

Obesity increases the risk of moderate or severe axial and overall pain after motor vehicle collision

Bermudez AL^{1,2}, Hu J^{1,2}, Bortsov AL^{1,2}, Soward AC^{1,2}, Swor RA³, Peak DA⁴, Jones JS⁵, Rathlev NK⁶, Lee DC⁷, Domeier RM⁸, Hendry PL⁹, Linnstaedt SD^{1,2}, McLean SA^{1,2,10}

¹TRYUMPH Research Program, USA, ²Department of Anesthesiology, University of North Carolina, Chapel Hill, NC, USA, ³Department of Emergency Medicine, William Beaumont Hospital, Royal Oak, MI, ⁴Department of Emergency Medicine, Massachusetts General Hospital, Boston, MA, ⁵Department of Emergency Medicine, Spectrum Health System, Grand Rapids, MI, ⁶Department of Emergency Medicine, Baystate Medical Center, Springfield, MA, ⁷Department of Emergency Medicine, North Shore University Hospital, Manhasset, NY ⁸Department of Emergency Medicine, St. Joseph Mercy Livingston Hospital, Ann Arbor, MI, ⁹Department of Emergency Medicine and Pediatrics, University of Florida, Jacksonville, FL, ¹⁰Department of Emergency Medicine, University of North Carolina, Chapel Hill, NC, USA

TRYUMPH Research Program
UNC Department of Anesthesiology
Trauma Recovery: Understanding Mechanisms
& Promoting Healing



INTRODUCTION

- Ninety percent of patients seen in the emergency department (ED) after motor vehicle collision (MVC) are not admitted.¹ Unfortunately, chronic post-MVC pain develops in 20-40% of these individuals.²
- Evidence from population-based and postoperative studies suggests that increased body mass index (BMI) increases risk of chronic pain development.
- However, results of previous studies have been mixed.³ To our knowledge, no studies have assessed the affect of BMI on chronic pain risk after exposure to traumatic/stressful events such as a MVC.
- In this study we evaluated the influence of BMI on moderate or severe axial pain (MSAP) and overall pain (MSOP) outcomes after MVC. We hypothesized that increased BMI would increase the risk of developing these pain outcomes.

METHODS

- European Americans were enrolled in ED post-MVC (Figure 1, Table 1). Height and weight data were collected and used to calculate BMI. Pain outcomes assessed in the ED, 6 weeks, 6 months, and 12 months after MVC included an evaluation of overall pain (0-10 NRS) and axial pain (maximum pain experienced in the neck, right and left shoulders, and upper or lower back; 0-10 NRS). If pain was reported in a region, participants were asked if it was MVC-related. Only MVC-related pain was used in analyses. BMI was defined using standard categories.⁴
- Pain severity ≥ 4 was defined as moderate or severe.²
- The relative risk of each pain outcome according to BMI category was assessed using Proc GenMod (SAS 9.3) adjusting for age, sex, and study site.

