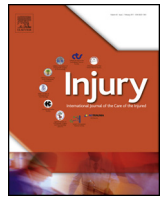




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## Preexisting psychiatric illness worsens acute care outcomes after orthopaedic trauma in obese patients

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### ABSTRACT

**Purpose:** Pre-existing psychiatric illness, illicit drug use, and alcohol abuse adversely impact patients with orthopaedic trauma injuries. Obesity is an independent factor associated with poorer clinical outcomes and discharge disposition, and higher hospital resource use. It is not known whether interactions exist between pre-existing illness, illicit drug use and obesity on acute trauma care outcomes.

**Patients and methods:** This cohort study is from orthopaedic trauma patients prospectively measured over 10 years (N = 6353). Psychiatric illness, illicit drug use and alcohol were classified by presence or absence. Body mass index (BMI) was analyzed as both a continuous and categorical measure (<30 kg/m<sup>2</sup> [non-obese], 30–39.9 kg/m<sup>2</sup> [obese] and ≥40 kg/m<sup>2</sup> [morbidly obese]). Main outcomes were the number of acute care services provided, length of stay (LOS), discharge home, hospital readmissions, and mortality in the hospital.

**Results:** Statistically significant BMI by pre-existing condition (psychiatric illness, illicit drug use) interactions existed for LOS and number of acute care services provided ( $\beta$  values 0.012–0.098; all  $p < 0.05$ ). The interaction between BMI and psychiatric illness was statistically significant for discharge to locations other than home ( $\beta = 0.023$ ;  $p = 0.001$ ).

**Discussion:** Obese patients with orthopaedic trauma, particularly with preexisting mental health conditions, will require more hospital resources and longer care than patients without psychiatric illness. Early identification of these patients through screening for psychiatric illness and history of illicit drug use at admission is imperative to mobilize the resources and provide psychosocial support to facilitate the recovery trajectory of affected obese patients.

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### Background

There are numerous complexities of managing orthopaedic trauma patients who are admitted with any pre-existing psychiatric illness, illicit drug use, alcohol abuse or obesity. Between 40%–70% of traumatically injured patients present to the trauma center with detectable levels of drugs or alcohol [1]. Existing, but limited, data indicate that psychiatric disorders interfere with tissue

healing processes and functional improvement after orthopaedic trauma [2], tend to prolong hospital length of stay (LOS) and increase hospital costs [3]. Alcohol intoxication independently increases and prolongs adipose tissue inflammation after traumatic injury, increases infection rates and increases management complexity [1,4]. Both illicit drug and alcohol use interfere with hemodynamic and physical recovery which can independently worsen trauma acute care outcomes [5,6]. Pre-injury alcohol and illicit drug use may be related to greater hospital LOS, but not significantly worse outcomes [1].

Alarming, there is steady growth in the proportion of patients who are severely obese. At our institution, the prevalence of morbid obesity has grown from 4.6% to 7.1% over the last six years among patients admitted for orthopaedic trauma. High body mass index (BMI) poses serious health risks and physical limitations, and

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is associated with worse acute care outcomes such as prolonged length of stay (LOS) [7–9], more hospital procedures [9–11], discharge to locations other than home, mortality [7,9,12,13] and higher hospital charges [14]. The challenge of interpreting this evidence is that obesity itself is independently associated with psychiatric disorders and poorer mental health [2,15,16]. If the number of patients admitted with a combination of obesity, psychiatric illness or drug use increases as anticipated, the burden on the providers and hospital system will rise. Determination of the interactions between preexisting psychiatric illness, alcohol abuse and illicit drug use and the severities of obesity and on acute care outcomes after orthopaedic trauma is imperative for preparedness of providers and healthcare systems with respect to resource use. Early identification of patients who are at highest risk for worst acute care outcomes permit care teams to implement aggressive health monitoring, safety precautions, resource allocation, and social support services to improve outcomes.

The purposes of this study were to determine whether interactions existed among presence of psychiatric illness, illicit drug use, alcohol abuse and BMI on key acute trauma care outcomes. We hypothesized that patients with pre-existing psychiatric illness, illicit drug abuse or alcohol abuse issues who were obese required more care, longer LOS, and reduced likelihood of being discharged home than those who were not obese.

