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Adult Obesity and Office-based Quality of Care in the U.S

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Abstract

Nationally representative data are limited on the quality of care for obese patients in U.S. ambulatory care settings. We conducted a cross-sectional analysis of the 2005 and 2006 National Ambulatory Medical Care Survey, which for the first time, collected patient weights and heights during a representative sample of visits to U.S. private physician practices. We examined obesity screening, diagnosis and counseling during adult visits and associations with patient and provider characteristics. We also assessed performance on 15 previously published ambulatory quality indicators for obese vs. normal/overweight patients. Nearly 50% (95% CI: 46%–54%) of visits lacked complete height and weight data needed to screen for obesity using body mass index (BMI). More visits were missing height (49%) as opposed to weight (14%) measurement. Of visits by patients with clinical obesity (BMI≥30.0 kg/m^2), 70% (66%–74%) were not diagnosed and 63% (59%–68%) received no counseling for diet, exercise or weight reduction. The percentage of visits not being screened (48%), diagnosed (66%) or counseled (54%) for obesity was also notably higher than expected even for patients with known obesity co-morbidities. Performance (defined as the percentage of applicable visits receiving appropriate care) on the quality indicators was suboptimal overall. In particular, performance was no better than 50% for 8 quality indicators, which are all related to the prevention and treatment of obesity co-morbidities, e.g., coronary artery disease, hypertension, hyperlipidemia, asthma, and depression. Performance did not differ by weight status for any of the 15 quality indicators; however, poorer performance was consistently associated with lack of height and weight measurements. In conclusion, many opportunities are missed for obesity screening and diagnosis, as well as for the prevention and treatment of obesity co-morbidities, in office-based practices across the United States, regardless of patient and provider characteristics.

Introduction

Obesity is an ever rising epidemic worldwide. In the U.S., more than 60 million, or 1 in every 3, adults are obese, as defined by body mass index (BMI) (calculated as weight in kilograms divided by height in meters squared)([1]). Obesity is strongly associated with increased morbidity and mortality ([2]), as well as higher health care utilization ([3]). Evidence-based clinical guidelines consistently recommend that clinicians screen all adult patients for obesity and offer intensive counseling about diet, exercise, and behavioral modification to promote sustained weight loss for obese adults ([4, 5]). However, our previous work found that obesity was notably under-diagnosed ([6, 7]) and lifestyle counseling was infrequently provided even among patients with physician-diagnosed obesity ([8]) in ambulatory care settings across the United States. Building

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on this research, we conducted the current study to specifically examine patient and provider factors associated with a lack of obesity screening, diagnosis and counseling for U.S. adults seeking care in office-based private practices. In addition, we examined the association of quality of ambulatory care with obesity status by focusing on a set of previously developed quality indicators of chronic care, acute care, and preventive care in ambulatory settings ([9]). We hypothesized that, compared with their normal/overweight counterparts, obese patients would receive better quality of care on indicators for obesity-related disease or risk factor management whereas they would receive similar care on quality indicators for unrelated conditions. It would be good to include mention of the issue of discrimination and potential neglect of quality of care in obese patients (as in Adams 1993). We can still hypothesize no difference in quality perhaps arguing that these issue might be less pertinent in patients already having access to care.

Methods

Data Sources

The National Ambulatory Medical Care Survey (NAMCS) is administered annually since 1989 by the Ambulatory Care Statistics Branch of the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention. Complete descriptions of the survey and yearly public use data can be found at http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm. The NCHS Institutional Review Board approved the protocols for the NAMCS, including a waiver of the requirement for informed consent of participating patients. The NAMCS has previously been validated against other national ambulatory care data ([10, 11]).

The NAMCS collects information on utilization and provision of health care during patient visits to non-federally funded, community, and office-based physician practices throughout the United States ([12, 13]). It uses a 3-stage stratified probability sampling design with sampling based on geographic location, office-based practices (stratified by specialty), and visits within office-based practices during randomly assigned reporting periods. The NCHS weights each patient visit to allow extrapolation to national estimates for all aspects of the survey. The visit weight accounts for selection probability, non-response adjustment, and other adjustments to reflect the universe of office-based patient visits in the U.S. An independent sample of physicians is selected for each survey year.