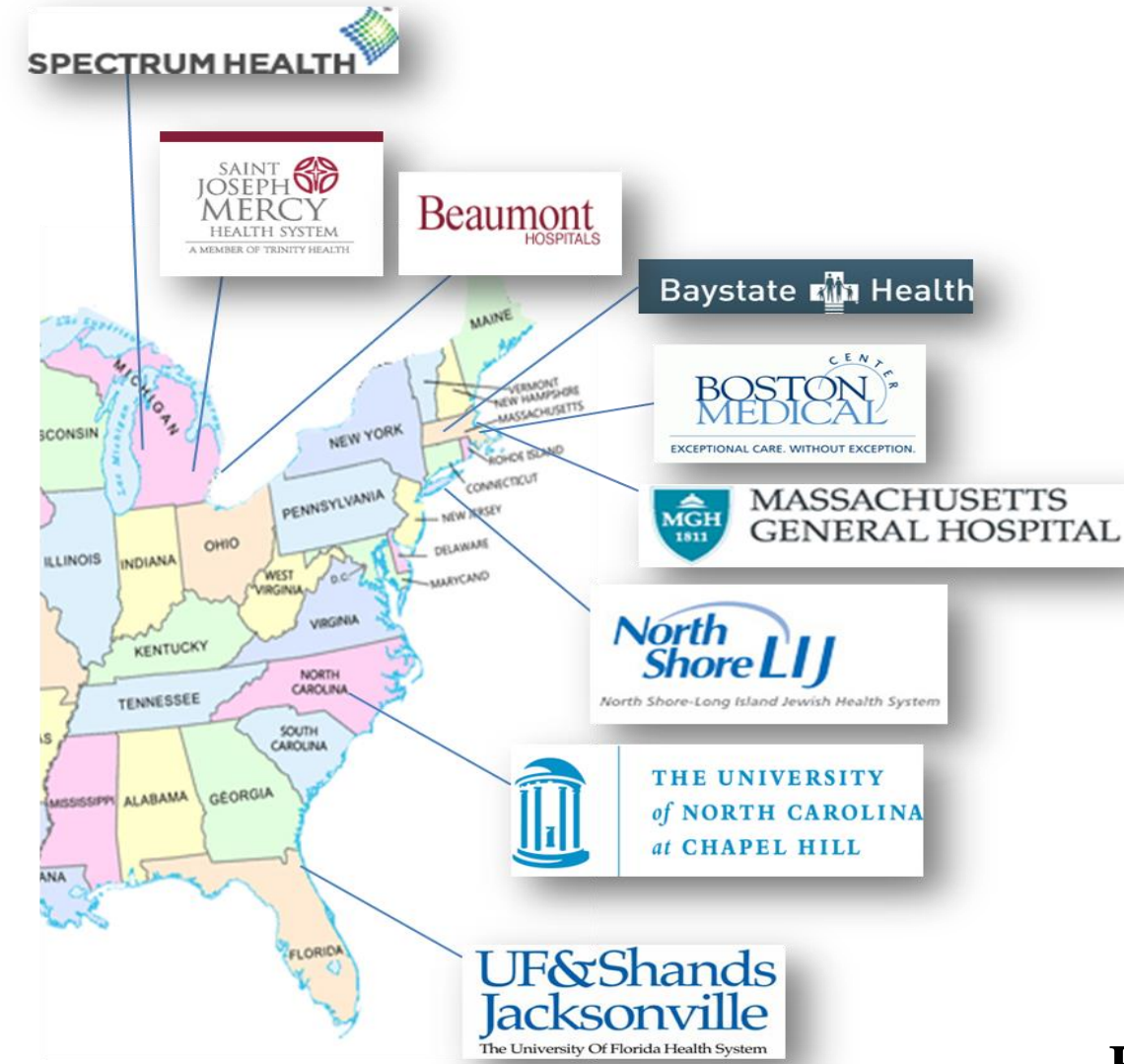


Figure 1: CRASH network study sites.

Table 1: Participant demographics (n=916).

Characteristics	n (%)
Age	
18-32	474 (49.8)
33-49	296 (31.3)
50-65	178 (18.9)
Total	948 (99.9)
Gender	
Male	373 (39.3)
Female	575 (60.6)
Total	948 (99.9)
Education	
8-11 years	42 (4.4)
High School	184 (19.4)
Post-high school ¹	369 (38.9)
College graduate	238 (25.1)
Post graduate	113 (11.9)
Total	946 (99.7)

¹Either technical school or some college.