## Methods

### Study design

This was a 10-year cohort study using data from UF Health at Shands Hospital. Patient admission dates were between January 1, 2004 to December 31, 2014 (N = 12,029). This investigation was approved by the Institutional Review Board at the University of Florida (study approval #201500018).

### Patients

Patients admitted to UF's Orthopaedic Trauma service with major primary diagnoses of orthopaedic-related traumas (without brain injury or paralysis) were identified (N = 6353). Demographics such as age, height, weight, BMI, race, and the type and number of

comorbidities were included. Patients were stratified into groups based on BMI: non-obese (n = 4523; BMI < 30 kg/m<sup>2</sup>), obese (n = 1830; BMI = 30–39.9 kg/m<sup>2</sup>) and morbidly obese (n = 350; BMI ≥ 40 kg/m<sup>2</sup>). Pre-existing illicit drug abuse, alcohol abuse and presence of psychiatric illness were documented at admission by the care team and entered into the patient registry.

### Injury severity

Injury severity was determined from the Injury Severity Score. The Injury Severity Score is an anatomical scoring system that generates a score for patients with multiple injuries and is an important when studying LOS [17]. The Glasgow Coma Scale is a standardized measurement for assessing the degree of consciousness and predicting the duration and ultimate outcome of coma. Glasgow Coma Scale has moderate levels of inter-rater agreement (r = 0.808) [18].

### Clinical outcomes

The intensive care unit (ICU) stay, the overall hospital LOS, and the discharge disposition locations were collected. The number of acute care services was obtained from the International Classification of Disease-9 codes. The number of services provided were summed from the following: mechanical ventilation, vessel catheterization, diagnostic ultrasound, tracheotomy or endotracheotomy, splint or cast, plastic repair, wound debridement, nasogastric tube or percutaneous endoscopic gastrostomy, urinary catheterization, laceration repair, intercostal catheterization for drainage, and Discharge locations included home, skilled nursing facilities, inpatient rehabilitation hospitals, long-term hospital or other. For the statistical analyses, discharge location was dichotomized: home, or not to home. Readmissions back to acute care within 30 days and the readmission LOS were also collected. Mortality was defined as expiration during the acute care stay.

### Statistical analyses

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 24.0; Chicago, IL, USA). Data are expressed as mean ± standard deviation (SD) for

**Table 1**  
Characteristics of patients admitted for orthopaedic trauma. Values are means ± SD or% of the group. BMI is expressed in kg/m<sup>2</sup>.

	Non-obese (BMI < 30) n = 4523	Obese (BMI > 30–39.9) n = 1480	Morbidly Obese (BMI ≥ 40) n = 350	p (sig)
Age (yr)	42.8 ± 22.9	47.9 ± 18.4	45.5 ± 18.3	0.0001
Women (#, %)	(1588) 35.1	(480) 32.4	(160) 45.7	0.0001
BMI (kg/m <sup>2</sup> )	24.2 ± 3.6	33.5 ± 2.6	46.8 ± 7.5	0.0001
Race (#, %)				
Caucasian	(3926) 86.8	(1271) 85.9	(291) 83.1	
African-American	(362) 8.0	(141) 9.5	(38) 10.9	
Hispanic	(149) 3.3	(47) 3.2	(13) 3.7	
Other	(86) 1.9	(21) 1.4	(8) 2.3	0.211
Comorbidities (#, %)				
Diabetes	(217) 4.8	(184) 12.4	(63) 18.0	0.0001
Hypertension	(941) 20.8	(502) 33.9	(138) 39.4	0.0001
Anemia	(77) 1.7	(24) 1.6	(10) 2.9	0.707
Psychiatric disorders	(276) 6.1	(112) 7.6	(26) 7.4	0.231
Illicit drug abuse (%)	(348) 7.7	(73) 4.9	(12) 3.4	0.0001
Tobacco use (%)	(1076) 23.8	(334) 22.6	(56) 16.0	0.007
Alcohol abuse (%)	(638) 14.1	(166) 11.2	(24) 6.9	0.0001
Injury Severity Score (pts)	14.4 ± 10.9	14.9 ± 12.1	14.1 ± 12.1	0.282
Glasgow Coma Score (pts)	13.6 ± 3.6	13.5 ± 3.7	13.7 ± 3.5	0.707

BMI = body mass index; COPD = chronic obstructive pulmonary disease; CAD = coronary artery disease.

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