Quality of Care Among Obese Patients

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Context Clinicians often have negative attitudes toward obesity and express dissatisfaction in caring for obese patients. Moreover, obese patients often feel that clinicians are biased or disrespectful because of their weight. These observations raise the concern that obese patients may receive lower quality of care.

Objective To determine whether performance on common outpatient quality measures differs by patient weight status.

Design, Setting, and Participants Eight different performance measures were examined in 2 national-level patient populations: (1) Medicare beneficiaries (n=36 122) using data from the Medicare Beneficiary Survey (1994-2006); and (2) recipients of care from the Veterans Health Administration (VHA) (n=33 550) using data from an ongoing performance-evaluation program (2003-2004).

Main Outcome Measures Performance measures among eligible patients for diabetes care (eye examination, glycated hemoglobin [HbA_{1c}] testing, and lipid screening), pneumococcal vaccination, influenza vaccination, screening mammography, colorectal cancer screening, and cervical cancer screening. Measures were based on a combination of administrative claims, survey, and chart review data.

Results We found no evidence that obese or overweight patients were less likely to receive recommended care relative to normal-weight patients. Moreover, success rates were marginally higher for obese and/or overweight patients on several measures. The most notable differentials were observed for recommended diabetes care among Medicare beneficiaries: comparing obese vs normal-weight patients with diabetes, obese patients were more likely to receive recommended care on lipid screening (72% vs 65%; odds ratio, 1.37 [95% confidence interval, 1.09-1.73]) and HbA_{1c} testing (74% vs 62%; odds ratio, 1.73 [95% confidence interval, 1.41-2.11]). All analyses were adjusted for sociodemographic factors, health status, clinical complexity, and visit frequency.

Conclusions Among samples of patients from the Medicare and VHA populations, there was no evidence across 8 performance measures that obese or overweight patients received inferior care when compared with normal-weight patients. Being obese or overweight was associated with a marginally higher rate of recommended care on several measures.

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PRIOR STUDIES SHOW THAT CLINIcians openly admit to negative attitudes toward obese patients, and many express dissatisfaction in caring for obese patients.[1,2] For example, a study of family physicians found that one-third of respondents named obesity as a patient characteristic arousing a feeling of discomfort, reluctance, or dislike.[3] Other studies have suggested that many clinicians prefer not to manage obesity or obese patients, find it awkward or unpleasant, have low expectations for success, or do not find it gratifying or professionally rewarding.[1,2] Moreover, these findings generally concur with patient perceptions.[2] A study of overweight and obese women found that 52% reported experiencing weight-related stigma from a physician on multiple occasions and that physicians are one of the most commonly reported sources of weight bias.[4]

These observations raise the possibility that obese patients may experience lower quality of care. The evidence on weight-related disparities in quality of care, however, is mixed. Prior research has focused on cancer screening, primarily for women. Although several studies have found that obese women report lower rates of Papanicolaou tests and mammography, others have failed to find such disparities.[5-10] Findings are also mixed for colorectal cancer (CRC) screening.[9-13] Prior research, however, relies exclusively on self-reported receipt of care or is limited to small, local samples. Furthermore, less is known about whether there are disparities in more general aspects of care (eg, vaccinations and the management of diabetes and cardiovascular risk factors) and how obesity might influence care among men. Some studies, for example, have found disparities among both sexes for CRC screening.[11,13]

In this study, we examined whether quality of care differs by patient weight status using an array of common outpatient quality measures pertaining to both men and women. We incorporated measures that do not rely on patient self-reports and examined analogous indices of quality across 2 large and important US patient populations—Medicare beneficiaries and recipients of care from the Veterans Health Administration (VHA).

METHODS

Data Sources

Medicare Beneficiaries. We used data from the Medicare Current Beneficiary Survey (MCBS), which is linked to Medicare enrollment and claims files. The MCBS is a continuous in-person survey

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of nationally representative samples of the Medicare population sponsored by the Centers for Medicare & Medicaid Services (CMS) and is designed to reflect the use of health services, health insurance coverage, sources of payment, and health status. The survey uses a 4-year rotating panel design wherein a new sample is added each year to replenish the overall sample. We use data from 1994-2006 and pool data on new entrants across multiple years of the survey, essentially creating an overall sample of repeated cross sections that are nationally representative of the Medicare population.