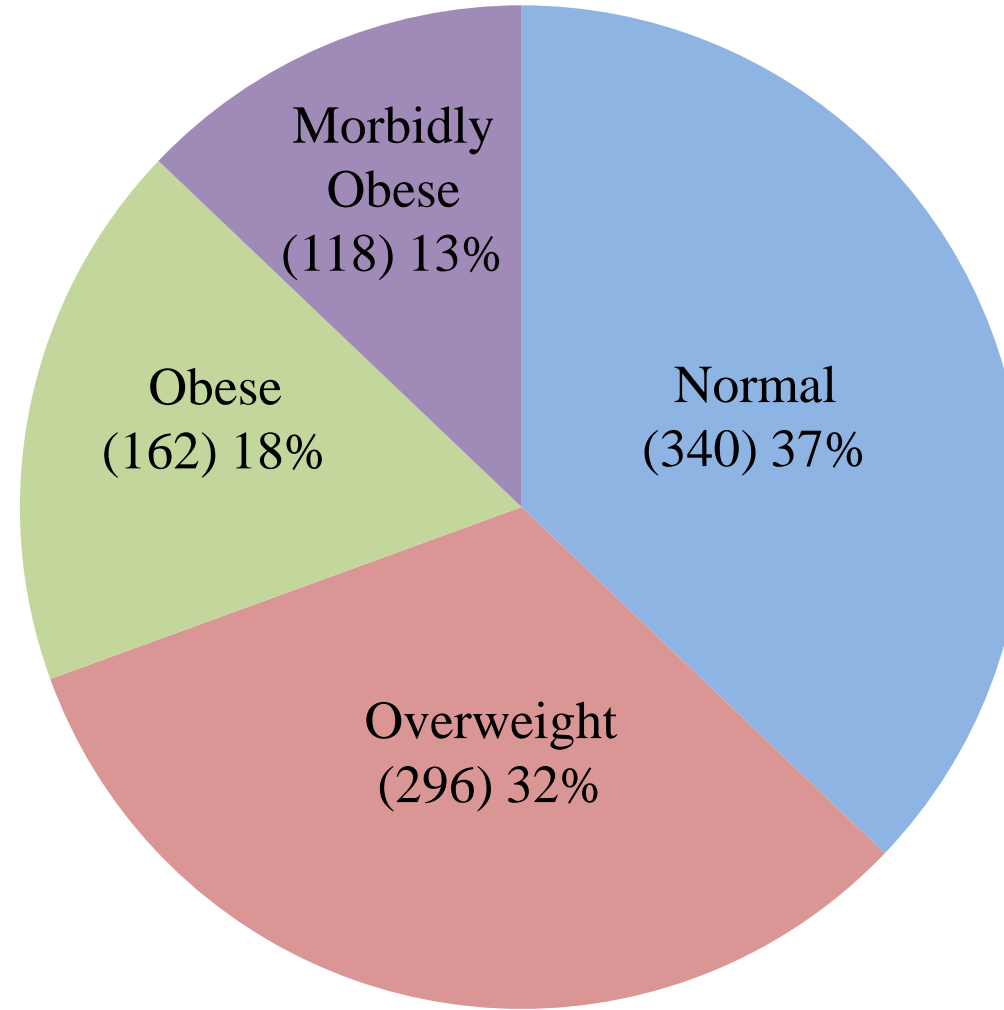


Figure 2: BMI categories (n=916). Definitions: Normal = 18.5-24.9, Overweight = 25.0-29.9, Obese = 30.0-34.5 and Morbidly Obese ≥ 35.0 .