The NCHS collects physician and practice information using the Physician Induction Interview Form at the start of the survey process. The characteristics included in this study were self-identified physician specialty, physician employment status, region of practice location, whether the practice was in a rural area, type of office setting, whether it was a solo practice, practice ownership, percent of practice's patient care revenue from managed care contracts, and whether the practice used an electronic health record (EHR). Information about individual physician demographic characteristics, such as age and gender, are not available in NAMCS public use data.

Patient and clinical information is collected for each sample visit and is recorded on NCHS standardized Patient Record Forms by participating physicians, office staff, or US Census Bureau representatives. The 2005 and 2006 Forms included patient information, particularly demographics and insurance status. Clinical characteristics included up to 3 reasons for the visit and 8 medications, both coded according to the classification schemes developed at NCHS ([12–14]). Listed medications included prescription and non-prescription medications that the physician prescribed or provided at or prior to the visit and that the physician expected the patient to continue taking. In addition, physician diagnoses were documented using a) write-in spaces for up to 3 visit diagnoses (later coded according to *the International Classification*

of Diseases, ninth Revision, Clinical Modification [ICD-9-CM]), and b) check boxes for a pre-specified list of current medical problems, one of which was obesity, regardless of visit diagnoses.

We categorized visits according to the patient's risk for obesity-related disease complications and mortality. We used established clinical guidelines that were modified owing to limitations of our data source ([5]). Patients with any 1 of the following were classified as "high risk": ([1]) coronary artery disease (CAD), ([2]) diabetes mellitus, or ([3]) other atherosclerotic diseases. Patients with any 1 of the following were classified as "moderate risk": ([1]) men aged ≥45 years and women aged ≥55 years, ([2]) hypertension, ([3]) hyperlipidemia, ([4]) cigarette smoking, ([5]) sleep apnea, ([6]) osteoarthritis, or ([7]) asthma. Finally, patients without any of those conditions were classified as "low risk." Medical conditions were identified using either visit diagnoses or, if available, diagnostic check boxes. Patients whose encounter form did not indicate the presence of a condition were assumed to not have that condition.

Patient height and weight were collected, for the first time in 2005, and again in 2006. Survey instructions specified that the patient's height and weight be recorded using either measurements taken at the sample visit or, if not measured at the visit and the patient was 21 years or older, the most recent values in the patient's medical chart. BMI was computed during data processing by NCSH staff for all patients with height and weight data, except for persons under the age of 2 and pregnant females.

Quality control was done using a two-way independent verification procedure for 10% of the sample records in each survey year. Coding error rates for various items ranged from 0.6% to 4.5% in 2005 and from 0.2% to 1.4% in 2006. Item non-response rates for most data elements were <5% in both years.

Data Analysis

We performed a retrospective, cross-sectional analysis of ambulatory visits in the NAMCS from 2005 and 2006, the latest releases at the time of study. The study sample consisted of office-based visits by men and women 18 years and older (excluding pregnant women) to physicians with a specialty of general medicine, family medicine, internal medicine, and cardiovascular disease because many of the quality indicators concern the practice of primary care physicians and cardiovascular specialists.

We measured the number and percentage of ambulatory visits in which height and/or weight measurements were obtained. For patients who were obese by BMI, we measured the number and percentage of visits at which a physician diagnosis of obesity was recorded and counseling for diet, exercise, or weight reduction was provided or ordered. We also examined the associations of these measures with patient demographics, physician specialty, and practice characteristics.

Further, we examined a set of 15 indicators (**Appendix**) that measure the quality of ambulatory care during adult visits for management of chronic diseases (8 indicators), appropriate antibiotic use (2 indicators), and preventive counseling and screening services (5 indicators). Detailed criteria and methods for the construction of the quality indicators have been previously published ([9, 15]). Briefly, the quality indicators were developed in accordance with the Institute of Medicine's criteria of clinical importance, scientific soundness, and feasibility for indicator selection as well as criteria specific to the limitations of the data source. The performance on quality indicators was the percentage of applicable visits receiving appropriate care (i.e., the higher the percentage the greater the performance). Visits meeting criteria for exclusion were removed from both the numerator and denominator for computing the percentage. Inclusions

and exclusions were identified using NAMCS reason for visit codes, medication codes, ICD-9-CM codes, and diagnostic check boxes.