Veterans Health Administration. VHA data combine 3 different national sources: (1) the Performance Measurement System and External Peer Review Program (EPRP); (2) the Survey of Healthcare Experiences of Patients (SHEP); and (3) VHA administrative claims data. The EPRP data provide information on quality of care delivered within the VHA. These data are based on chart abstraction and are routinely collected by the VHA to measure and monitor quality of care nationwide. They have also been used to compare the quality of care provided by the VHA to that supported by the Medicare system.[14] The SHEP data are a survey of veterans' health care experiences that contain sociodemographic variables not available in EPRP data. We used data from fiscal years 2003 and 2004, which are years when individuals in the EPRP sample were also administered the SHEP.

Quality-of-Care Measures

We used process-based measures to study how obesity is associated with quality of care. These measures focused on clinicians' actions and specified populations of patients for whom specific actions were indicated over a certain time interval by established guidelines. We considered 8 different quality measures for common outpatient preventive services relating to diabetes management, adult vaccinations, and cancer screening. Individual measures, time intervals for receipt of care, and eligibility criteria are shown in TABLE 1. Seven of the 8 quality measures were examined in both the Medicare and VHA samples. Cervical cancer screening with a Papanicolaou test was restricted to the VHA sample. We did not consider Papanicolaou tests in the Medicare sample because of uncertainty surrounding the benefits of continued screening in patients older than 65 years.[15]

We used measures in which eligibility for receipt of recommended care did not depend on weight status. For example, all patients with diabetes should have their HbA_{1c} level monitored at least once a year, regardless of whether or not they are obese. We used process- rather than outcomes-based measures because obesity and its comorbidities may have a direct physiological effect on outcomes.

Medicare Sample. We restricted the Medicare sample to beneficiaries aged 65 years and older who were not residing in care facilities. Quality measures were constructed from either Medicare claims linked to the MCBS respondents or survey data, depending on which source was considered more valid based on prior research. When claims data were used, individuals were excluded for health maintenance organization participation, breaks in Medicare coverage, death, or dropout over the period under consideration for a specific measure to ensure complete follow-up with respect to Medicare claims.

We assessed diabetes care quality using 3 process measures that are consistent with performance standards developed by the Diabetes Quality Improvement Project: eye examination, lipid screening, and glycated hemoglobin (HbA_{1c}) testing.[16] These measures also correspond to those used by CMS to monitor quality of diabetes care among Medicare beneficiaries.[17] In keeping with prior studies on diabetes care quality, all measures were assessed using Medicare claims data.[17-19] Patients with diabetes were identified by self-reported data, which has high validity and has been used as a criterion standard in validating other approaches to detection.[20]

We used self-reported data to assess receipt of influenza and pneumococcal vaccinations. Throughout the period covered in our sample, the Centers for Disease Control and Prevention has recommended that adults aged 65 years and older be vaccinated annually for influenza and at least once for pneumococcus.[21,22] Self-reported vaccination is highly sensitive and moderately specific compared with medical records.[23] We did not use claims data for these measures because influenza vaccinations are often delivered without a Medicare claim[17] and because MCBS respondents have only 4 years of claims available, which is insufficient for determining pneumococcal immunization status.

For cancer screening, we examined mammography and colorectal cancer (CRC) screening. In keeping with prior studies of the Medicare population, we used claims data to assess receipt of mammography.[17,19,24] Claims data perform well in this context,[25] whereas self-reports for mammography are relatively less specific.[26,27] For CRC screening, we used self-reported MCBS data. Unlike mammography, the performance characteristics of claims-based measures of CRC screening are largely unknown[28] and survey data can yield good sensitivity and specificity.[29] The MCBS asked about receipt of "sigmoidoscopy or colonoscopy" because validation studies have shown that respondents have difficulty distinguishing between these procedures.[29] The MCBS also asked about fecal occult blood testing but did not ask about barium enema.

