

1 Article

2 **Prevalence and Documentation Rates of Obesity in Hospitalized Patients: Results of a**  
3 **Retrospective Cohort Study.**

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19 **Abstract:** While obesity is a serious chronic condition, its prevalence and documentation as a  
20 diagnosis has not been extensively studied in hospitalized patients. We conducted a retrospective  
21 chart review to investigate the prevalence and documentation of obesity as a diagnosis among  
22 patients admitted to our medical center. IRB approval was obtained for this retrospective study.  
23 Body mass index as per CDC, admission and discharge diagnosis of obesity and common  
24 comorbidities including hypertension, diabetes, hyperlipidemia and others, were recorded. Length  
25 of hospital stay was calculated. We also investigated whether counselling for weight loss was  
26 provided to obese patients. A total of 540 consecutive patients with mean age of  $66 \pm 6$  years, were  
27 investigated, of which 182(34%) had normal weight, 188(35%) patients were overweight and  
28 170(31%) patients were obese. Obese group included 55% female and 45% male. 100 (59%) had class I  
29 obesity, 43(25%) had class II obesity and 27(16%) class III obesity. Of the obese patients 40/170(23.5%)  
30 patients had obesity documented on the admission problem list and only 21(12%) had obesity  
31 documented as a discharge diagnosis. Only 3(2%) patients received appropriate counseling and  
32 referral for obesity management during the hospitalization. Comorbidities included hypertension  
33 (68%), diabetes (35%), hyperlipidemia (36%), coronary artery disease (18%), chronic kidney disease  
34 (17%), congestive heart failure (18%) and COPD (24%). The average length of stay in normal weight,  
35 overweight and obese patients was similar ( $4.5 \pm 0.5$  days). An overwhelming percentage never had  
36 weight status documented despite significant prevalence of obesity. Hospitalization offers health  
37 care providers a window of opportunity to identify obesity, communicate risks and initiate weight  
38 management interventions.

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40 **Keywords:** obesity, documentation, comorbidities.

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42 **1. Introduction**

43 In recent decades, obesity has been increasingly cited as a major health issue in the United States and  
44 is associated with multiple comorbidities [1-7]. World Health Organization (WHO) describes obesity  
45 as the most visible but most neglected public health problem [3]. Two out of three Americans are  
46 considered to be overweight or obese. Moreover, obesity plays a major role in modifying treatment  
47 outcomes associated with comorbid chronic diseases [3, 5-10]. This impacts our health system by  
48 spending approximately \$147 billion in medical expenses per year and this number is expected to  
49 increase approximately by \$1.24 billion per year [3-4].

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51 Despite the dramatic increase in obesity and its impact on healthcare, the weight status of obese  
52 patients admitted to the hospital remains under diagnosed and under documented. The purpose of  
53 this study was to determine the prevalence of overweight and obesity among hospitalized patients  
54 and to assess the extent of documentation of weight status in their inpatient electronic medical  
55 records (EMR). Additionally, the current study investigated the prevalence of chronic conditions  
56 associated with obesity.

## 57 **2. Methods**

58 The study was conducted at Jersey Shore University Medical Center (a tertiary care hospital) part of  
59 Hackensack-Meridian Health, Neptune, New Jersey. EMR were reviewed for all (consecutive)  
60 patients admitted under inpatient medical floor during a 60-day period (from September through  
61 October 2017). Data extracted from the EMR included age, gender, race, height, weight, BMI,  
62 admission diagnosis and discharge diagnosis. Comorbidities (such as hypertension, diabetes  
63 mellitus, hyperlipidemia, coronary artery disease, chronic kidney disease, congestive heart failure  
64 and chronic obstructive pulmonary disease) associated with obesity were also investigated. BMI was  
65 calculated by the EMR using admission weight and height. Charts were reviewed to ascertain  
66 whether counselling was provided to the obese patients for weight loss. BMI was categorized as per  
67 Centers for Disease Control and Prevention (CDC) guidelines. Categories were defined as: normal  
68 weight [BMI 18-24.9 kg/m<sup>2</sup>], overweight [BMI 25-29.9 kg/m<sup>2</sup>] and obese [BMI >30 kg/m<sup>2</sup>]. The obese  
69 group was further divided into 3 classes. Class I [BMI 30-34 kg/m<sup>2</sup>], Class II [BMI 35-39.9 kg/m<sup>2</sup>] and  
70 Class III [BMI >40 kg/m<sup>2</sup>]. Documentation of overweight or obesity status was extracted from EMR,  
71 admission and discharge diagnosis lists, admission history notes, physical examination notes and  
72 discharge summaries. Patients under 18 years of age and the patients with terminal illness were  
73 excluded from the study.