Statistical Analysis

All analyses were performed with SAS statistical software, version 9.1.3 (SAS Institute, Cary, NC). The unit of analysis was the patient visit. We calculated standard errors for all results as recommended by the NCHS, which accounts for the sampling weights and complex multi-stage sampling design of the NAMCS ([12, 16]). According to the NCHS, estimates with greater than a 30% relative standard error or based on fewer than 30 sample cases may be unreliable ([12, 16]). Comparisons of 2005 and 2006 data suggested few differences on the main outcome measures. In accord with the NCHS analytical guidelines, we combined the data to obtain a larger sample size and, thus, more reliable estimates.

National estimates were generated using the SURVEYMEANS procedure for the number and percentage of patient visits, including 95% confidence intervals (CIs). Chi-square tests (PROC SURVEYFREQ) examined isolated associations between an outcome measure and individual explanatory variables. Explanatory variables that were at least nominally associated with an outcome measure (2-sided $P<.10$) were entered into a multiple logistic regression model (PROC SURVEYLOGISTIC) for that outcome. Adjusted odds ratios (ORs) and associated Wald χ^2 statistics from the logistic procedure were used to determine the significance of the independent association of an explanatory variable with the outcome measure after controlling for all other explanatory variables in the model. Statistical significance was set at 2-sided $P<.05$.

Results

Screening for Obesity

In 2005 and 2006, American adults 18 years of age and older made 696 million visits (95% CI: 625 million to 767 million) to office-based physicians in a specialty of primary care or cardiovascular disease. Of these visits, 50% (95% CI, 46%–54%) had both height and weight measurements (hence BMI could be determined), 36% (95% CI, 32%–40%) had a weight but not height measurement, and 13% (95% CI, 11%–16%) had neither measurement. A very small percentage of total visits (0.9%) had a height but not weight measurement. Greater likelihood of lacking complete height and weight measurements to screen for obesity was independently associated with type of visit (OR, 1.6 [95% CI, 1.3–2.1] for treatment vs. preventive care visits) and region of practice location (1.7 [95% CI, 1.1–2.7] for the Northeast and 2.0 [95% CI, 1.2–3.4] for the West vs. Midwest) (Table 1).

Obesity Diagnosis and Lifestyle Counseling

Of the visits in which BMI was determined, 27% (95% CI, 26%–29%) were made by normal weight patients, 31% (95% CI, 30%–33%) by overweight patients, and 37% (95% CI, 35%–40%) by obese patients. Only 30% (95% CI, 26%–34%) of visits by patients who were obese by BMI had a physician-reported diagnosis of obesity. The likelihood of lacking obesity diagnosis for patients whose BMI was 30.0 or greater was independently associated with patient gender (OR, 1.5 [95% CI, 1.2–2.0] for men vs. women) and region of practice location (1.8 [95% CI, 1.2–2.7] for the South vs. Midwest) (Table 2).

Counseling for diet, exercise, or weight reduction occurred in 37% (95% CI, 32%–41%) of visits by patients who were obese by BMI and in 55% (95% CI, 47%–62%) of visits by patients who also received a physician diagnosis of obesity (Table 2). The likelihood of patients with a BMI of 30.0 or greater not receiving counseling was independently associated with risk of obesity co-morbidities (OR, 1.6 [95% CI, 1.2–2.2] for moderate risk; 2.4 [95% CI, 1.7–3.5]

for low risk vs. high risk), office type (2.9 [95% CI, 1.7–4.9] for free-standing clinics vs. private solo or group practices), and physician specialty (0.6 [95% CI, 0.4–0.9] for internal medicine vs. general/family medicine).