VHA Sample. All quality measures for the VHA sample were based on EPRP chart abstraction, which is considered the most valid and reliable source of systematic performance measurement within the VHA. The EPRP provides individual-level data on whether patients who are eligible for specific quality measures receive recommended care. The VHA-defined criteria for eligibility and success on each quality measure are shown in Table 1. To be eligible for inclusion in the EPRP, a patient must be continuously enrolled in the VHA for 2 years and have a qualifying visit in the previous 12 months. Random samples from this co-

hort were selected monthly from each facility. The VHA further excluded patients if they had cancer of the liver, esophagus, or pancreas; were enrolled in a hospice program; or if they had a life expectancy of less than 6 months documented. Additional detail on EPRP eligibility and review criteria is available elsewhere.[30]

Weight Status

Weight categories were based on body mass index (BMI, [calculated as weight in kilograms divided by height in meters squared]) and defined according to standard guidelines: underweight (BMI<18.5), normal weight (BMI, 18.5-24.9), overweight (BMI, 25.0-29.9), and obese (BMI≥30).[31] For Medicare beneficiaries, BMI was based on self-reported height and weight assessed during the baseline MCBS interview. For the VHA population, however, BMI was based on measured height and weight collected with each EPRP chart abstraction.

Clinical Complexity and Visit Frequency

Obese patients may have more medical problems. Although clinical complexity may crowd out success on individual performance measures, recent research suggests that clinically complex patients are more likely to receive recommended care.[32,33] A greater frequency of office visits also increases the likelihood that recommended care is performed[32] and obesity is positively associated with visit frequency.[6] To capture each patient's clinical complexity, we used the Diagnostic Cost Groups-Hierarchical Condition Categories (DCG-HCC) system, which uses diagnoses (*International Classification of Diseases, Ninth Revision, Clinical Modification*) codes to summarize patients' medical problems into a score.[34] We generated a complexity score for each patient using all inpatient and outpatient claims over a 1-year period coinciding with performance measurement. Visit frequency was based on outpatient visits detected in claims data and was also tabulated for a 1-year period coinciding with performance measurement. For each of these variables, we assigned patients into quartiles that were specific to the sample for each quality measure. Our analyses were not sensitive to the use of finer percentile categories. TABLE 2 dis-

Table 1. Process-Based Measures of Quality

	Medicare Beneficiaries[a]			Veterans Health Administration[b]	
Process Measure	Interval, y	Eligibility	Source	Interval, y	Eligibility
Diabetes					
Eye examination	2	Diabetes	*CPT* codes: 92002-14, 92225, 92250; *ICD-9-CM* codes: 95.02-3, 95.11, V72.0, V80.2	2 if any 2 of the following: not using insulin, HbA_{1c} <8% (past y), normal eye examination (past 2 y); otherwise 1	Diabetes
Lipid screening	2	Diabetes	*CPT* code 80061 (lipid panel) or the following set: 82465 (total cholesterol), 83718 (HDL-C), and 84478 (triglycerides)	2	Diabetes
HbA_{1c} testing	1	Diabetes	*CPT* code: 83036	1	Diabetes
Adult vaccinations					
Pneumococcal	Ever	All	MCBS	Ever	Aged ≥65 y or cardiomyopathy, heart failure, prior myocardial infarction, diabetes mellitus, chronic obstructive pulmonary disease, sickle cell disease, or splenectomy
Influenza	1	All	MCBS	1	Aged ≥65 y or cardiopulmonary disease, metabolic disease, hemoglobinopathy, renal disease, immunosuppression, or second-/third-trimester pregnancy
Cancer screenings					
Mammography	2	Women without history of breast cancer	*CPT* codes: 76090-2; *ICD-9-CM* code: 87.37	2	Women aged 52-69 y without history of bilateral mastectomy
Colorectal cancer	FOBT, 1; or endoscopy, 5	No history of colon cancer	MCBS	FOBT, 1; sigmoidoscopy, 5; or colonoscopy, 10	Aged 52-80 y
Papanicolaou test[c]				3	Women aged <65 y without history of hysterectomy

Abbreviations: *CPT, Current Procedural Terminology*; FOBT, fecal occult blood test; HbA_{1c}, hemoglobin (glycated) A_{1c}; HDL-C, high-density lipoprotein cholesterol; *ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification*; MCBS, Medicare Current Beneficiary Survey.
[a] Beneficiaries aged 65 years or older.
[b] Source for all Veterans Health Administration measures is External Peer Review Program chart abstraction.
[c] Papanicolaou test was not considered for the Medicare sample because of uncertainty about the benefits of screening in patients older than 65 years.

plays the data sources for variables included in our analyses.

