Impact of Morbid Obesity on Injury Severity Score and Outcomes

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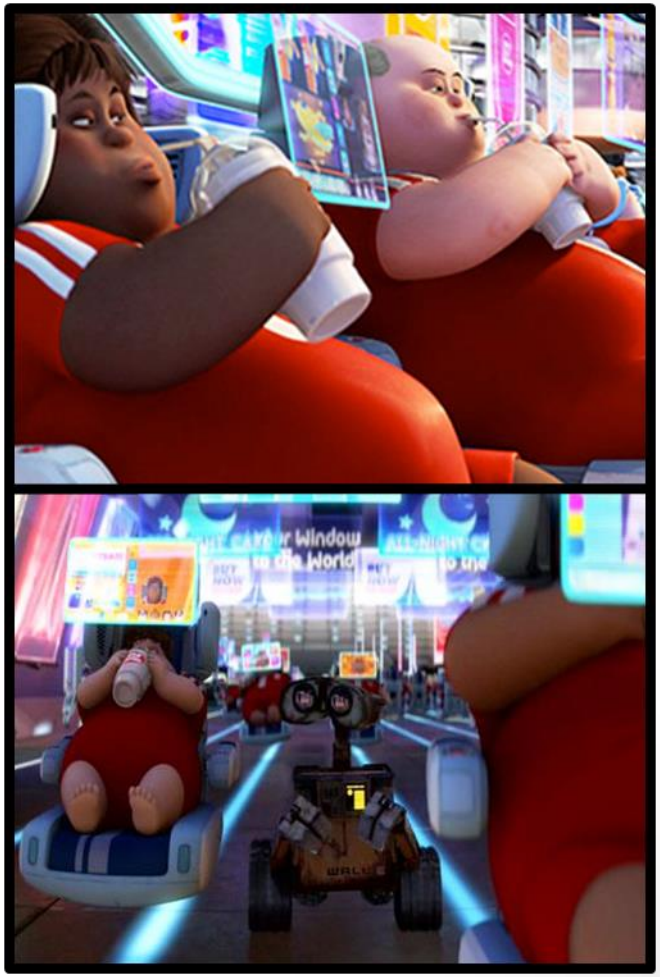
Obesity in the United States

- Increased risk for type 2 diabetes, hypertension and hyperlipidemia
- 36% of adult Americans are obese (2010)
- 17% of children and adolescents are affected
- 8% increase in obesity rates among males between 1999 and 2010



CDC, January 2012

Trauma in the United States

- 5th leading cause of death among all ages in 2010, with 120,859 deaths
- 1st leading cause of deaths between 1 and 44 years of age
- 3rd cause of death between 45 and 54 years of age

CDC, October 2012

Obesity and Trauma

- **Conflicting data correlating high Body Mass Index (BMI) and mortality[1]**
- **Increased chest and extremity trauma and decreased head injury in obese patients[1]**
- **Increased incidence of multiple organ failure and wound infection in obese trauma patients[2]**

1.Newell M et al. *J Am Coll Surg*.2006;204:1056-1061
2.Diaz J et al. *J Trauma*.2009;66:226-231

Research Questions

Does increasing BMI correlate with decreasing Injury Severity Score (ISS)?

Do lower ISS scores in high BMI patients impact clinical outcomes?

Methods

- Retrospective Cohort Study
- GMC Trauma Registry
- All trauma patients older than 18 years of age admitted to GMC Trauma Service between January 1, 2007 and December 31, 2011

- Variables:
  - BMI, age, gender, pre-existing conditions, injury type, ISS, length of stay (LOS), ICU days, total ventilation days, surgeries, complications and mortality

Pre-existing Conditions and Complications

- **Pre-existing conditions:**

Cardiac, diabetes, gastrointestinal, hematologic, psychiatric, immunosuppression, liver, malignancy, musculoskeletal, neurologic, obesity, pulmonary, renal, substance abuse, pregnancy, previous trauma, endocrine, congenital