Performance of Quality Indicators

The performance were significantly greater than 50% of applicable visits (the lower 95% CIs were above 50%) for 7 of the 15 quality indicators, including 2 of the 8 quality indicators for medical management of common chronic diseases, both indicators for appropriate antibiotic use, and 3 of the 5 indicators for screening tests (Table 3). The 2 chronic disease management indicators were use of antithrombotic agents in atrial fibrillation (AF) (68% [95% CI, 61%–74%]) and aspirin use in CAD (54% [95% CI, 50% –58%]). The performance was 70% (95% CI, 61%–79%) for recommended antibiotic use for uncomplicated urinary tract infection (UTI) and 72% (95% CI, 63%–80%) for avoiding antibiotic use for uncomplicated upper respiratory tract infection (URTI). The performance was 93% (95% CI, 90%–95%) of GME visits for hypertension screening, 85% (95% CI, 81%–89%) for avoiding routine electrocardiography, and 88% (95% CI, 82%–94%) for avoiding routine urinalysis.

Mean performance of the remaining 6 quality indicators for chronic disease management ranged between 31% and 51% of applicable visits. The indicators included angiotensin-converting enzyme (ACE) inhibitor use for chronic heart failure (CHF), β-blocker use for CAD, diuretic use for hypertension, inhaled corticosteroid use for asthma, statin use for dyslipidemia, and pharmacotherapy or psychotherapy for depression. In addition, counseling about smoking cessation occurred in only 33% (95% CI, 25%–41%) of annual general medical examination (GME) visits by current smokers. Routine complete blood count (CBC) testing was avoided in 50% (95% CI, 39%–61%) of all GME visits.

Among visits with both height and weight measurements, no significant difference in quality was detected for any of the 15 indicators, including those for obesity-related disease and risk factor management, between the obese and non-obese (Table 3). Similar levels of quality also were observed for patient visits in which obesity status could not be determined due to lack of either (predominantly height) measurement, whereas poorer quality was noted for visits lacking both height and weight measurements.

Discussion

Obesity is a complex chronic condition and health care providers have an important role in identifying, preventing, and managing the disease ([5]). This study indicates that U.S. office-based providers fail to prioritize obesity as a clinical issue. We found that providers often failed to obtain needed anthropometric patient data (height in particular) to screen for obesity and then failed to diagnose obesity even when data that were obtained identified the condition. In addition, our finding of low rates of counseling for diet, exercise or weight reduction during visits by obese patients indicates that obesity is commonly under-treated. Rates of obesity screening, diagnosis and counseling were comparably low across a wide array of patient and provider characteristics. Even among patients whose BMI was 30.0 or greater – definition of clinical obesity – and had significant co-morbidities (e.g., CAD, diabetes or other atherosclerotic disease), only 34% (vs. 26% among obese patients without co-morbidities) were diagnosed with obesity and 46% (vs. 26%) received counseling.

Obesity-related disease complications increase health care costs, reduce quality of life, and shorten life expectancy ([2, 17]), underscoring the importance of prevention and treatment of obesity. Even modest weight reductions (typically in the range of 5–10% of initial body weight) – as opposed to the large reductions necessary to achieve ideal or normal weight – significantly improve surrogate disease outcomes ([18, 19]) and obesity-related morbidity ([20, 21]). Current

national guidelines recommend that, to promote modest, sustained weight loss for obese adults, clinicians offer intensive counseling about diet and exercise, as well as counseling about behavioral strategies to help patients acquire the skills, motivation and support needed to change eating patterns and food preparation practices and to become physically active ([4, 5]). The evidence remains unclear with regard to the efficacy of moderate- or low-intensity counseling together with behavioral interventions in inducing sustained weight loss for obese adults ([4]). The U.S. Preventive Services Task Force defines intensity of counseling by the frequency of contact – an intervention is high intensity if it involves more than 1 person-to-person (individual or group) session per month for at least the first 3 months ([4]). Current anti-obesity medications have significant side effects and data on their long-term (longer than 2 years) benefits or side effects are lacking ([5]). If prescribed, these medications should be used in conjunction with intensive counseling about diet, exercise, and behavioral modification ([5]). Finally, weight loss surgery is costly and should be reserved for patients with severe obesity who have at least 1 clinically significant co-morbidity ([5]).

