

The Impact of Timing of Inpatient Physical Therapy on Venous Thromboembolic Events after Elective Spine Fusion Surgery

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INTRODUCTION: Venous Thromboembolism (VTE) is the formation of blood clots in the veins and the third leading cause of death in the world. In a study by Pastori et al., the incidence of VTE ranges from 1-2 per 1000 and <1 per 1000 in the western and eastern countries, respectively. While surgical procedures have been associated as one of the predisposing factors with an increased risk of VTE, recent studies have suggested that early ambulation and compressive stockings are treatment choices for VTE prevention. Physical therapy (PT) has been a common hallmark for the postoperative care of patients after spinal fusion surgery. However, the timing to initial physical therapy on venous thromboembolic (VTE) outcomes is sparse in scientific literature. We seek to investigate if the time to physical therapy has an effect on the rate of postoperative VTE events in patients undergoing spine fusion surgery.

METHODS: After approval from our Institutional Review Board, we retrospectively identified patients over 18 years old who underwent cervical, thoracic and spinal fusion surgery at a tertiary urban medical center from 2017-2021. Electronic medical records were reviewed for physical therapy variables such as Activity Measure of Post-Acute Care Basic Mobility (AM-PAC Basic Mobility), gait trial distance achieved (distance walked in feet), and time to physical therapy. Time to physical therapy was defined as surgery end time to time of the first inpatient physical therapy session. Patients who had surgery for trauma, infection, or malignancy were excluded. Continuous variables were assessed using either an independent t-test or Mann-Whitney U test for parametric and nonparametric data. Logistics regression was performed to assess predictors of postoperative VTE events. Statistical analysis used R studio version 4.02 (Boston, Massachusetts, USA). A P value <0.05 was considered statistically significant.

RESULTS: Of the 2130 patients identified, 32 had a VTE, and 2098 did not. Patient's age, past medical history of lower extremity VTE, and pulmonary embolism were significantly associated with future VTE events ($P=0.029$, 0.049 , 0.001 , respectively). Additionally, operative duration (303 vs. 241 minutes, $P=0.039$) and length of stay (4.75 vs. 3.60 days, $P=0.001$) were significantly longer in patients with VTE events. (**Table 1**). Time to initiate physical therapy (<6, 6-24, or >24hrs) was not significantly associated with VTE rate ($P=0.179$). The AM-PAC Basic Mobility Score (15.7 vs. 17.2, $P=0.107$) and total gait trial distance achieved (48.4 vs. 69.9 feet, $P=0.055$) were also not associated with VTE frequency. (**Table 2**.) Stepwise logistic regression performed showed that operative duration time, and past medical history of lower extremity VTE were independent predictors of VTE (OR 1.003, CI: 1.0001 – 1.01, $P=0.032$) and (OR: 3.51, 95% CI: 1.15 – 8.87, $P=0.014$), respectively. (**Table 3**.)

DISCUSSION: Our study found that the time that physical therapy or mobilization protocols are initiated after elective spine fusion surgery does not affect rates of postoperative VTE significantly. VTE patients had a longer hospital length of stay and operative duration time which were predictive of future VTE events. Therefore, initiating early mobilization and closely monitoring these patients is encouraged to prevent VTE recurrence or identify VTEs as early as possible. In patients with a prior history of VTE and pulmonary embolism, there does not appear to be a significant difference between initiating PT earlier versus later in the admission. Additionally, the extent of patient mobilization and activity during PT sessions did not predict VTE likelihood.

SIGNIFICANCE/CLINICAL RELEVANCE: Postoperative inpatient physical therapy has been suggested to assist with patients' recovery after major orthopaedic surgery; however, this may not remarkably prevent VTE events after elective spine fusion surgery. While physical therapy is encouraged, other preventive measures such as medications, mechanical compression, and close patient monitoring should be continued. Since preventing VTE is of utmost priority, we encourage continuous interdisciplinary communication between members of the postoperative care team in order to implement timely clinical actions.

Table 2: Looking at Physical therapy variables and Time to PT on VTE rates

	No VTE (n=2098)	VTE (n=32)	P Value
Hours to First PT Appointment:			0.179
< 6 hours	502 (23.9%)	6 (18.8%)	
6 – 24 hours	1316 (62.7%)	18 (56.2%)	
24+ hours	280 (13.3%)	8 (25.0%)	
AM-PAC Basic Mobility Score	17.2 (3.19)	15.7 (5.40)	0.107
Total Gait Trial Distance Achieved (feet)	69.9 (106)	48.4 (34.2)	0.055
Post-treatment Pain Rating	5.26 (2.80)	6.00 (3.11)	0.153

PT: Physical Therapy AM-PAC: Activity Measure of Post-Acute Care

Table 1: Demographic and Surgical Characteristics Data

	No VTE (n=2098)	VTE (n=32)	P Value
Sex			0.029
Female	1097 (52.3%)	10 (31.2%)	
Male	1001 (47.7%)	22 (68.8%)	
BMI	30.4 (6.30)	31.3 (5.97)	0.345
Smoking Status			0.647
No	1738 (82.8%)	28 (87.5%)	
Yes	360 (17.2%)	4 (12.5%)	
PMH Lower extremity clotting	131 (6.24%)	5 (15.6%)	0.049
PMH Pulmonary Embolism	4 (0.19%)	14 (43.8%)	<0.001
Levels Fused	1.98 (1.80)	2.22 (1.74)	0.104
Levels Decompressed	2.09 (1.37)	2.16 (1.17)	0.560
Hospital Length of Stay (Days)	3.60 (2.45)	4.75 (2.27)	<0.001
Operative duration (Minutes)	241 (111)	303 (165)	0.039

PMH: Past Medical History BMI: Body Mass Index

Table 3: Stepwise logistic regression analysis using VTE as the dependent outcome.

Predictors	Estimate	Odds Ratio	Lower 95	Upper 95	P Value
Sex: (Male)	0.70	2.02	0.91	4.79	0.091
Operative duration time (Minutes)	0.003	1.003	1.0001	1.01	0.032
PMH Lower extremity Clotting	1.26	3.51	1.15	8.87	0.014

This model provides us with an AUC of 0.670.