Practice Management

Effect of a Computerized Body Mass Index Prompt on Diagnosis and Treatment of Adult Obesity

Susan P. Schriefer, PhD, FNP-BC; Suzanne E. Landis, MD, MPH; David J. Turbow, PhD; Steven C. Patch, PhD

Background: *In obese adults, physicians often fail to identify obesity and recommend treatments for it. We sought to determine whether a computerized body mass index (BMI) chart prompt would increase the likelihood that patients of family physicians would be diagnosed with obesity and referred for obesity treatment.* Methods: *A total of 846 obese patients of 37 family physicians were randomly assigned to either have a patient's BMI chart prompt placed in their electronic medical record (intervention group) or not have a BMI prompt (comparison group) placed in the record. We then examined patient medical records for evidence of an obesity diagnosis and referral for specific obesity treatments. We also measured whether the presence of comorbidities in obese patients influenced the likelihood of diagnoses and treatments by the physicians.* Results: *Obese patients of physicians who had a BMI chart prompt in their medical records were significantly more likely than obese patients of physicians who did not receive a BMI chart prompt to receive a diagnosis of obesity (16.6% versus 10.7%; P=.016). Patients of physicians who were provided with a BMI chart prompt were also more likely than patients of physicians who did not get a chart prompt to receive a referral for diet treatment (14.0% versus 7.3%, P=.002) and exercise (12.1% versus 7.1%, P=.016). Of the obesity comorbidities, only obstructive sleep apnea (OSA) was a predictor of a patient being diagnosed with obesity (OR=.49, 95% CI=0.281, 0.869, P=.014).* Conclusions: *Inclusion of a computerized BMI chart prompt increased the likelihood that physicians would diagnose obesity in obese patients and refer them for treatment.*

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Obesity rates among American adults have increased from 12.0% in 1991 to 32.2% in 2003–2004.[1,2] Obesity is associated with higher mortality rates and increased risk of several diseases, including coronary artery disease, diabetes mellitus type 2, osteoarthritis/degenerative joint disease, gallstones, hypertension, obstructive sleep apnea, dyslipidemia, and certain types of cancer (endometrial, esophageal, renal, colon, and breast).[3-5]

The United States Preventive Services Task Force recommends that physicians screen all adult patients for obesity and offer intensive counseling and interventions to promote weight loss to those who are obese.[6] Interventions include diet, exercise, weight loss medication, weight loss programs, and bariatric surgery.

Physicians often fail to identify obesity in their obese patients and thus fail to recommend obesity treatment.[7] Previously published estimates of the rate of diagnosis of obesity by physicians range widely, from 3.0% to 53%.[3,7,8-13] Among obese patients, diet referrals by physicians range from 13.7% to 41.5%, and exercise referrals range from 9.8% to 45%.[8-13]

Chart prompts for physicians have proven to be effective for increasing the likelihood that physicians provide patients with preventive services, including immunizations and smoking cessation services.[14-21] Previous evidence on the effectiveness of body mass index (BMI) chart prompts to aid in diagnosis of obesity, however, is limited. Clothier et al[22] found no significant difference in rates of obesity diagnosis among patients of physicians who received a BMI prompt compared to those patients of physicians who did not receive a

From the MAHEC Family Health Center, Asheville, NC (Drs Schriefer and Landis); College of Health Sciences, TUI University, Cypress, Calif (Dr Turbow); and Mathematics Department, University of North Carolina-Asheville (Dr Patch).

chart prompt; however, this study had an insufficient sample size to identify a true difference. The purpose of the study reported here was to evaluate whether or not the inclusion of a computerized BMI chart prompt as a vital sign on an electronic medical record would increase the likelihood that patients would receive a diagnosis of obesity and referral for treatment from their family physicians.

Methods

The study used an intervention design to determine the effect of a chart prompt for increasing the frequency with which patients are diagnosed with and offered treatment for obesity. The study was approved by Mission Hospitals Institutional Review Board.

Setting and Subjects

The study took place in a family medicine residency program clinic located in a small urban area of western North Carolina over 2 months in the first half of 2006. The patients of the clinic primarily live in a county of population size approximately 212,000. The active patient base at the clinic is approximately 14,000. By patients' self report, 85% of the clinic's patients are Caucasian, 7% are African American, and 5% are Hispanic.

