Venous Thromboembolism Rates Have Not Decreased in Elective Lumbar Fusion Surgery from 2011 to 2020

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INTRODUCTION:

Current literature regarding the incidence, trend, and predictors of venous thromboembolic events (VTEs) after lumbar fusion is severely limited. Previous database studies on VTEs after spine surgery have focused on general trends among all surgery types rather than analyzing for time-dependent trends in incidence rates and risk factors for lumbar fusion. Therefore, this study aimed to 1) evaluate for any temporal trends in the rates of VTE, deep venous thrombosis (DVT), pulmonary embolism (PE), and mortality from 2011 to 2020 and 2) identify the predictors of VTE following lumbar fusion surgery.

METHODS:

Using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database, annual incidences of 30-day VTE, DVT, PE, and mortality were calculated for each of the operation years from 2011 to 2020 for patients who underwent primary lumbar fusion. Multivariable Poisson regression was utilized to test the association between operation year and primary outcomes, and to identify significant predictors of VTE.

RESULTS:

A total of 121,205 patients were included. There were no statistically significant differences in VTE, DVT, PE, or mortality rates among the operation year groups. Multivariable regression analysis revealed that compared to 2011, operation year 2019 was associated with significantly lower rates of DVT. Age, BMI, prolonged operation time, prolonged length of stay, non-home discharge, anterior fusion, smoking status, functional dependence, and chronic steroid use were identified as independent predictors of VTE following lumbar fusion. Female sex, Hispanic ethnicity, and outpatient surgery setting were identified as protective factors from VTE in this cohort.

DISCUSSION AND CONCLUSION:

Rates of VTE after lumbar fusion have remained mostly unchanged between 2011 and 2020. Older age, higher BMI, longer operation time, prolonged length of stay, non-home discharge, anterior fusion, smoking, functional dependence, and steroid use were independent predictors of VTE after lumbar fusion, while female sex, Hispanic ethnicity, and outpatient surgery were protective factors. Further research is needed to establish patient and/or procedure specific guidelines, which include demographic and surgical risk factors, for VTE prophylaxis in spine surgery.

Table 1. Predictors of VTE following Lumbar Fusion

Variables	Odds Ratio	95% CI	p-value
Age	**1.012**	**1.006 - 1.017**	**<0.001**
Female sex	**0.841**	**0.751 - 0.941**	**0.002**
Black race	1.137	0.945 - 1.368	0.175
Hispanic ethnicity	**0.649**	**0.487 - 0.864**	**0.003**
BMI	**1.026**	**1.017 - 1.035**	**<0.001**
Operation time	**1.003**	**1.002 - 1.003**	**<0.001**
Outpatient surgery	**0.648**	**0.428 - 0.982**	**0.041**
Length of stay	**1.072**	**1.063 - 1.082**	**<0.001**
Non-home discharge	**1.888**	**1.659 - 2.150**	**<0.001**
Diabetes mellitus	0.869	0.750 - 1.005	0.059
Current smoker	**1.206**	**1.062 - 1.327**	**0.006**
Dyspnea	0.941	0.747 - 1.184	0.602
Functional dependence	**1.454**	**1.103 - 1.918**	**0.008**
CHF	1.497	0.736 - 3.043	0.265
Hypertension	0.910	0.801 - 1.034	0.148
Chronic steroid use	**1.289**	**1.020 - 1.629**	**0.034**
Wound class ≥2	0.861	0.459 - 1.618	0.643
ASA class ≥3	1.025	0.903 - 1.163	0.703

Bold indicates statistical significance ($p<0.05$). CI, confidence interval. BMI, body mass index. CHF, congestive heart failure. ASA, American Society of Anesthesiologists.
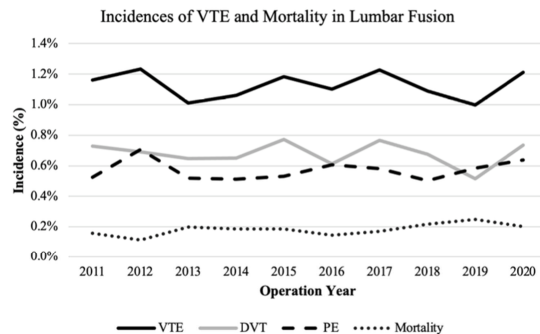

Figure 1. Incidences of VTE and Mortality in Lumbar Fusion