74 Institutional review board approval was obtained for this study. All study procedures were carried  
75 out in accordance with the Declaration of Helsinki regarding research involving human subjects.  
76 The summary statistics of continuous variables were reported as mean  $\pm$  standard deviation. P value  
77 was considered significant if >0.05. All data analysis was conducted with Microsoft excel software,  
78 with means and percentage calculated among subgroups of patients.

## 79 **3. Results**

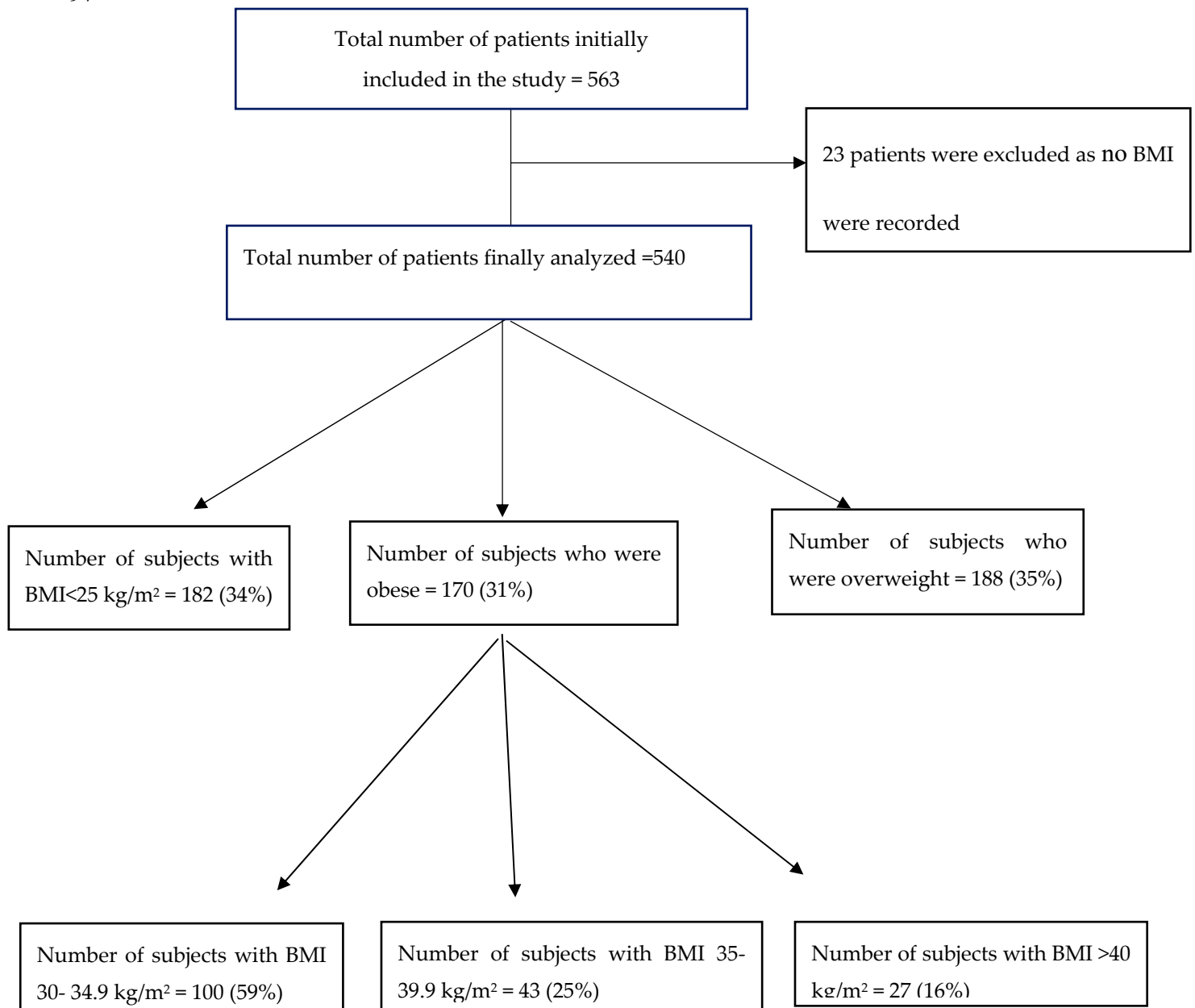
80 During the study period, 563 patients were admitted to the medical floor, of those 540 admission  
81 were eligible for the study, 23 patients were excluded because of the absence of recorded height and  
82 BMI. Consequently, a total of 540 consecutive patients were included in this analysis (Figure 1).