We only included active patients in the study. We defined an active patient as one who made at least one office visit within the previous 3 years. We only included patients who were 20 years of age or older for the study because this age range coincides with appropriate use of the BMI as a tool for measuring body fat. Further, we only included patients whose calculated BMI (weight in kg/height in m^2) was 30 or higher at the beginning of the study. Pregnant patients were excluded.

Team Assignments

Prior to the study, clinic management had assigned each faculty physician, in a rotating sequence, to work as a member of one of four clinical teams. Each resident physician is also assigned to one of the teams, with assignment occurring at the beginning of residency. Patients are then assigned to a specific physician (and the physician's team) at the time of their enrollment in the clinic. Thus, each patient receives care from within one particular clinic team for the entire duration of care in the clinic, and in the event that the assigned physician is unavailable, then the patient will instead be seen by another physician from within that particular clinic team. Despite being assigned to a clinical team, each physician within a team operates independently when evaluating patients and deciding on diagnoses and treatment plans.

Assignment of Teams to Study Groups

Two physician teams were assigned to an intervention group and two to a comparison group by drawing from a hat. Patients were considered to be in the intervention or comparison group based on their physician's group assignment.

BMI Prompts

When a patient came for an office visit with a physician on an intervention group team, clinic staff obtained the patient's weight and height and computed the BMI from a calculation table that was provided by the researchers. The staff member then entered the height, weight, and BMI into the patient's electronic medical record. When the physician saw the patient, a computerized BMI appeared with other vital signs in the medical record. A member of the research team subsequently manually calculated the BMI of each patient to verify that the staff was making correct computations of BMI; they were correct in 99% of cases.

Clinical staff collected and recorded heights and weights in the record of patients in the comparison group. Physicians in the comparison group did not, however, receive a BMI prompt in the computerized medical record.

In both groups, the physician examined the patient, made diagnoses, determined a plan of care, and recorded findings in the medical record. Entries in the medical record were performed either by typing directly into the electronic medical record or by dictating the office visit note to a transcriptionist, who entered the information in the electronic medical record.

Data Collection

We reviewed medical records and collected obesity treatment and referral data on patients for their first office visit during the 2-month study period. If patients were seen in the office more than once during the study period, only the first visit was reviewed.

Data Analysis

The dependent variables were (1) patients of physicians receiving an obesity diagnosis (yes or no) and (2) patients of physicians receiving a referral for various obesity treatment options (yes or no with each option) noted under the obesity diagnosis. Obesity diagnosis (ICD-9 code of 278.00–278.01 or listing obesity without the ICD-9 code) and obesity treatment options (diet, exercise, weight loss medication, weight loss program, bariatric surgery, or a combination) that were recorded into the assessment and plan section of the patient's medical record and that were abstracted through a chart review were the basis for determining whether to code the dependent variables yes or no.

The primary independent variable was the presence of a BMI chart prompt in the patient's medical record. Other independent variables measured in the study were patients' sociodemographic characteristics and comorbidities of obesity. Sociodemographic data extracted from patient medical records included gender,

age, ethnicity, marital status, employment status, and health insurance. Comorbidities of obesity recorded in the medical record were coronary artery disease, diabetes mellitus type 2, osteoarthritis/degenerative joint disease, gallstones, hypertension, obstructive sleep apnea, dyslipidemia, and certain types of cancer.

Chi-square tests of independence were conducted to assess the relationship between the presence or absence of the BMI chart prompt and the diagnosis of obesity by the physician. Chi-square tests were also conducted to assess the relationships between the presence or absence of the BMI chart prompt and physician referral for treatment. A logistic regression analysis was carried out to determine whether or not sociodemographic characteristics of patients as well as the presence of comorbidities of obesity were predictive of the likelihood that patients would be diagnosed with obesity and referred for obesity treatment.

We calculated the required sample size for our study *a priori* for a Pearson chi-square statistic with a desired power of 0.9, a difference in proportions of 0.1 with a control group proportion of 0.1. We thus determined that a sample size of 266 per group would be required to assess the effects of the prompt on each of the three dependent variables.