The results of this study rejected our hypothesis that obesity would be associated with higher performance on quality indicators for obesity-related disease or risk factor management. Instead, we found that obese patients received similar, although largely suboptimal, care as normal or overweight patients on all 15 ambulatory quality indicators. We noted, however, that poorer performance was consistently associated with lack of height and weight measurements, which occurred in 13% (95% CI, 11%–16%) of total visits. This finding may be due the minimal nature of visits where neither height or weight are measured. In addition, the lack of systems for measuring and documenting height and weight may be correlate with similar lack of systems that could facilitate higher ambulatory care quality. RANDY, WHAT MORE TO SAY ABOUT THIS FINDING?

Our finding that obesity is generally not associated with differential ambulatory care quality may not be extrapolated to quality indicators not measured in this study. However, this finding is consistent with past reports (including our own) that once patients were in the exam room, patient characteristics, such as race, income, and insurance status, made little difference in the quality of care patients receive from their physicians ([9, 22]). These findings are not a refutation of the substantial evidence of health disparities by race, ethnicity and socioeconomic status ([23]) and the emerging evidence of disparities in the obese ([24–28]). Instead, they imply that these disparities do not arise primarily from unequal treatment in doctors' offices. Strategies to successfully reduce health disparities will need to address the underlying social, cultural and economic issues faced by patients who are known to be affected by these disparities as they attempt to access the health care system. Lack of health insurance was highlighted in the 2007 National Healthcare Disparities Report as a major barrier to health care access – the uninsured are six times as likely to be without a usual source of care and three times as likely to delay care for illness or injury ([23]). Some studies have reported that obese persons may encounter considerable social, economic, and psychological barriers, including, but not limited to, higher premiums for life insurance, less income, other forms of societal discrimination, and poor self-perception ([29–32]). Further, obese individuals may reluctant to see health care professionals because of their concern about clinician attitudes towards their appearance, discomfort with medical procedures (especially those involving disrobing and manual manipulation of their bodies), or the nature of the interaction with a clinician in general ([33, 34]).

Beyond the lack of association between obesity and quality, it is worth noting that the performance on most indicators was suboptimal. Room for improvement was substantial for at least 8 of the 15 quality indicators in that no more than 50% of applicable visits received appropriate care. These 8 quality indicators are concentrated in the areas of chronic disease management and preventive services. In comparison with our previously published data on the same measures ([9]), improvements in quality since 2002 were modest. The 2007 National

Healthcare Quality Report cites slower quality improvement between 2000 and 2005 compared to modest improvement between 1994 and 2000, with gaps continuing to be most substantial in chronic and preventive care ([35]). These data lend support to the assertion that continuing, meaningful quality improvement requires fundamental reforms of clinical care that will shift the emphasis from acute care to chronic and preventive care, e.g., through implementing a systems approach to patient-centered, collaborative care ([36–38]).

This study has several limitations that should be considered in interpreting its results. First, the NAMCS is a cross-sectional survey, and any statistically significant associations do not imply causation. We provided 95% CIs for all reported statistics to help gauge the size and precision of any observed differences in point estimates. The consistency of the findings in this study indicates their reliability; however, these findings need to be corroborated in future investigations. Second, our findings reflect the rates of obesity-related services and the performance of selected quality indicators in the general US office-based outpatient population only to the extent to which information was accurately reported and coded on the encounter forms. Both over- and under-reporting are possible, and the magnitude of bias is difficult to predict. On the one hand, because the NAMCS data are linked to patient visits rather than individual patients, sicker, more frequent users of outpatient care (e.g., obese patients with co-morbidities requiring continuing medical care) may be over-sampled, and the prevalence of medical conditions (e.g., patients diagnosed with obesity) and the provision and utilization of ambulatory health care services (e.g., obese patients receiving lifestyle counseling) may be overestimated. On the other hand, the per-patient visit basis may be associated with a reduced likelihood of reporting or treatment for patients at any given visit who see physicians more often. Patients lacking diagnoses (e.g., obesity) or services (e.g., lifestyle counseling) at a particular visit may have received those diagnoses and services at another visit. Third, an additional potential limitation closely related to accuracy of the NAMCS data is the quality of height and weight measurements. The proportion of patients whose height and weight were measured at the time of the visit vs. those who had a historic height and weight is unknown and the accuracy of the measurements cannot be verified. Therefore, misclassification of individuals as obese based on height and weight data recorded in NAMCS is possible.

