Anatomic Region and the Risk of Adverse Events in Orthopaedic Trauma: An Analysis of 19,000 Patients

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Purpose: Little data exist exploring adverse events in orthopaedic trauma surgery. As our health-care system creates potential reimbursement implications for perioperative complications through readmission penalties, etc, it is increasingly important to turn our attention to this issue. Through the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database, we sought to compare adverse events in orthopaedic trauma procedures by anatomic region (upper extremity [UE], hip and pelvis [HP], and lower extremity [LE]) and to evaluate the impact of anatomic region on the overall rate of complications.

Methods: The ACS-NSQIP prospective database was used to identify a total of 91 CPT codes representing 19,028 orthopaedic trauma patients from 2005-2011. These patients were then divided into three anatomic regions: UE (n = 4925), HP (n = 5273), and LE (n = 8830). Perioperative minor and major complications were recorded and include wound dehiscence, superficial surgical site infection, pneumonia, urinary tract infection, death, deep wound infection, myocardial infarction, deep venous thrombosis, pulmonary embolism, peripheral nerve injury, sepsis, and septic shock. A comparison in perioperative complications between the three groups was performed using c^2 analysis. We used a multivariate analysis that controls for age, medical comorbidities, American Society of Anesthesiologists (ASA) status, operative time, baseline functional status, and anatomic region to evaluate risk factors for complications.

Results: A total of 19,028 orthopaedic trauma cases were divided into three anatomic regions: 25.9% (n = 4925) UE, 27.7% (n = 5273) HP, and 46.4% (n = 8830) LE. Table 1 shows the difference in age, ASA scores, and complication rates between the three groups. Statistically significant differences were identified when comparing demographics between HP and UE patients; these include the number of patients in each group over 65 years of age (85% vs. 32.2%), ASA >2 (78.9% vs. 32.4%), and diabetes (17.9% vs. 11.1%) ($P = 0.01$). No other variables were significantly different among the groups. After controlling for several important individual patient factors, hip and pelvis patients are nearly four times more likely to develop any perioperative complication than upper extremity patients (odds ratio [OR]: 3.79, 95% confidence interval [CI]: 3.01-4.79, $P = 0.01$). Also, patients in the LE group are three times more likely to develop any complication versus UE patients (OR: 2.82, 95% CI: 2.30-3.46, $P = 0.01$). The table shows the differences in patient age and ASA status as well as presents the overall complication rates:

See pages 99 - 147 for financial disclosure information.

Table 1. Patient Demographics/Characteristics and Rates of Complications*			
Anatomic Region	Mean Age*	Mean ASA Score*	Complication Rate*
Upper extremity (n = 4925)	55.4 ± 19.2	2.16 ± 0.77	3.0% (148)
Hip/pelvis (n = 5273)	79.3 ± 14.0	2.95 ± 0.67	19.0% (1002)
Lower extremity (n = 8830)	70.2 ± 19.3	2.77 ± 0.77	14.2% (1251)

*$P < 0.005$

Conclusion: There is an alarming difference in complication rates among anatomic regions in orthopaedic trauma patients. Even after controlling for several variables, patients undergoing procedures to the LE are almost three times more likely to develop a complication than patients in the UE group. Those undergoing procedures to the HP are almost four times more likely to develop a complication than patients in the UE group. While some of these results are explained by age and ASA status, further studies are required to explain the impact that anatomic region has on the overall complication rate.