management or discharge criteria may account for this variability. For example, some surgeons have different thresholds for discharge or different postoperative care protocols that can contribute to differences in LOS.

This study was initiated in response to the perceived lack of standardized postoperative pathways, with the recognition that discharge times seem more reliant on individual surgeons' preference and intuition than on consistent, institutionwide protocols. Such variability is evident in chest tube management. Standard practice for most surgeons involves setting the chest-tube to wall suction at -20 cm H₂O for an initial 12 to 24 hours, followed by a switch to water seal, whereas others do not routinely use suction. Furthermore, the criteria for chest tube removal is left to surgeon discretion and is not standardized amongst

TABLE 5. Multivariate analysis

Variables associated with prolonged length of stay	Odds ratio (95% CI)
Surgeon	
1	0.08 (0.04-0.18)
2	0.09 (0.04-0.21)
3	0.41 (0.17-1.01)
4	0.31 (0.15-0.67)
5	0.49 (0.22-1.10)
6	0.34 (0.15-0.80)
7	1.00*
Age, per year	1.04 (1.02-1.06)
Chronic obstructive pulmonary disease	1.10 (0.77-1.59)
Forced expiratory volume in 1 s (%), per 10% increments	0.98 (0.92-1.06)
Atrial fibrillation	1.49 (0.82-2.72)
Operation duration, per minute	1.01 (1.00-1.01)
Blood loss >400 mL	1.24 (0.80-1.93)
Any postoperative complication	2.85 (1.92-4.24)
Chest-tube duration >5 d	17.65 (8.30-37.55)

CI, Confidence interval. *Reference category.

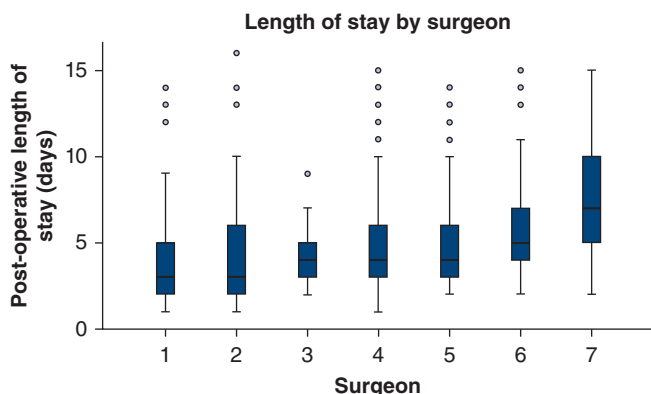


FIGURE 1. The lower and upper borders of the box represent the lower and upper quartiles (25th percentile and 75th percentile). The middle horizontal line represents the median. The lower and upper whiskers represent the minimum and maximum values of nonoutliers. Extra dots represent outliers.

surgeons. For example, some surgeons in the group consider it acceptable to remove the chest tube in the absence of an air leak and with less than 400 cc fluid drained over 24 hours. Other, more conservation surgeons, require less than 300 cc or even 200 cc per 24 hours. Moreover, chest tubes are not automatically removed by all surgeons when these criteria are met; this decision stays at the surgeon's discretion. The nonstandardized management of chest tubes likely exacerbates the prolonged LOS. Indeed, it's been shown that ERAS pathways focusing on proactive chest-tube management, including no routine use of suction, removal of tube at a higher threshold (<450 mL/24 hours) of serious fluid output are safe and lead to superior patient outcomes.²²⁻²⁴ Enhanced chest-tube management may also lead to earlier mobilization and lower opioid use. A further point of divergence is the discharge protocol of patients with chest tubes. Some surgeons are comfortable with discharging patients with a Heimlich valve, whereas others are not. In contrast, the pain management protocols are more standardized across the surgical team. Epidural anesthesia is a standard procedure for several surgeons and is managed by a dedicated postoperative pain management anesthesia service. Following this, the transition to stepdown pain regimens is guided by a structured process based on patient-specific factors such as weight and age.

