Risk Factors for Deep Venous Thrombosis in Orthopaedic Trauma: An Analysis of 56,000 Patients

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Purpose: Deep venous thrombosis (DVT) and pulmonary embolism (PE) are recognized as major causes of morbidity and mortality in orthopaedic trauma patients. Despite the high incidence of these complications following orthopaedic trauma, there is a paucity of literature investigating the clinical risk factors for DVT in this population. As our health-care system increasingly emphasizes quality measures, it is critical for orthopaedic surgeons to understand the clinical factors that increase the risk of DVT following orthopaedic trauma. Utilizing the ACS NSQIP (American College of Surgeons National Surgical Quality Improvement Program) database, we sought to identify risk factors associated with the development of DVT in orthopaedic trauma patients.

Methods: A prospective cohort of 56,299 patients was identified from the 2006 to 2013 ACS NSQIP database using CPT codes for orthopaedic trauma procedures. Using Wilcoxon-Mann-Whitney and chi-square tests where appropriate, 49 variables including age, race, body mass index (BMI), American Society of Anesthesiologists (ASA) score, medical comorbidities, operative time, and anatomic region injured were compared between patients who developed a DVT within 30 days and those who did not. Using a multivariate logistic regression analysis, odds ratios (ORs) for DVT were determined for these 49 potential risk factors. Significance was set at $P < 0.05$.

Results: 56,299 orthopaedic trauma patients were included in the analysis, of whom 473 (0.84%) developed a DVT within 30 days. In univariate analysis, 25 of the 49 variables were significantly associated with the development of a DVT, including age ($P < 0.0001$), BMI ($P = 0.037$), diabetes ($P = 0.01$), ASA score ($P < 0.0001$), and anatomic region injured ($P < 0.0001$) (Table 1). As shown in Figure 1, multivariate analysis identified several risk factors that significantly increased the odds of developing a DVT. The use of a ventilator increased the odds of DVT by 43.67 times ($P = 0.039$) while ascites increased the risk of DVT 41.61 times ($P = 0.0038$). Compared to patients with upper extremity trauma, those with lower extremity injuries had 7.55 times (confidence interval [CI]: 1.78-32.04, $P = 0.006$) greater odds of developing a DVT within 30 days (Fig. 2). The trend toward greater odds of DVT among patients with injuries to the hip / pelvis did not reach statistical significance (odds ratio [OR] 4.51, CI: 0.39-52.50, $P = 0.22$). Smoking was not found to be an independent risk factor for developing a DVT ($P = 0.1217$).

Conclusion: This is the largest study to date aimed at identifying risk factors for DVT in orthopaedic trauma patients. Although the incidence of DVT was low in this cohort, the presence of certain risk factors significantly increased the odds of developing a DVT following orthopaedic trauma. These findings will enable orthopaedic surgeons to target at-risk patients and implement postoperative care protocols aimed at reducing the morbidity and mortality associated with DVT in orthopaedic trauma patients.

Table 1. Patient Demographics

	DVT (N= 473, 0.08%)	No DVT (N=55,826, 99.2%)	p-value
Age (mean)	79	72	0.0001
BMI (mean)	25.4	25.0	0.037
Diabetes	100 (21.1%)	8,931 (16.0%)	0.01
Location			0.0001
Upper extremity	30 (6.34%)	11,373 (20.4%)	
Lower extremity	433 (91.54%)	42,819 (76.7%)	
Hip/ pelvis	6 (1.3%)	762 (1.4%)	
ASA Status			0.0001
1	15 (3.17%)	5,423 (9.7%)	
2	101 (21.4%)	17,631 (31.6%)	
3	253 (53.5%)	26,070 (46.7%)	
4	104 (22.0%)	6,577 (11.8%)	

Figure 1. Odds Ratio for Risk Factors for a DVT

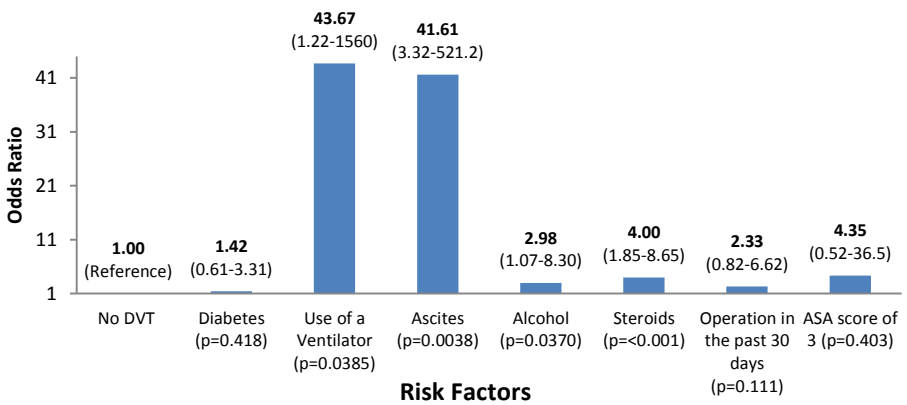
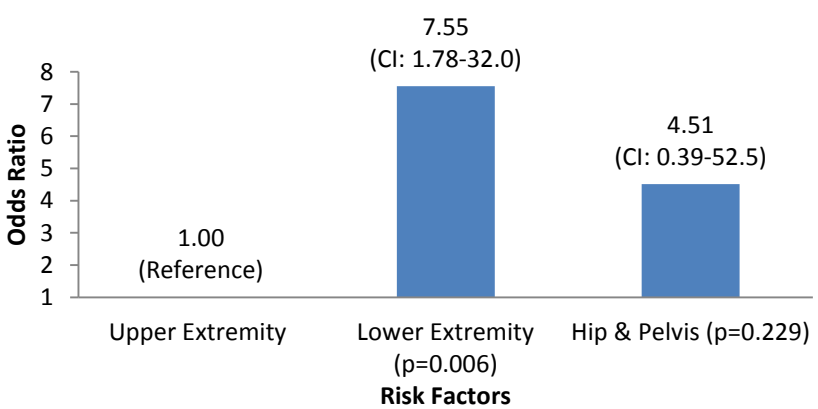


Figure 2. Odds Ratios for Risk Factors for a DVT: Anatomic Region



See pages 47 - 108 for financial disclosure information.