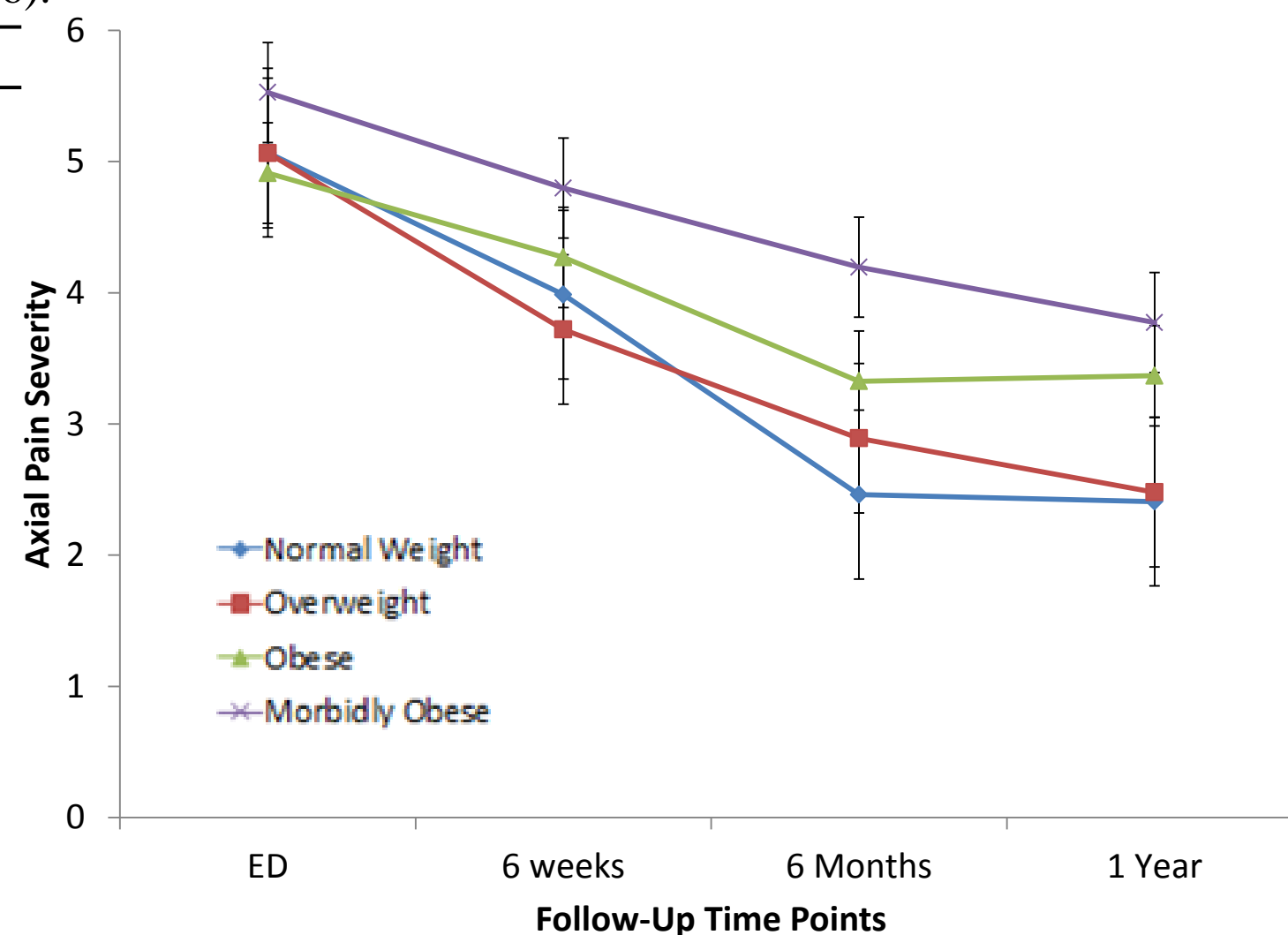


Figure 3: Axial pain severity by BMI category across time after MVC. A statistically significant difference in post-MVC pain scores was observed at 6 months (ANOVA, $F = 7.51$, $p < 0.001$) and 1 year (ANOVA, $F = 4.54$, $p = 0.004$).

Table 2: Relative risk for moderate or severe axial pain across time-points.

BMI Categories	ED RR ¹ (95% CI)	6 Weeks RR ¹ (95% CI)	6 Months RR ¹ (95% CI)	1 Year RR ¹ (95% CI)
Normal	REF	REF	REF	REF
Overweight	0.97 (0.88,1.1)	0.89 (0.76,1.1)	1.2 (0.92,1.5)	1.0 (0.78,1.3)
Obese	0.90 (0.78,1.0)	0.95 (0.78,1.2)	1.4 (1.1, 1.8)	1.2 (0.94,1.6)
Morbidly Obese	1.0 (0.90,1.2)	1.1 (0.93, 1.3)	1.9 (1.4, 2.4)	1.4 (1.1, 1.9)

¹Adjusted for age, site of collection, and sex of participant.

Table 3: Relative risk for moderate or severe overall pain across the time-points.

BMI Categories	ED RR ¹ (95% CI)	6 Weeks RR ¹ (95% CI)	6 Months RR ¹ (95% CI)	1 Year RR ¹ (95% CI)
Normal	REF	REF	REF	REF
Overweight	1.0 (0.95, 1.1)	1.1 (0.91,1.3)	1.1 (0.91,1.4)	1.0 (0.84,1.3)
Obese	1.1 (0.95,1.2)	1.2 (1.0,1.5)	1.3 (1.0,1.7)	1.3 (0.99,1.6)
Morbidly Obese	1.1 (1.0,1.2)	1.4 (1.2,1.7)	1.7 (1.3,2.1)	1.4 (1.1,1.8)

¹Adjusted for age, site of collection, and sex of participant.