The finding that some surgeons consistently demonstrated shorter LOS than others, and that this association remains significant on multivariate analysis, after controlling for patient characteristics and perioperative complications, highlights the need for a standardized and reproducible approach to postoperative patient management in VATS-L. The adoption ERAS protocols may be an effective solution to minimize intersurgeon variability, optimize outcomes, improve patient quality of life, and decrease costs.¹² Using our own institution as an example, our financial management

division's 2021 end-of-year assessment reported a median cost per day of postoperative stay after VATS-L of CA\$798. With a difference in intersurgeon variation in median LOS of 7 days versus 3 days between our longest and shortest time surgeons, and a surgical volume of 350 to 400 VATS-L per year, standardizing hospital discharge may translate into some major cost savings. The implementation of standardized ERAS protocols in our institution is a potential solution to reduce the observed intersurgeon variation in LOS, and the associated costs of prolonged LOS. Furthermore, our findings suggest that this would be safe. Indeed, there was no significant association between postoperative LOS and 60-day readmission rates. In this regard, the literature provides conflicting data. Our findings are in keeping with that of Patel and colleagues²⁵ who have similarly reported comparable readmission rates after lobectomy, regardless of LOS. In contrast, our findings are not in keeping with that of Freeman and colleagues,²⁶ who reported an inverse relationship between LOS and readmission rates. Nonetheless, our data support efforts to reduce LOS without compromising outcomes.

Generalization of the conclusions drawn from this study is limited by the fact that it is a single-center retrospective study. Prospective multicenter studies with larger sample sizes and more diverse patient populations will be required to confirm the general applicability of the findings. Additionally, our findings call for further investigation into the specific intersurgeon differences in postoperative care pathways, such as differences in surgical technique, perioperative management, or discharge criteria, which were not considered in the present analysis but may contribute to LOS variability. The inherent constraints associated with conducting a retrospective analysis of a prospectively accrued database primarily revolve around the predetermined data points. Consequently, several relevant factors that may influence length of stay could not be accounted for in our study. Among them, the absence of information regarding discharge medications and discharge location, as well as specific tumor characteristics such as neoadjuvant treatment, tumor size, clinical stage, and location, pose limitations to our analysis. Furthermore, our dataset lacked comprehensive data on patient functional status, with only the ASA score available, while potentially enlightening scores like the Eastern Cooperative Oncology Group or Zubrod were absent. Our study also lacked access to information about the status of oxygen use or chest tubes at the point of discharge. Lastly, although all patients in our study had full provincial medical coverage, other social determinants of health such as income and education level were not available in our dataset. These omissions represent notable limitations of our study and underscore potential avenues for further research to provide a more nuanced understanding of the factors influencing length of stay.



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Inter-Surgeon Variation in Post-Operative Length of Stay after VATS Lobectomy		
Methods	Results	Implications
<p>Retrospective Cohort of 1006 VATS Lobectomy Patients</p> <pre> graph TD A[Retrospective Cohort of 1006 VATS Lobectomy Patients] --> B[LOS > 3 days (N = 632)] A --> C[LOS ≤ 3 days (N = 374)] </pre>	<p>Factors independently associated with prolonged length of stay on multivariate analysis:</p> <ul style="list-style-type: none"> • Surgeon • Age • Operation Duration • Post-Operative Complications • Prolonged Air-Leak 	<ul style="list-style-type: none"> • Inter-surgeon variation in post-operative LOS after VATS lobectomy is independent of patient baseline characteristics or peri-operative complications • Standardized post-operative pathways may improve patient outcomes, including reducing LOS. • Postoperative discharge within 3 days is safe and does not increase hospital readmissions.
<p>VATS: Video-assisted thoracoscopic surgery; LOS: Length of Stay</p>		

FIGURE 2. A retrospective cohort of 1006 patients undergoing video-assisted thoracoscopic surgery (VATS) were evaluated to identify the factors independently associated with prolonged postoperative length of stay. Through multivariate analysis, it was determined that these factors were surgeon, age, operation duration, postoperative complications, and prolonged air-leak. Furthermore, no association was found between early discharge and 60-day hospital readmission, demonstrating that postoperative discharge within 3 days following VATS lobectomy is safe and feasible. LOS, Length of stay.

CONCLUSIONS

This study identified several factors independently associated with prolonged LOS after VATS-L, emphasizing the importance of addressing modifiable factors to reduce LOS and potentially improve the cost-effectiveness of VATS-L. Moreover, it found no significant association between LOS and 60-day readmission rates, further supporting early discharge for low-risk patients. The implementation of standardized postoperative management protocols that favor shorter LOS, such as ERAS, may help minimize intersurgeon variability and optimize patient outcomes following VATS-L.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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