Underweight Patients are the Greatest Risk Body Mass Index Group for Perioperative Adverse Events Following Total Shoulder Arthroplasty

Taylor Ottesen, Walter Hsiang, Rohil Malpani, Arya Giri Varthi[1], Lee Eric Rubin[2], Jonathan N Grauer[3]
[1]Yale School of Medicine, [2]Yale University, [3]Dept of Ortho

INTRODUCTION:
Existing literature investigating the influence of body mass index (BMI) on arthroscopy outcomes have focused high BMI, but these investigations have reported mixed conclusions, possibly due to insufficient power, poor controlling of confounding variables, and inconsistent definitions of BMI categories (e.g., underweight, overweight, obese). Few studies have considered outcomes of patients with low BMI. The aim of this study was to analyze the association of different categories of BMI with total shoulder arthroplasty (TSA) outcomes to better assess where along the BMI spectrum patients become at risk for complications and mortality.

METHODS: Patients undergoing elective TSA were abstracted from NSQIP databases 2005-2016. Patients were then aggregated into BMI categories and adverse outcomes were normalized to average risk of normal-weight subjects (BMI 18.5-24.9 kg/m^2). Risk-adjusted multivariate regressions were performed adjusting for all patient demographics and overall health.

RESULTS: A total of 15,725 patients met inclusion criteria. Odds ratios (OR) for underweight patients (BMI<20.0 kg/m^2) were elevated beyond those observed in any other BMI category. Underweight patients were more likely to experience any adverse event (OR=2.30, p=0.027, major adverse events (OR=3.32, p=0.003), or have a major postoperative infection (OR=2.97, p=0.007) when compared to normal-weight patients. There was no significant difference in these same variables for other BMI categories (Table 1). Underweight patients were also more likely to need revision surgery.

DISCUSSION AND CONCLUSION: Underweight patients have higher rates of adverse events and postoperative infection than any other BMI category, including the super morbidly obese (BMI>50 kg/m^2). This finding is consistent with literature in other surgical fields including general emergency, cardiac, and vascular surgery. Underweight patients are an extremely at-risk population who have previously not received significant focus. Physicians and healthcare systems should give additional consideration to this fragile population, as they often already do for those at the other end of the BMI spectrum.

Table 1: Multivariable odds ratio for adverse events, post operative infection and readmission for patients of varying body mass index (BMI)												
	BMI < 18.5 Underweight		BMI 18.5-24.9 Normal Weight		BMI 25-29.9 Overweight		BMI 30-40 Obese		BMI 40-50 Morbidly Obese		BMI > 50 Super Morbidly Obese	
Total Number of Patients (n = 15,725)	n = 116		n = 2,591		n = 5,110		n = 6,290		n = 1,399		n = 219	
	Odds Ratio	p-value	Odds Ratio	p-value	Odds Ratio	p-value	Odds Ratio	p-value	Odds Ratio	p-value	Odds Ratio	p-value
Any Adverse Event (AAE)	**2.30**	**0.027**	1.00	-	1.03	0.857	1.08	0.602	1.03	0.863	0.88	0.763
Major Adverse Event (SAE)	**3.32**	**0.003**	1.00	-	1.14	0.464	0.97	0.860	1.13	0.613	0.39	0.203
Minor Adverse Event (MAE)	1.51	0.505	1.00	-	0.90	0.615	1.22	0.332	0.85	0.595	1.42	0.482
Post-operative infection	**2.97**	**0.007**	1.00	-	0.98	0.905	0.93	0.663	0.93	0.571	0.52	0.281
Readmission within 30 days of operation	1.68	0.285	1.00	-	1.05	0.757	1.09	0.590	1.31	0.206	1.35	0.471

Bolding indicates statistical significance at p < 0.05

*Regression controlled for all patient demographics including age, gender, functional status, and health status as measured by ASA class