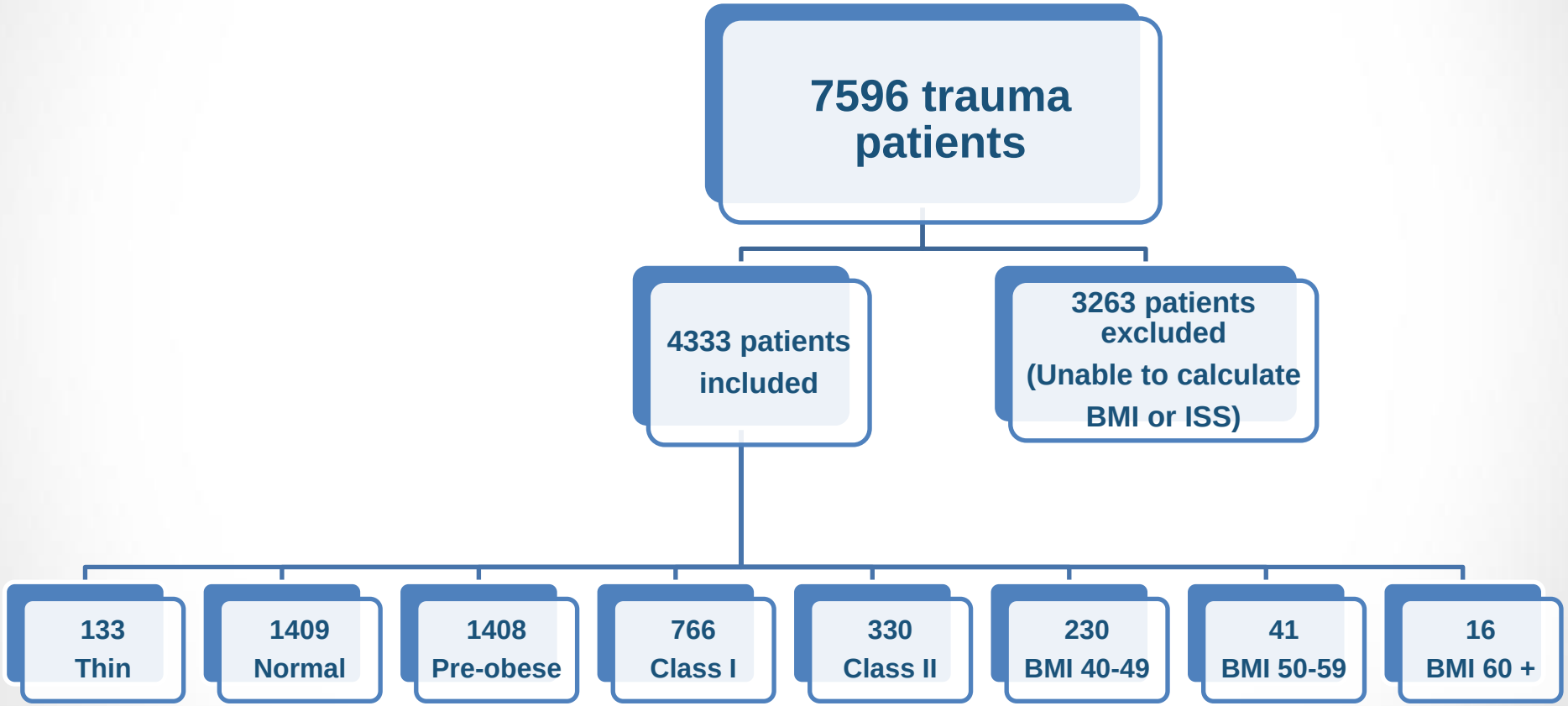
- **Complications:**

Airway management, burn, cardiovascular, decubitus, gastrointestinal, hematologic/coagulopathy, hypothermia, infection/sepsis, neurologic, pharmacologic, procedure related, pulmonary, renal