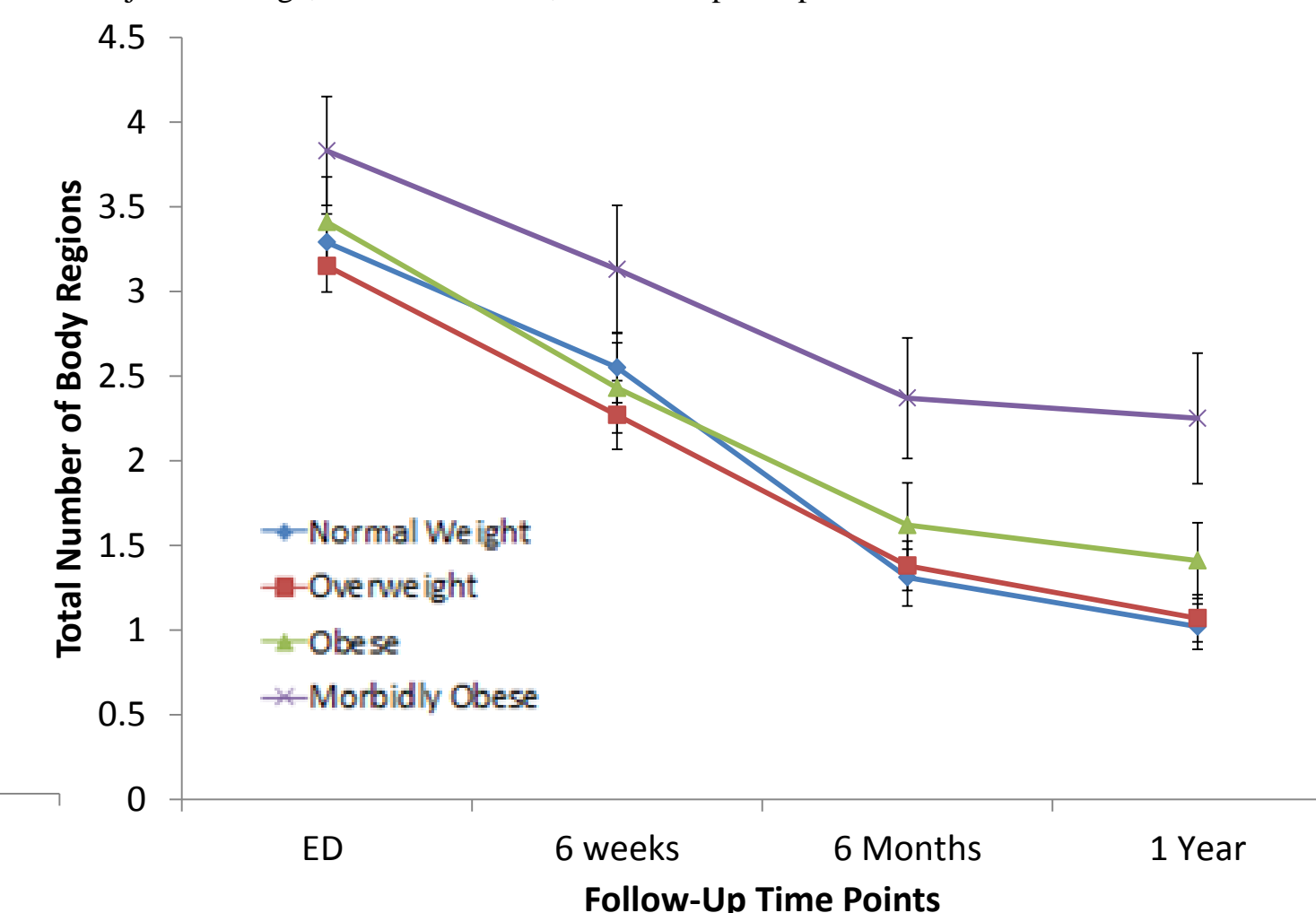


Figure 4: Number of body regions with moderate or severe pain by BMI category across time after MVC. A statistically significant difference was observed at 6 months (ANOVA, $F = 3.93$, $p = 0.008$) and 1 year (ANOVA, $F = 6.47$, $p < 0.001$).

RESULTS

- 840/948 (89%) of participants completed 6 month and 861/498(91%) completed 1 year follow-up.
- Due to small sample size, underweight individuals were excluded. BMI category distribution of participants are shown in Figure 2.
- In crude analyses BMI did not influence acute pain outcomes but predicted pain severity and number of body regions with moderate or severe pain at 6 months and 1 year (Figures 3 and 4).
- Adjusted relative risks for adverse pain outcomes by BMI category are shown in Tables 2 and 3. Obese and morbidly obese individuals were at increased risk of persistent pain at 6 months and/or 1 year.
- Risk appeared to increase in stepwise fashion with increasing BMI category.

CONCLUSIONS

- Increasing BMI increases the risk of persistent moderate or severe axial pain and overall pain. The strength of this association is modest for overweight or obese BMI categories, and moderate to strong for the morbidly obese BMI category.

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