Despite these limitations, the NAMCS is the best data source available to date that captures health care services in office-based ambulatory care settings throughout the U.S. The inclusion of height and weight measurements beginning in 2005 provides a unique opportunity for assessing obesity status and its association with the quality of ambulatory care in this nationally representative survey.

To conclude, the evidence is compelling that obesity is underappreciated in office-based physician practices across the United States. Many opportunities are missed for obesity screening and diagnosis, as well as for the prevention and treatment of obesity and related health risks, regardless of patient and provider characteristics. Quality is equally suboptimal on a number of measures, particularly those of chronic disease management and preventive counseling, for both normal/overweight and obese patients. These findings are not surprising given that the current primary care delivery model continues to lack the structure and organization needed to effectively prevent and manage obesity and many other chronic diseases ([39]). The health care system's acute care orientation, structure of physician visits and reimbursement, and lack of a population health orientation contribute to the neglect of chronic and preventive care. Optimal health care for the growing numbers of Americans with chronic diseases requires both a change in the conceptualization of health care models and in the implementation of health care itself ([36–38]).

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Table 1

Patient and Provider Characteristics and Associations with Height and Weight Measurements

			Measurements (%)[a]				
Characteristics	**Patient Records, No.**	**Estimated Visits, No. in Millions**	**Both**	**Either**	**Neither**	***P* Value[b]**	**Adjusted Odds Ratio (95% CI)[c]**
All adult visits	16574	696	50	37	13		
Patient characteristics							
Gender						0.78	
Female	9464	395	50	37	13		---[d]
Male	7110	300	50	37	13		
Age						0.03	
18–44	4946	208	52	34	14		reference
45–64	6312	263	51	37	12		1.1 (0.9–1.4)
>=65	5316	225	47	39	13		1.3 (1.0–1.7)
Race/ethnicity						0.67	
White	11932	534	50	37	13		
Black	1785	59	53	36	11		---
Hispanic	1949	67	45	43	12		
Other	908	35	56	31	13		
Co-morbidity risk status						0.001	
High risk	4184	149	52	37	11		reference
Moderate risk	9304	410	50	38	12		1.1 (1.0–1.3)
Low risk	3086	137	47	35	17		1.3 (1.0–1.7)
Medical insurance						<.001	
Private	7435	357	52	36	11		Reference
Medicare/Medicaid	6467	254	49	38	13		1.1 (0.9–1.3)
No insurance	2672	86	44	37	20		1.2 (1.0–1.6)
Visit type						0.02	
Preventive care	2313	102	58	31	11		Reference
Treatment visit	14261	594	49	38	13		1.6 (1.3–2.1)
Provider characteristics							
Physician specialty						0.71	
General/family practice	9339	360	51	37	12		---
Internal Medicine	4421	283	48	37	14		
Cardiology	2814	52	48	36	16		

Characteristics	Patient Records, No.	Estimated Visits, No. in Millions	Measurements (%)[a]			*P* Value[b]	Adjusted Odds Ratio (95% CI)[c]
			Both	Either	Neither		
Physician employment status						0.002	
Owner	10334	506	51	34	15		reference
Other (employee, contractor, other)	6240	189	46	44	9		0.9 (0.5–1.4)
Geographic region						0.006	
Midwest	3604	126	43	35	22		reference
Northeast	4017	170	59	31	10		1.7 (1.1–2.7)
South	5556	255	51	38	11		1.6 (1.0–2.4)
West	3397	145	44	43	13		2.0 (1.2–3.4)
Metropolitan statistical area						0.54	---
No	2565	106	46	41	13		
Yes	14009	590	51	36	13		
Office type						0.68	
Private solo or group	13151	627	50	36	13		---
Free-standing clinic	676	40	49	39	12		
Other	2747	29	47	46	7		
Solo practice						0.004	
No	11130	424	48	41	10		reference
Yes	5444	272	52	30	17		1.5 (1.0–2.3)
Practice ownership						<.001	
Physician or physician group	12110	589	51	35	14		Reference
Health maintenance organization	233	12	39	51	10		1.7 (0.5–5.8)
Medical/academic health center	2282	11	59	33	8		0.8 (0.3–2.1)
Other	1949	84	39	52	8		2.2 (1.0–4.1)
Revenue from managed care						0.91	
≤25%	4162	167	54	34	12		---
26–50%	3804	163	48	40	13		
51–75%	2314	114	48	37	16		
>75%	2305	114	46	40	14		
EHR use						0.94	
Yes	4906	204	49	37	14		
No	11668	492	50	37	13		---