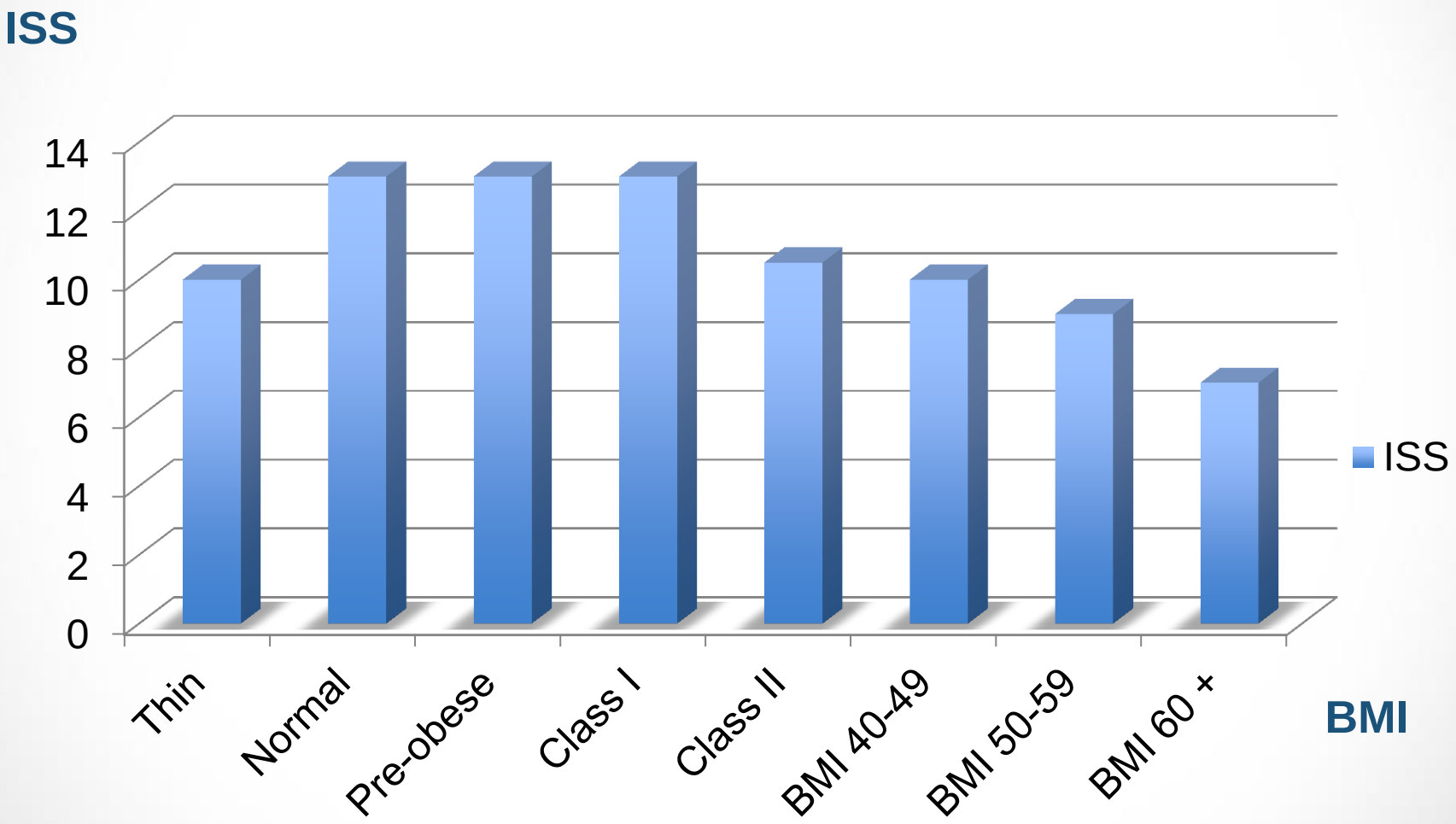
BMI stratification

- Thin below 19 kg/m^2
- Normal 20- 24 kg/m^2
- Pre-obese 25- 29 kg/m^2
- Obese Class I 30- 34 kg/m^2
- Obese Class II 35- 40 kg/m^2
- Obese Class III was further stratified on:
  - BMI 40- 49 kg/m^2
  - BMI 50- 59 kg/m^2
  - BMI 60 kg/m^2 and above