Results

Subjects

A total of 37 physicians participated, of whom 18 were assigned to an intervention group (seven faculty, four first-year, four second-year, and four third-year residents) and 19 to the comparison group (six faculty, four first-year residents, four second-year residents, and four third-year residents). The ages of physicians ranged from 28 years to 64 years.

Physicians examined a total of 846 obese patients, with 379 in the intervention group and 467 in the comparison group. The sociodemographic characteristics of patients seen by physicians in the intervention and comparison groups were similar (Table 1), with the exception of a slightly higher percentage of Medicare enrollees in the intervention group versus the comparison (13.5% versus 8.6%, X^2 [1, n=846]=10.65, *P*=.016). Medical characteristics of the two groups were also similar, except for a higher percentage of intervention-group enrollees, compared to comparison-group enrollees having dyslipidemia (50.6% versus 42.6%, X^2 [1, n =846]=5.45, *P*=.022).

Rate of Obesity Diagnosis

Obese patients of physicians who received a BMI prompt were significantly more likely than obese patients of physicians who did not receive the chart prompt to receive a diagnosis of obesity (16.6% versus 10.7%, respectively; X^2 [1, n=846]=5.83, *P*=.016). Obese patients of physicians who received the BMI chart prompt were also more likely than obese patients seen by physicians who did not receive the prompt to be referred to diet treatment (14.0% versus 7.3%, respectively; X^2 [1, n=846]=9.47, *P*=.002). Further, obese patients of physicians who had been given the BMI chart prompt were also more likely to be referred to exercise compared to obese patients seen by physicians without the BMI prompt (12.1% versus 7.1%, respectively; X^2 [1, n= 846]=5.88, *P*=.016) (Table 2). Too few patients were referred by their physicians for medications, weight loss programs, and bariatric surgery to enable valid statistical comparison between the intervention and comparison groups for these variables. A significantly higher proportion of patients of physicians who had been given BMI prompts were referred for combination therapy compared to obese patients of physicians who had not been given BMI prompts (11.9% versus 6.6%, respectively; X^2 [1, n=846]=6.38, *P*=.011).

Patients categorized as class III obese (BMI $\geq$ 40 kg/m^2) were more likely to be diagnosed with obesity by physicians than patients in class I (BMI 30.0–34.9 kg/m^2) and class II (BMI 35.0–39.9 kg/m^2) (27.4%, 7.1%, 11.6%, respectively). Class of BMI was significantly associated with the patient's likelihood of receiving an obesity diagnosis (X^2 [1, n=846]=49.73, *P*<.0001).

Demographic characteristics of the patients (ie, age, gender, ethnicity, insurance status, employment status) were not predictive of the likelihood of receiving a medical record diagnosis of obesity by the physician. Of the patient's medical conditions, only obstructive sleep apnea (OSA) was a statistically significant predictor of the likelihood of the patient receiving a diagnosis of obesity by a physician (OR .49, 95% CI=0.281–0.869, *P*=.014).

Discussion

The insertion of a computerized BMI chart prompt in an electronic medical record increased the likelihood that physicians would diagnose obesity in their obese patients and refer them appropriately for treatment. Thus, the intervention was effective. That being said, only 16.6% of obese patients seen by physicians in the intervention group received a diagnosis of obesity, suggesting that a chart prompt alone is not sufficient to cause physicians to assign a diagnosis of obesity to most obese patients.

Reasons for the low rate of obesity diagnosis are unclear. We collected data for the patients' first office visit during the study period. Physicians may have diagnosed obesity and discussed obesity treatments with their patients either previously or upon subsequent visits, and such activity was not captured in our analyses. It is also possible that physicians simply do not discuss obesity with patients for fear of hurting the feelings of patients.[8,23,24] Also, family physicians may have little motivation or incentive to bring the issue of obesity to

Table 1

Characteristics of Obese Patients Seen by Their Physicians Before the Intervention