[a] Percentages of visits with both height and weight measurements, either but not both measurements, and neither measurement, respectively.

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[b] *P* values based on χ^2 tests

[c] The adjusted odds of lacking height and/or weight measurement. The odds ratio for each characteristic was adjusted for all of the other characteristics included in multiple logistic regression modeling.

[d] Dashes denote patient and provider characteristics that were not included in multiple logistic regression modeling for failing the $P<.10$ selection criterion based on χ^2 tests.

Table 2

Patient and Provider Characteristics and Associations with Obesity Diagnosis and Lifestyle Counseling for Patients with a BMI of 30.0 or greater

Characteristics	Patient Records, No.	Estimated Visits, No. in Millions	Visits with Diagnosis, %	Adjusted Odds Ratio[a] (95% CI)	Visits with Counseling, %	Adjusted Odds Ratio[b] (95% CI)
All visits with BMI ≥ 30.0	3222	134	30		37	
Patient Characteristics						
Gender						
Female	1835	73	34	reference	38	---[c]
Male	1387	61	25	1.5 (1.2–2.0)	35	
Age						
18–44	1000	41	32	---	36	---
45–64	1471	60	30		37	
>=65	751	33	27		37	
Race/ethnicity						
White	2159	100	30		36	
Black	494	16	35	---	37	---
Hispanic	401	14	23		40	
Other	168	5	26		37	
Co-morbidity risk status						
High risk	1046	40	34	reference	46	reference
Moderate risk	1739	75	29	1.3 (1.0–1.7)	34	1.6 (1.2–2.2)
Low risk	437	20	26	1.6 (1.0–2.5)	26	2.4 (1.7–3.5)
Medical insurance						
Private	1531	76	30	---	37	---
Medicare/Medicaid	1105	43	30		38	
No insurance	586	16	30		35	
Visit type						
Preventive care	477	21	26	---	38	---
Treatment visit	2745	113	31		36	
Provider Characteristics						
Physician specialty						
General/family practice	1900	72	30	---	32	reference
Internal medicine	830	53	29		43	0.6 (0.4–0.9)

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Characteristics	Patient Records, No.	Estimated Visits, No. in Millions	Visits with Diagnosis, %	Adjusted Odds Ratio[a] (95% CI)	Visits with Counseling, %	Adjusted Odds Ratio[b] (95% CI)
Cardiology	492	9	34		40	0.9 (0.6–1.5)
Physician employment status						
Owner	1852	99	29	---	37	---
Other (employee, contractor, other)	1370	35	32		37	
Geographic region						
Midwest	531	19	33	reference	44	---
Northeast	961	41	36	1.3 (0.8–2.2)	41	
South	1137	52	25	1.8 (1.2–2.7)	33	
West	593	22	26	1.7 (1.0–2.9)	31	
Metropolitan Statistical Area						
No	470	18	29	---	38	---
Yes	2752	115	30		37	
Office type						
Private solo or group	2376	120	30	---	38	reference
Free-standing clinic	127	9	24		19	2.9 (1.7–4.9)
Other	719	5	33		33	1.2 (0.8–2.0)
Solo practice						
Yes	1075	55	27	---	36	---
No	2147	79	32		38	
Practice ownership						
Physician or physician group	2247	117	29	reference	37	
Health maintenance organization	30	2	42	0.5 (0.2–1.1)	39	---
Medical/academic health center	633	2	35	0.7 (0.5–1.1)	44	
Other	312	13	35	0.9 (0.6–1.3)	33	
Revenue from managed care						
≤25%	884	37	28	reference	39	
26–50%	733	30	27	1.1 (0.6–1.8)	33	
51–75%	371	20	44	0.5 (0.3–0.8)	42	
>75%	401	21	28	0.9 (0.6–1.5)	31	
EHR use						
Yes	932	38	29	---	39	---
No	2290	96	31		36	
Physician diagnosis of obesity						

