

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 ± 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 ± 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].

50

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/m²], overweight [BMI 25-29.9 kg/m²] and obese [BMI >30 kg/m²]. The obese
69 group was further divided into 3 classes. Class I [BMI 30-34 kg/m²], Class II [BMI 35-39.9 kg/m²] and
70 Class III [BMI >40 kg/m²]. 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**

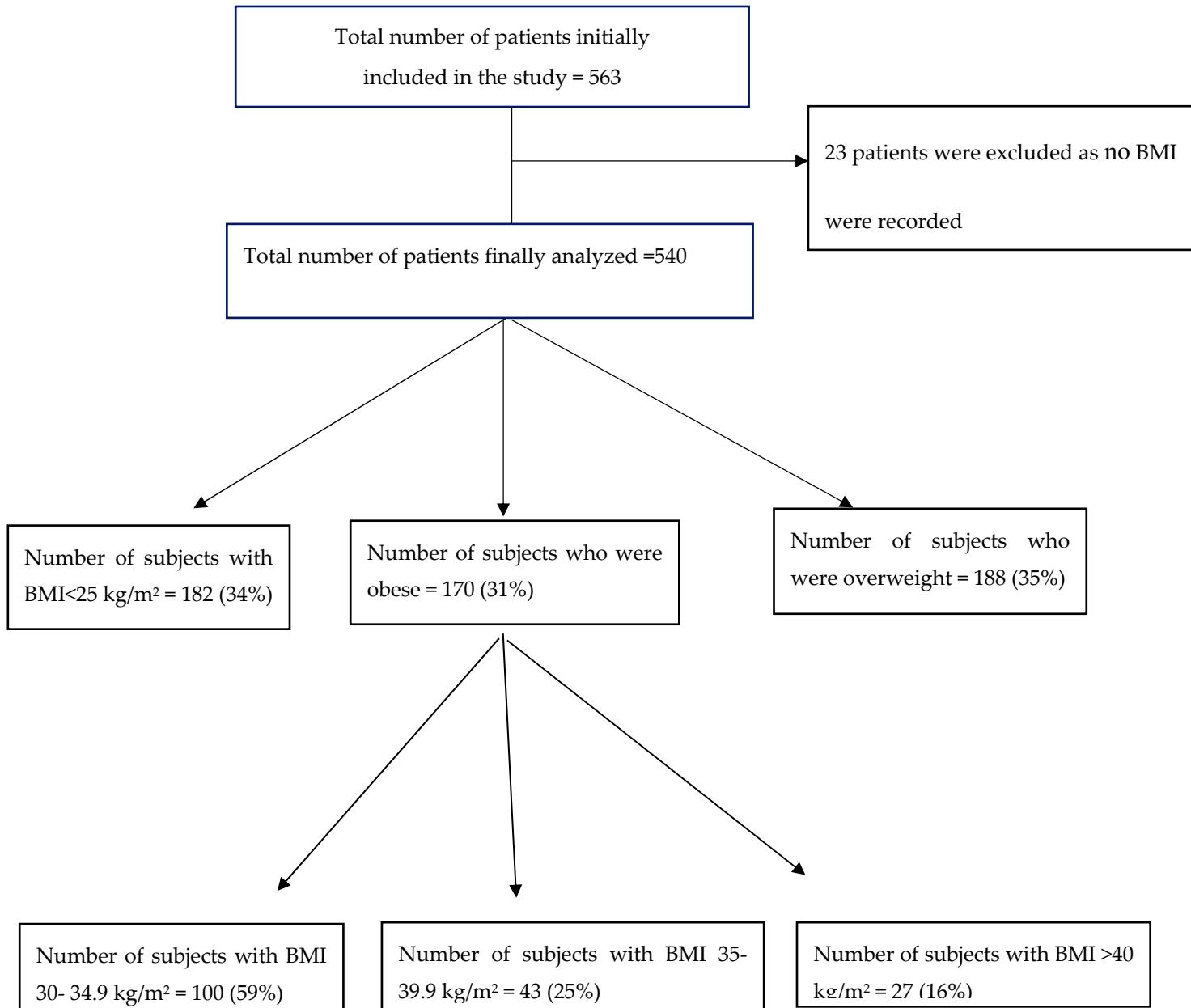
80 During the study period, 563 patients were admitted to the medical floor, of those 540 admission
81 were eligible for the study, 23 patients were excluded because of the absence of recorded height and
82 BMI. Consequently, a total of 540 consecutive patients were included in this analysis (Figure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