Statistical Analyses

We examined the association between quality of care and weight status using logistic regression models with receipt of the measured care process as the dependent variable and weight status categories as independent variables. We estimated a separate model for each of the 8 process measures including only patients who were eligible for a given measure. All models were adjusted for age, sex (where applicable), race/ethnicity, education, income, marital status, self-rated health, quartile of clinical complexity, quartile of visit frequency, and year. Age and year were modeled as continuous variables and all models included a squared term for age. Other covariates were modeled with categorical indicators as shown in TABLE 3. Race/ethnicity was based on self-report. Income categories were guided by those available in the survey data for each sample. Treating year as a categorical variable in the Medicare data did not substantively change our findings. Data for each variable was missing for 3% or less of individuals with the exception of income, which was missing for 4.1% in the Medicare sample and 7.7% in the VHA sample. Individuals with missing data were excluded from analyses.

Statistical testing was 2-sided and $P < .05$ was considered statistically significant. Power calculations showed that the minimum detectable difference in success rates between normal-weight and obese patients ranged from 2 to 4 percentage points for our outcomes with the exception of diabetes care and CRC screening in the Medicare sample, and mammography and Papanicolaou tests in the VHA sample, where the difference ranged from 5 to 7 percentage points (80% power).

We reported odds ratios (ORs) for the receipt of care for obese and overweight individuals relative to normal-weight individuals from our logistic regression models. Given that success on our process measures is common, ORs can overstate relationships, so we also reported the adjusted proportion receiving recommended care for each weight category. Proportions were computed from logistic regression models with all covariates held at mean values. Analyses of MCBS data accounted for survey design and sampling weights. Analyses of EPRP data included a random effect to account for clustering within 21 geographically based service networks that collectively cover the nation. Analyses throughout were conducted with STATA version 11.0 (StataCorp LP, College Station, Texas).

Table 2. Data Sources

Variable	Source of Data	
	Medicare	VHA
Quality measures	Medicare claims and MCBS	EPRP
Weight status	MCBS	EPRP
Sociodemographics (eg, race/ethnicity, education, income)	MCBS	SHEP
Self-rated health	MCBS	SHEP
Clinical complexity	Medicare claims	VHA claims
Visit frequency	Medicare claims	VHA claims

Abbreviations: EPRP, External Peer Review Program; MCBS, Medicare Current Beneficiary Survey; SHEP, Survey of Healthcare Experiences of Patients; VHA, Veterans Health Administration.

Table 3. Sample Characteristics

Variable	% [a]	
	Medicare [b] (n = 36 122) [c]	VHA (n = 33 550) [c]
Age, mean (IQR), y	73.8 (68-79)	68.4 (60-77)
BMI [d]		
Underweight (<18.5)	2.9	1.1
Normal (18.5-24.9)	39.4	21.7
Overweight (25.0-29.9)	37.8	38.2
Obese (≥30)	19.9	39.0
Male sex	42.7	81.9
Race/ethnicity		
Non-Hispanic white	83.9	85.3
Non-Hispanic black	7.2	7.8
Hispanic	5.5	3.5
Other	3.4	3.5
Education		
<High school	32.3	21.6
High school graduate	31.2	33.0
Some college	20.1	28.5
College graduate	16.3	17.0
Annual income, $		
MCBS ≤$25 000/VA ≤$15 000	59.3	39.6
MCBS $25 000-$50 000/VA $15 000-$30 000	32.4	40.7
MCBS >$50 000/VA $30 000-$60 000	8.2	16.0
VA >$60 000		3.6
Married	57.4	61.1
Self-rated health fair/poor	23.1	54.0
Clinical complexity score, mean (IQR) [e]	0.8 (0.1-0.9)	0.7 (0.2-0.9)
Charlson comorbidity index, mean (IQR) [f]	1.4 (0-2)	2.0 (1-3)
1-Year visit frequency, mean (IQR)	6.7 (2-9)	9.2 (3-12)