83 Demographic characteristics are shown in Table 1. Patient age ranged from 21-94 years (mean age  
 84  $66\pm 6$  years). Out of 540 patients only 182(34%) had normal weight, 188(35%) of the patients were  
 85 overweight and 170(31%) patients were obese (Figure 2). Of the obese group, 100(59%) had class I  
 86 obesity, 43(25%) had class II obesity and 27(16%) suffered from class III obesity (Figure 2). Average  
 87 BMI of all the patients was  $28 \text{ kg/m}^2$ . Only 40(23.5%) patients had obesity documented on the  
 88 admission problem list and only 21(12%) had obesity documented as a discharge diagnosis. Only  
 89 3(2%) patients were given appropriate counseling and referral for obesity management during the  
 90 hospitalization. Comorbidities and their prevalence included, hypertension (68%), diabetes (35%),  
 91 hyperlipidemia (36%), coronary artery disease (18%), chronic kidney disease (17%), congestive heart  
 92 failure (18%) and COPD (24%) (Table 2). The average length of hospital stay in normal weight,  
 93 overweight and obese patient about  $4.5\pm 0.5$  days was similar to all three groups. The prevalence of  
 94 obesity was 55% for females and 45% for male patients.

### 95 3.1 Figures, Tables and Schemes

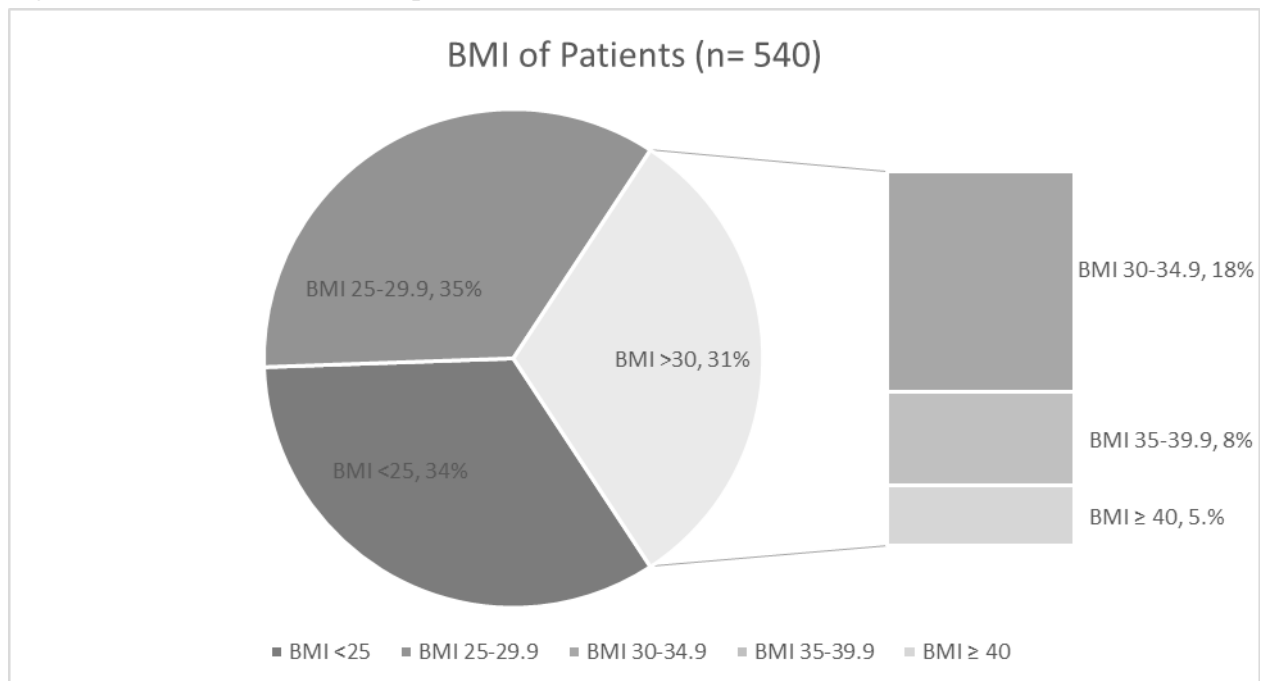
#### 96 **Figure 1: Patients selection**