Variable	*BMI Prompt Group n (%)*	*No BMI Prompt Group n (%)*	χ^2	P *Value*
Gender			.009	.924
Female	256 (67.5)	318 (68.1)		
Male	123 (32.4)	149 (31.9)		
Age (years)			2.15	.541
20–30	39 (10.3)	59(12.6)		
31–40	74 (19.5)	77 (16.5)		
41–50	83 (21.9)	100 (21.4)		
≥ 51	183 (48.3)	231 (49.5)		
Ethnicity			7.31	.121
Caucasian	296 (78.1)	368 (78.8)		
African American	71 (18.7)	83 (17.8)		
Hispanic	0	2 (0.4)		
Insurance			10.65	.059
Medicare	51 (13.5)	40 (8.6)		
Medicaid	95 (25.1)	124 (26.5)		
Medicare/Medicaid	34 (9.8)	28 (6.0)		
Commercial	180 (47.5)	239 (51.2)		
Self pay	8 (2.1)	12 (2.6)		
Marital Status			2.15	.342
Married	186 (49.1)	216 (46.3)		
Single	159 (42.0)	195 (41.8)		
Employment status			4.65	.325
Employed	193 (51.0)	231 (49.5)		
Unemployed	134 (35.4)	157 (38.6)		
Disabled	41 (10.8)	51 (11.0)		
Obesity classes			.254	.881
Class I	177 (46.7)	220 (47.1)		
Class II	111 (29.3)	130 (27.8)		
Class III	91 (24.0)	117 (25.0)		
Obesity comorbdities				
CAD	43 (11.3)	52 (11.1)	.000	1.00
DMT2	105 (27.7)	121 (26.0)	.259	.611
Hypertension	237 (62.5)	270 (57.8)	1.75	.186
Dyslipidemia	192 (50.6)	199 (42.6)	5.13	.023
DJD/OA	131 (34.6)	158 (33.8)	.023	.881
OSA	37 (9.8)	59 (12.6)	1.44	.230
CVA	20 (5.3)	16 (3.4)	1.33	.248
Gallstones	60 (15.8)	63 (13.5)	.744	.338
Cancer	65 (17.1)	73 (15.6)	.251	.616

BMI—body-mass index, Class I—BMI 30.0–34.9 kg/m², Class II—BMI 35.0–39.9 kg/m², Class III—BMI ≥ 40 kg/m², CAD—coronary artery disease, DMT2—diabetes mellitus type 2, DJD/OA—degenerative joint disease/osteoarthritis, OSA—obstructive sleep apnea, CVA—cerebrovascular accident (stroke). Cancers include prostate, renal, melanoma, cervical uterine, breast, colon, ovarian, lung, thyroid, bladder, and rectal.

Table 2

Effect of BMI Chart Prompt on Obesity Diagnosis and Treatment Referral

	Patients Receiving Diagnosis and Treatment n (%)			
Variable	*BMI Prompt Group*	*No BMI Prompt Group*	χ^2	P *Value*
Obesity diagnosis	63 (16.6)	50 (10.7)	5.83	.016
Diet	53 (14.0)	34 (7.3)	10.19	.002
Exercise	46 (12.1)	33 (7.1)	5.77	.016
Medication	2 (0.5)	1 (0.2)	.033	.856
Weight loss program	4 (1.1)	6 (1.3)	.000	1.00
Bariatric surgery	3 (0.8)	3 (0.6)	.000	1.00
Combination therapy	45 (11.9)	31 (6.6)	6.39	.011

BMI—body-mass index

the attention of the patient because physicians are not reimbursed by insurance companies for diagnosing obesity.[25] We are unable to determine from our study if these factors contributed to the low rate of obesity diagnosis.

Limitations

Our study was limited to a single urban family practice residency practice clinic in North Carolina, and thus our results may not be representative of what occurs in a typical family physician's practice—either in terms of sociodemographic characteristics of patients or behavior of physicians. For example, a large percentage of the patients at the study clinic are enrolled in Medicaid; physicians may feel that obesity treatment options are more limited for Medicaid patients than for other patients and thus might not insert the diagnosis into the medical record.

Conclusions

To our knowledge, ours was the first study to explore the extent to which a computerized BMI chart prompt might increase the likelihood that physicians would diagnose obesity in obese patients and refer the patients for treatment. Our results suggest that insertion of a BMI chart prompt in the medical record does increase the rate of obesity diagnosis and referral, but the rate is not increased to a satisfactory level.

Corresponding Author: Address correspondence to Dr Schriefer, MAHEC Family Health Center, 118 W.T. Weaver Blvd, Asheville, NC 28804. 828-257-4740. spschriefer@charter.net.

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