Abbreviations: BMI, body mass index; IQR, interquartile range; MCBS, Medicare Current Beneficiary Survey; VHA, Veterans Health Administration.
[a] Values are reported as percents unless otherwise indicated.
[b] Medicare data reflect MCBS sampling weights.
[c] Overall sample of individuals eligible for at least 1 quality measure.
[d] Calculated as weight in kilograms divided by height in meters squared.
[e] Minimum to maximum values for clinical complexity score: 0.0 to 23.1 (Medicare); 0.0 to 15.6 (VHA).
[f] Minimum to maximum values for Charlson comorbidity index: 0 to 18 (Medicare); 0 to 17 (VHA).

Some quality measures may be inappropriate in patients with limited life expectancy. Although the EPRP excluded patients with a short life expectancy, we repeated analyses on both the VHA and Medicare samples excluding individuals with a high Charlson comorbidity score (>5), indicating a high predicted probability of death.[35] Lastly, we tested the inclusion of interactions between weight status and sex as well as race/ethnicity. The influence of weight status may vary by sex,[12] and some studies on mammography and Papanicolaou tests suggest that disparities may exist predominately among whites.[7,8]

The University of Pennsylvania institutional review board granted an exemption for the portion of the study using MCBS data, and the Philadelphia VA Medical Center institutional review board approved the portion using VHA data.

RESULTS

Table 3 displays the characteristics of patients in the Medicare (n=36 122) and VHA (n=33 550) samples eligible for at least 1 quality measure. The prevalence of obesity was higher in the VHA data (39%) relative to Medicare (20%), and the distribution across weight categories was generally consistent with prior estimates in both of these populations.[36,37]

TABLE 4 shows the proportion of individuals receiving recommended care for each quality measure among all eligible individuals and subdivided by weight status category. Performance success was higher in the VHA than Medicare for all measures, and these differences are in keeping with prior research.[14]

TABLE 5 shows the relationship between receipt of recommended care and weight status based on multivariate logistic regression models adjusting for covariates. Across all measures in both the Medicare and VHA samples, there was no instance in which obese or overweight individuals were estimated to have significantly lower odds of recommended care relative to normal-weight individuals. Moreover, these groups often had higher estimated odds of care and the increase in odds from normal, to overweight, to obese sometimes exhibited a monotonic pattern.

Table 5 also shows the adjusted proportion (percentage) of individuals receiving recommended care for each weight category. Success rates on these measures are high, so relative risks are notably lower than their corresponding ORs and suggest that although these differences are statistically significant, success rates were, for the most part, only marginally higher for obese and/or overweight individuals relative to normal-weight individuals.

The largest differentials in care were seen for lipid and HbA_{1c} testing among Medicare beneficiaries with diabetes. Here, the adjusted success rates for obese vs normal-weight individuals with diabetes were 72% vs 65% (OR, 1.37; 95% CI, 1.09-1.73) for lipid screening (at least once over a 2-year interval), and 74% vs 62% (OR, 1.73; 95% CI, 1.41-2.11) for HbA_{1c} testing (at least once over a 1-year interval). Comparing overweight vs normal-weight individuals, these differences were 72% vs 65% (OR, 1.37; 95% CI, 1.09-1.71) for lipid screening, and 68% vs 62% (OR, 1.29; 95% CI, 1.07-1.55) for HbA_{1c} testing. The obese and overweight groups also had significant and positive associations with lipid screening and HbA_{1c} testing in the VHA sample, but differences in the adjusted percentages were far more modest with high success rates among all groups.

We also found ORs that were significant and greater than 1 for the obese and overweight categories on the vaccination measures, and the adjusted percentages indicate that success rates were marginally higher among these patients compared with normal-weight patients. For example, the adjusted success rates on the pneumococcal measure for obese vs normal-weight Medicare beneficiaries were 53% vs 49% (OR, 1.17; 95% CI, 1.09-1.26).