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98 **Table 1 :Demographic characteristic and comorbidities of study population:**

	Total	Obese	Overweight	BMI<25
<i>Number of patients</i>	540	170(31%)	188(35%)	182(34%)
<b>Gender</b>				
Male	237(44%)	76(45%)	85(45%)	76(42%)
Female	303(56%)	94(55%)	103(55%)	106(58%)
<b>Race</b>				
Caucasian	420(78%)	123(72%)	148(79%)	149(82%)
Black	91(17%)	38(22%)	27(14%)	26(14.2%)
Asian	7(1%)	2(1%)	3(2%)	2(1%)
Other	19(3.5%)	6(3%)	10(5%)	5(3%)

99 **Figure 2: BMI distribution of the patients (n=540)**100  
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106 **Table 2 :Comorbidities among patients (n=540)**  
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Comorbidities among patients	Obese (n= 170)	Overweight (n= 188)	BMI<25 (n= 182)	p value
Hypertension	115(68%)	116(62%)	103(56%)	0.079
Coronary Artery Disease	31(18%)	52(27%)	44(24%)	0.148
Peripheral Vascular Disease	12(7%)	13(7%)	8(4%)	0.47
Chronic Kidney Disease	29(17%)	34(18%)	33(18%)	0.953
Malignancy	24(14%)	45(24%)	42(23%)	0.049
Congestive Heart Failure	88(16%)	34(18%)	23(12.5%)	0.258
Cerebro Vascular Accident	66(12%)	23(12%)	22(12%)	0.988
Diabetes Mellitus	139(24%)	52(27%)	28(15%)	<0.001
COPD	113(21%)	36(19%)	36(20%)	0.465
Obstructive Sleep Apnea	28(5%)	9(5%)	3(2%)	0.004
Hypothyroidism	75(14%)	28(15%)	23(12.5%)	0.773
Hyperlipidemia	183(34%)	67(35.6%)	54(29%)	0.321

108

#### 109 4. Discussion

110 The present study found that a significant number (65%) of patients admitted to the hospital for  
 111 general medical conditions were overweight (34%) and obese (31%). Out of these patients, only 23%  
 112 received the diagnosis of obesity during hospitalization. Importantly, at the time of discharge, only  
 113 21/170 (12%) patients had obesity as a diagnosis on the discharge list. A miniscule percentage (3  
 114 of the 170 obese patients) received obesity counseling at the time of discharge highlighting the missed  
 115 opportunity that could potentially have a positive impact on weight reduction.

116

117 The 23% obesity documentation rates observed in our study are much higher than the obesity  
 118 documentation rates reported previously in hospitalized patients [11-13]. As an example, Azhdam et  
 119 al noted that only 13.2% of patients in their study had their weight status documented anywhere in  
 120 their medical records [12]. The same authors found that at the time of discharge less than 1% of  
 121 hospitalized obese and overweight patients had any documentation of obesity in their discharge  
 122 summary. Other researchers reported similarly low rates of documentation with only 1.7% of  
 123 hospitalized obese patients having the diagnosis listed on the discharge summary [13]. Our study  
 124 found a much higher percentage (12%) of obesity diagnosis at the time of discharge. However, our  
 125 study still highlights the opportunity gap in appropriately documenting a major chronic disease. An  
 126 improvement in obesity documentation would allow a focused attention and intervention to reduce  
 127 obesity.

128

129 In our study predominant medical conditions associated with obesity were hypertension (68%),  
130 diabetes (35%), hyperlipidemia (36%), chronic kidney disease (18%), COPD (24%) and coronary  
131 artery disease (18%) (Table 2). Multiple previous studies have also documented a high prevalence of  
132 chronic diseases in obese patients [3-5]. In one study, investigators found a significantly high  
133 prevalence of hypertension (18.1% for normal weight and 52.3% for obesity class 3), diabetes  
134 mellitus (2.4% for normal weight and 14.2% for obesity class 3) and dyslipidemia (8.9% for normal  
135 weight and 19.0% for obesity class 3). We failed to find a significant difference in our cohort (Table  
136 2). We only found diabetes (normal weight 15%, overweight 27%, obese 24%;  $P<0.001$ ) and  
137 obstructive sleep apnea (normal weight 2%, overweight 5%, obese 5%;  $P=0.004$ ) to have significantly  
138 increased prevalence in the overweight and obese patients compared to the normal weight.  
139 However, there are major differences between our study and the report by Nguyen et al [4]. The  
140 study by Nguyen et al included general population [4]. Our study, however, included only  
141 hospitalized patients. In addition, Nguyen and colleagues reported on class 3 obesity and the  
142 co-morbid conditions. We included both overweight and obese patients. These differences might  
143 have led to the discrepancies between the results demonstrated by our study and those reported by  
144 Nguyen et al [4].