83 Demographic characteristics are shown in Table 1. Patient age ranged from 21-94 years (mean age
 84 66 ± 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 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 ± 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*

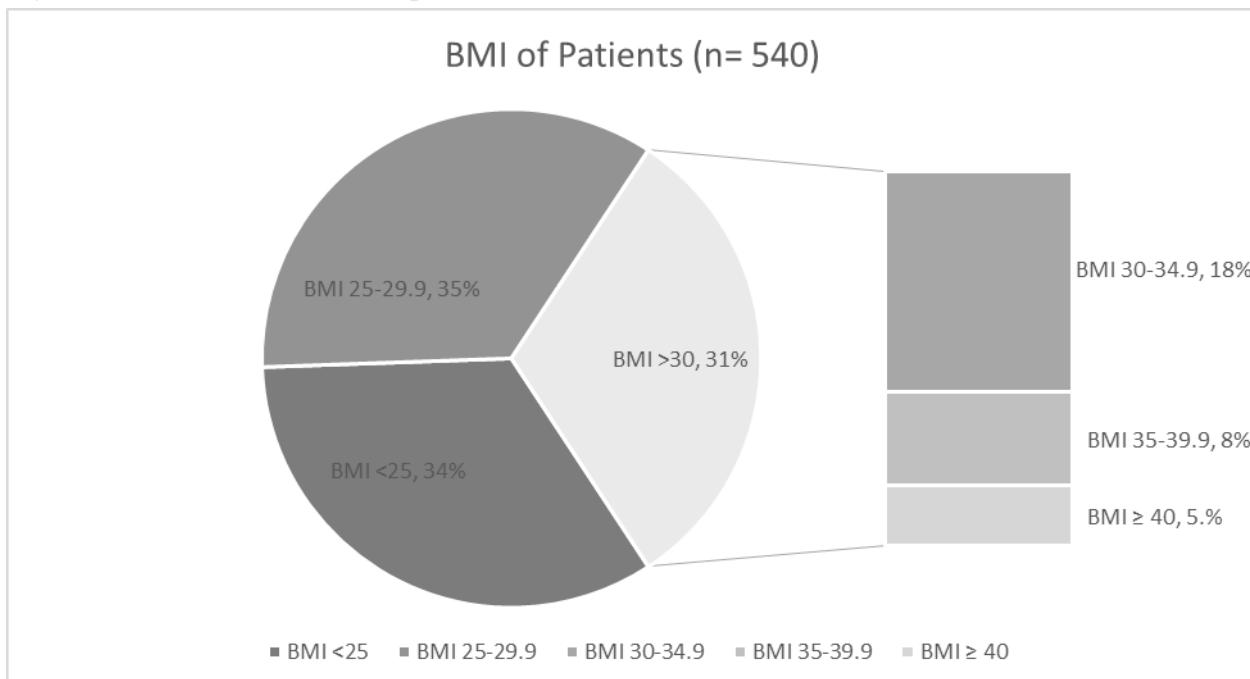
96 **Figure 1: Patients selection**

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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%)
Gender				
Male	237(44%)	76(45%)	85(45%)	76(42%)
Female	303(56%)	94(55%)	103(55%)	106(58%)
Race				
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 minuscule percentage (3 of
 114 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].

184

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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213

214 **References**

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1. ["Statistics Related to Overweight and Obesity". CDC](#). 2006. Retrieved 2009-01-23.
2. Obesity and the risk for a hematological malignancy: leukemia, lymphoma, or myeloma. *Oncologist.* 2010;15(10):1083-101. doi: 10.1634/theoncologist.2010-0206. Epub 2010 Oct 7.
3. Li Q, Blume SW, Huang JC, Hammer M, Ganz ML. Prevalence and healthcare costs of obesity-related comorbidities: evidence from an electronic medical records system in the United States. *J Med Econ* 2015;Sep 4: 1-9.
4. Nguyen NT¹, Magno CP, Lane KT, Hinojosa MW, Lane JS. Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: findings from the National Health and Nutrition Examination Survey, 1999 to 2004. *J Am Coll Surg.* 2008 Dec;207(6):928-34. doi: 10.1016/j.jamcollsurg.2008.08.022. Epub 2008 Oct 10
5. Cawley J, Meyerhoefer C. The medical care costs of obesity: an instrumental variables approach. *J Health Econ.* 2012; 31(1): 219-230.
6. James WP. WHO recognition of the global obesity epidemic. *Int J Obes (Lond).* 2008 Dec;32 Suppl 7:S120-6. doi: 10.1038/ijo.2008.247.

