

BMI as a Predictor of Perioperative Complications Following Orthopaedic Trauma Surgery: An ACS-NSQIP Analysis

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Background/Purpose: Obesity is among the most common health conditions affecting orthopaedic patients, with a prevalence in the United States approaching two-thirds of the population. Obesity affects nearly every organ system and is associated with significant medical comorbidities. While the impact of obesity on total joint arthroplasty outcomes has been documented extensively in the literature, very few large-scale studies have explored the influence of obesity on outcomes following orthopaedic trauma. Utilizing the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database, we sought to investigate the relationship between body mass index (BMI) and perioperative complications 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. Preoperative BMI was used to group patients into one of five categories: underweight (BMI <18.5 kg/m²), normal weight (18.5-24.9), overweight (25-29.9), obese (30-39.9), or morbidly obese (40 or higher). Perioperative complications within 30 days were recorded and categorized as minor (wound dehiscence, superficial wound infection, pneumonia, and urinary tract infection) or major (deep wound infection, organ space infection, myocardial infarction, pulmonary embolism, deep venous thrombosis, cerebrovascular accident, neurologic deficit, sepsis, septic shock, coma, and death). Using a multivariate logistic regression analysis controlling for age, smoking status, American Society of Anesthesiologists (ASA) score, and medical comorbidities, odds ratios (ORs) for minor, major, and total complications were calculated for each BMI category. The analysis was then repeated using wound-related complications (deep infection, superficial infection, and wound dehiscence) as the outcomes of interest.

Results: Of the 53,219 patients with a recorded BMI, 10.1% were underweight, 37.3% were of normal weight, 28.4% were overweight, 19.7% were obese, and 4.6% were morbidly obese. Compared with patients of normal weight, underweight patients had significantly greater odds of minor (OR 1.12, P = 0.04), major (OR 1.20, P <0.001), and total complications (OR 1.18, P <0.001). Morbidly obese patients had significantly greater odds of major (OR 1.22, P = 0.023) and total complications (OR 1.18, P = 0.023) than did patients of normal weight. Having a BMI in the overweight or obese range did not significantly increase the odds of minor, major, or total complications (Table 1). When wound-related complications were examined independently, compared with patients of normal weight, obesity was associated with increased odds of superficial (OR 1.67, P <0.0001) and deep wound infection (OR 1.52, P = 0.018), and morbid obesity was associated with increased odds of wound dehiscence (OR 2.29, P = 0.034) and deep infection (OR 2.51, P <0.0001). Trends toward increased odds of wound dehiscence in overweight (OR 1.72, P = 0.053) and obese (OR 1.71, P = 0.07) patients did not reach statistical significance.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.

Conclusion: BMI is a significant predictor of perioperative complications in orthopaedic trauma patients. Morbid obesity is associated with increased odds of major and total complications as well as wound-related complications including dehiscence and deep infection. In addition to identifying morbid obesity as a risk factor for perioperative complications, we demonstrate that a BMI less than 18.5 also places orthopaedic trauma patients at significantly higher risk for minor, major, and total complications, a finding not previously reported in the literature.

Table 1. Odds Ratios of Minor, Major, and Total Complications by BMI Category, as determined on multivariate analysis.

Complications	Underweight N=5369 (10.1%) (95% CI, p-value)	Normal Weight N=19831 (37.3%) (Reference)	Overweight N=15098 (28.4%) (95% CI, p-value)	Obese N=10467 (19.7%) (95% CI, p-value)	Morbidly Obese N=2454 (4.6%) (95% CI, p-value)
All Minor	1.12 (1.01-1.26, p=0.04)	1	0.96 (0.87-1.05, p=0.32)	1.01 (0.91-1.12, p=0.87)	1.18 (0.98-1.43, p=0.077)
Wound Dehiscence	0.69 (0.24-2.02, p=0.50)	1	1.72 (0.99-2.98, p=0.054)	1.71 (0.96-3.06, p=0.07)	2.29 (1.07-4.92, p=0.034)
Superficial Wound Infection	0.96 (0.66-1.38, p=0.82)	1	1.09 (0.85-1.40, p=0.48)	1.67 (1.30-2.15, p<0.0001)	1.37 (0.89-2.11, p=0.15)
All Major	1.20 (1.08-1.33, p<0.001)	1	0.88 (0.81-0.96, p=0.004)	0.90 (0.81-1.00, p=0.053)	1.22 (1.02-1.46, p=0.023)
Deep Wound Infection	0.96 (0.58-1.58, p=0.87)	1	1.01 (0.71-1.44, p=0.95)	1.52 (1.08-2.14, p=0.018)	2.51 (1.60-3.93, p<0.0001)
Total	1.18 (1.08-1.28, p<0.001)	1	0.90 (0.84-0.96, p=0.002)	0.94 (0.867-1.026, p=0.17)	1.18 (1.02-1.37, p=0.023)