145

146 Rising cost of obesity to the payers is a global concern and has always been a priority for researchers.  
147 Reducing direct and indirect cost of obesity can decrease healthcare consumption [3]. Stratifying the  
148 cost on obesity into direct and indirect group has focused the healthcare interventions to target the  
149 group requiring more concentration [15-16]. One study conducted by Finklestein et al in 2010 to  
150 estimate costs of obesity on a cross sectional basis found that for all categories of obesity, the three  
151 variables: healthcare costs, absenteeism and presentism all increased with increasing BMI [16].  
152 Raising awareness to reduce obesity and related complications is a health care priority worldwide  
153 [6]. Previous research concluded that documentation of obesity as a medical problem was associated  
154 with greater physician attention to patient weight, specifically an increased prevalence of exercise  
155 counseling in both inpatient and outpatient settings [8,10,14,17]. In the present study, only 2%  
156 patients received obesity related counseling at the time of discharge although 12% patient had  
157 obesity diagnosis at discharge summary. Furthermore, adding obesity diagnosis to the problem list  
158 and documentation in the medical records increases work RVUs and revenue stream for the facility  
159 and providers. Medicare ICD-10 codes allow counseling that has separate reimbursement codes  
160 [5,17]. More strategic and policy based study is needed to identify effective methods for  
161 documentation, physician counseling and behavioral therapy approaches in the treatment of obesity  
162 in both inpatient and primary care settings.

163

164 The US preventive service Task Force and the American Academy of Family Physician set  
165 guidelines for primary care clinics and recommended that screening for obesity using BMI should be  
166 done for all adults [19]. However, there are no clear guidelines to address obesity on the inpatient  
167 settings. The most recent recommendation in 2015 from the American College of  
168 Cardiology/American Heart Association and the Obesity Society, introduced five major steps for  
169 obesity management including identifying those at risk, physician counselling and guidelines for  
170 treatment with diet, life style intervention and surgery [20]. The initial step to increasing guideline  
171 compliance may be encouraging physicians to document obesity as a medical problem in the



172 patient's EMR. In our study, only 3 patients received obesity counseling. Clearly, there is a major  
173 opportunity that exists in identifying and managing weight status of the patients.

174

175 Given the high prevalence of obesity among hospitalized patients, we believe that the development  
176 of hospital-based weight management program may help to create an action plan in collaboration  
177 with department of endocrinology and metabolism that will mandate BMI calculation for every  
178 patient within the electronic medical record. The goal for hospital provider and residents should  
179 include the documentation of obesity diagnosis to be included in discharge paperwork. The  
180 implementation of such a program in a medical center would highlight the importance of weight  
181 reduction and make awareness to patients and families. The initial strategies may include nutritional  
182 education, cognitive behavioral strategies, emphasis on a supportive family environment, and  
183 physical activity prescriptions [22-23].

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185 Our study has several limitations. First, retrospective nature and past medical history gleaned from  
186 the EMR limits the ability to infer causal effects and limits our analyses to associations. Secondly, the  
187 problem list used as a supplement for addressing the problem as part of the clinical encounter  
188 because all of the patients admitted for different reason not related to obesity directly. There could  
189 have been counseling related to obesity provided by residents and hospitalists that was verbally  
190 provided but not documented within the medical records. This may explain very low counseling  
191 rate during discharge even in morbidly obese patients. Finally, this is a single-center study and does  
192 not reflect the overall picture of other academic hospitals.

193

194 In summary, this study demonstrates that an overwhelming number of obese patients never had  
195 their weight status documented during their hospital admission and as a result counseling and  
196 appropriate referral service were used infrequently. Additionally, we found obesity to be associated  
197 with an increase in the prevalence of diabetes mellitus and obstructive sleep apnea. Inpatient  
198 admissions offer health care providers a window of opportunity to effectively act on identifying  
199 obesity, communicating risks and initiating weight management intervention such as counseling,  
200 behavioral and other interventional therapies.

201

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#### 207 **Conflict of Interest Statement**

208 The authors declare no conflicts of interest in relation to the presented study.

209

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