Population



BMI and ISS



BMI and Outcomes

	Thin	Normal	Pre-obese	Class I	Class II	BMI 40-49	BMI 50-59	BMI 60 +	*p*-value
# of patients	133	1409	1408	766	330	230	41	16	
Gender (female) (%)	85 (63.9)	590 (41.9)	461 (32.7)	273 (35.6)	132 (40)	113 (49.1)	21 (51.2)	10 (62.5)	<0.001
Pre-existing conditions (%)	108 (81.2)	965 (68.5)	985 (70)	588 (76.8)	289 (87.62)	217 (94.4)	39 (95.1)	16 (100)	<0.001
ISS > 15 (%)	55 (41.4)	587 (41.8)	580 (41.3)	328 (42.9)	125 (38.1)	76 (33)	8 (19.5)	3 (18.8)	0.003
LOS	6.2	5.9	6.4	7.2	6.9	8.4	8.4	11.3	<0.001
Surgery (%)	55 (41.4)	598 (42.4)	660 (47.3)	378 (49.4)	162 (49.1)	136 (59.1)	24 (58.5)	11 (68.8)	<0.001
Complications (%)	20 (15)	141 (10)	165 (11.7)	117 (15.30)	44 (13.3)	41 (17.8)	6 (14.6)	4 (25)	<0.001

BMI and Outcomes

	Thin	Normal	Pre-obese	Class I	Class II	BMI 40-49	BMI 50-59	BMI 60 +	*p*-value
# of patients	133	1409	1408	766	330	230	41	16	
Age	60.9	54.9	55.9	54.7	53.1	54.5	56	57.8	0.29
Type of injury (blunt) (%)	132 (99.3)	1356 (96.2)	1358 (96.5)	738 (96.3)	316 (95.8)	226 (98.3)	41 (100)	16 (100)	0.35
ICU days	1.6	1.3	1.6	1.7	1.9	2.7	2.6	2.9	0.24
Ventilation days	0.8	0.7	1.0	1.0	1.2	3.0	1.5	1.6	0.23
Death (%)	11 (8.3)	59 (4.2)	74 (5.3)	34 (4.4)	13 (3.9)	15 (6.5)	0	1 (6.3)	0.73

BMI and Outcomes

Effect	Odds Ratio	95% Confidence Interval
Pre-obese *vs.* Thin and Normal	0.96	0.83- 1.11
Class I *vs.* Thin and Normal	1.01	0.85- 1.21
Class II *vs.* Thin and Normal	0.82	0.64- 1.05
Class III *vs.* Thin and Normal	0.58	0.44- 0.77

BMI and Injury per Body Region

Body Region	BMI	Odds Ratio	95% Confidence Interval
Head and Neck	Class III	0.56	0.36- 0.87
Chest	Class III	1.86	1.09- 3.16

Results

- **Increased BMI was associated with decreased ISS scores**
- **All patients with BMI above 60 kg/m^2 had pre-existing conditions**
- **Even with lower ISS, high BMI patients had increased LOS, surgeries and complications**
- **Although not statistically significant, a trend was seen for increased ICU and ventilation days**

Results

- **Class III obese patients had 41% lower odds of severe injuries compared to thin or normal BMI patients**
- **Class III obese patients have 44% lower chance to have severe injuries in the head or neck region if compared to the normal BMI patients**
- **Class III patients have 86% more chance to have severe injuries in the chest if compared to the normal BMI patients**

Conclusion

- As the prevalence of morbid obesity continues to increase in the United States, more obese patients will be encountered in the trauma setting

- We propose that morbidly obese patients require a higher level of care since even with low ISS scores this population tends to have an increased morbidity compared with normal BMI patients

Questions?