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252

7. Huang J, Marin E, Yu H, Carden D, Arnold C, Davis T, Banks D. Prevalence of overweight, obesity and associated diseases among outpatients in a public hospital. *South Med J.* 2003;96(6):558-562. doi: 10.1097/01.SMJ.0000054725.35262.D4. (6):558-62
8. Davis NJ, Emerenini A, Wylie-Rosett J. Obesity management: physician practice patterns and patient preference. *Diabetes Educ.* 2006;32(4):557-561.
9. Chen Y, Jiang Y, Mao Y. Hospital admission associated with body mass index in Canadian adults. *Int J Obes.* 2007;31:962-967. doi: 10.1038/sj.ijo.0803530
10. Post RE, Mainous AG 3rd, Gregorie SH, Knoll ME, Diaz VA, Saxena SK. The influence of physician acknowledgment of patients' weight status on patient perceptions of overweight and obesity in the United States. *Arch Intern Med.* 2011;171(4):316-321.
11. Kraschnewski JL, Sciamanna CN, Stuckey HL, et al. A silent response to the obesity epidemic: decline in US physician weight counseling. *Med Care.* 2013;51(2):186-192

253 12. Fink J, Morris GL, Singh M, Nelson DA, Walker R, Cisler RA. Discordant documentation of
254 obesity body mass index and obesity diagnosis in electronic medical records.
255 *J.Patient-Centered Res Rev.* 2014;1(4):164-170.

256

257 13. Azhdam DB, Reyhan I, Grant-Guimaraes J, Feinstein R. Prevalence and documentation of
258 overweight and obesity in hospitalized children and adolescents. *Hosp Pediatr* 2014; 4(6):
259 377-381.

260

261 14. Woo JG, Zeller MH, Wilson K, Inge T. Obesity identified by discharge ICD-9 codes
262 underestimates the true prevalence of obesity in hospitalized children. *J Pediatr* 2009; 154(3):
263 327-33

264 15. Dee A, Kearns K, O'Neill C. The direct and indirect costs of both overweight and obesity: a
265 systematic review. *BMC Res Notes.* 2014 Apr 16; 7:242. doi: 10.1186/1756-0500-7-242

266 16. Finklestein EA, DiBonaventura M, Burgess SM, Hale BC. The costs of obesity in the
267 workplace. *J Occup Environ Med.* 2010;52(10):971-976.

268

269 17. Bordowitz R, et al The use of an electronic medical record to improve documentation
270 and treatment of obesity. *Fam Med* 2007 Apr;39(4):274-9.

271

272 18. Banerjee ES, et al Adding obesity to the problem list increases the rate of providers
273 addressing obesity. *Fam Med*.2013 Oct;45(9):629-33.

274

275 19. Brown I, Thompson J, Tod A, Jones G. Primary care support for tackling obesity: a
276 qualitative study of the perceptions of obese patients. *Br J Gen Pract* 2006; 56(530): 666-672.

277

278 20. Screening for and management of obesity in adults: recommendation statement.
279 *American family physician.*2012; 86(10): 1-3.

280

281 21. Jensen MD, et al. Guideline for the management of overweight and obesity in adults: a
282 report of the American College of Cardiology/American Heart Association Task Force on
283 Practice Guidelines and The Obesity Society. *J Am Coll Cardiol* 2014; 63(25 Pt B):
284 2985-3023.

285

286 22. Ryan DH, et al. What the new obesity guidelines will tell us. *Curr Opin Endocrinol
287 Diabetes Obes* 2013; 20(5): 429-433.

288

289 23. Hurley RE, Freund DA, Taylor DE. Emergency room use and primary care case
290 management: evidence from four Medicaid demonstration programs. *Am J Public Health.*
291 1989;79(7):843-846.