Characteristics	Patient Records, No.	Estimated Visits, No. in Millions	Visits with Diagnosis, %	Adjusted Odds Ratio[a] (95% CI)	Visits with Counseling, %	Adjusted Odds Ratio[b] (95% CI)
Yes	1012	40	N/A[d]	N/A	55	reference
No	2210	94	N/A	N/A	29	3.3 (2.0–5.0)

[a] The adjusted odds of not being diagnosed with obesity.

[b] The adjusted odds of not being counseled for diet, exercise or weight reduction.

[c] Dashes denote patient and provider characteristics that were not included in multiple logistic regression modeling for failing the $P<.10$ selection criterion based on χ^2 tests.

[d] Estimates not applicable.

Table 3

Indicator Performance by obesity status

Indicator	All visits	Obese(BMI ≥ 30.0)	Normal/Overweight (BMI 18.5–29.9)	Obesity Status Undetermined	
				Missing height or weight	Missing both height and weight
Medical Management of Chronic Diseases					
Antithrombotic therapy for AF	67 (61–74)	67 (46–88)	69 (59–79)	72 (63–81)	53 (35–71)
ACE inhibitor use for CHF	44 (38–50)	55 (43–68)	39 (29–50)	47 (40–54)	24 (15–34)[a]
Aspirin use for CAD	54 (50–58)	56 (49–63)	57 (50–63)	56 (49–62)	37 (27–47)[a]
Beta Blocker use for CAD	48 (45–52)	50 (43–58)	54 (47–60)	47 (42–51)	33 (23–44)[a]
Diuretic use for HTN	43 (40–46)	45 (39–50)	41 (36–46)	45 (41–48)	41 (30–52)
IC use for asthma in adults	31 (26–36)	30 (22–38)	30 (21–40)	33 (26–41)	31 (19–43)
Statin use for hyperlipidemia	38 (35–41)	40 (35–45)	39 (33–44)	39 (35–44)	27 (19–35)[a]
Treatment of Depression	51 (47–54)	48 (41–55)	50 (44–57)	52 (46–57)	51 (40–62)
Appropriate Antibiotic Use					
TMP-SMX use for UTI	70 (61–79)	61 (44–79)	61 (50–71)	73 (61–85)	---[b]
No antibiotic use for URTI	71 (63–80)	56 (37–75)	83 (70–96)	70 (58–83)	65 (41–89)
Preventive Services					
Smoking cessation counseling	33 (25–41)	46 (32–61)	32 (19–44)	31 (17–45)	---
Blood pressure check	93 (90–95)	98 (97–100)	98 (97–99)	97 (95–99)	54 (39–69)[a]
No routine EKG	85 (81–89)	80 (73–87)	81 (73–89)	92 (85–98)	90 (83–98)
No routine urinalysis	88 (82–94)	89 (71–106)	93 (90–96)	83 (72–94)	---
No routine CBC	50 (39–61)	50 (22–79)	44 (30–58)	50 (34–67)	---

Abbreviations: ACE, angiotensin-converting enzyme; AF, atrial fibrillation; BMI, body mass index; CAD, coronary artery disease; CBC, complete blood count; CHF, chronic heart failure; ECG, electrocardiography; HTN, hypertension; IC, inhaled corticosteroid; TMP-SMX, trimethoprim-sulfamethoxazole; URTI, upper respiratory tract infection; UTI, urinary tract infection.

[a] Denotes statistically significant differences in indicator performance, compared with visits with height and/or weight measurement, after controlling for patient and physician characteristics associated with measurements of height and weight at $P<.10$ based on χ^2 tests (patient age, risk of obesity co-morbidities, medical insurance, visit type, physician employment status, region of practice location, solo practice status, and practice ownership).

[b] Dashes denote estimates that are suppressed for reporting due to a large (≥30%) relative standard error or a small sample size (<30 sample cases).