There was no evidence in either the Medicare or VHA sample suggesting that obese patients received inferior care

Table 4. Unadjusted Receipt of Recommended Care Among Eligible Individuals

	% Receiving Care (No. Eligible)									
	Medicare (1994-2006)[a]					VHA (2003-2004)				
Quality Measure	All	Under-weight	Normal Weight	Overweight	Obese	All	Under-weight	Normal Weight	Overweight	Obese
Diabetes										
Eye examination	62.0 (3580)	78.8 (31)	63.2 (911)	59.9 (1417)	63.2 (1221)	78.6 (10 197)	84.6 (26)	76.9 (1326)	79.0 (3416)	78.7 (5429)
Lipid screening	68.1 (3580)	50.8 (31)	60.4 (911)	67.3 (1417)	74.5 (1221)	95.4 (10 197)	92.3 (26)	93.1 (1326)	95.1 (3416)	96.2 (5429)
HbA_{1c} testing	66.9 (4232)	49.3 (47)	59.4 (1127)	65.2 (1655)	74.5 (1403)	94.5 (10 196)	96.2 (26)	91.8 (1325)	94.1 (3417)	95.5 (5428)
Adult vaccinations										
Pneumococcal	49.5 (32 266)	46.4 (1085)	48.3 (13 501)	50.3 (11 947)	50.9 (5733)	87.2 (28 337)	83.7 (301)	87.3 (6269)	87.8 (11 044)	86.6 (10 723)
Influenza	65.7 (33 071)	61.5 (1125)	65.0 (13 837)	66.9 (12 236)	65.8 (5837)	74.7 (19 240)	66.1 (180)	74.1 (4104)	75.2 (7506)	74.7 (7450)
Cancer screenings										
Mammography	53.4 (12 159)	30.9 (465)	52.1 (5334)	56.5 (3980)	54.7 (2380)	85.7 (2832)	74.4 (39)	83.0 (571)	86.0 (748)	87.0 (1474)
CRC[b]	51.7 (8314)	37.7 (217)	51.0 (3258)	52.6 (3114)	52.7 (1725)	72.5 (29 550)	59.0 (310)	70.9 (6520)	74.4 (11 589)	71.9 (11 131)
Papanicolaou test[c]						91.4 (2698)	85.3 (34)	89.9 (585)	93.6 (764)	91.0 (1315)

Abbreviations: CRC, colorectal cancer; HbA_{1c}, hemoglobin (glycated) A_{1c}; MCBS, Medicare Current Beneficiary Survey; VHA, Veterans Health Administration.
[a] Medicare data reflect MCBS sampling weights.
[b] CRC screening for Medicare is based on 2000, 2003, and 2005 data only.
[c] Papanicolaou test was not considered for the Medicare sample because of uncertainty about the benefits of screening in patients older than 65 years.

on any of the 3 measures of cancer screening. Moreover, overweight patients had significantly higher odds of care in some instances, with marginally higher adjusted success rates relative to normal-weight patients.

Estimated ORs for the obese group are less than 1 for diabetes eye examination, mammography, and CRC screening in the Medicare sample. Although the corresponding differences in the adjusted success rates (between

Table 5. Logistic Regression Models for Receipt of Recommended Care Among Eligible Individuals[a]

	Medicare Beneficiaries				VHA Care Recipients			
Quality Measure	Underweight	Normal Weight	Overweight	Obese	Underweight	Normal Weight	Overweight	Obese
Diabetes eye examination								
No. eligible		3580				10 197		
OR	2.65	1.0 [Reference]	0.91	0.96	1.64	1.0 [Reference]	1.12	1.04
95% CI	1.04-6.72		0.74-1.12	0.77-1.19	0.54-5.05		0.95-1.31	0.89-1.21
P value	.04		.39	.69	.39		.17	.65
Adjusted percentage[b]	83	64	62	63	86	79	81	80
Diabetes lipid screening								
No. eligible		3580				10 197		
OR	1.13	1.0 [Reference]	1.37	1.37	1.00	1.0 [Reference]	1.33	1.57
95% CI	0.39-3.23		1.09-1.71	1.09-1.73	0.22-4.60		1.02-1.75	1.20-2.05
P value	.83		.006	.007	.997		.04	.001
Adjusted percentage[b]	68	65	72	72	95	95	96	97
Diabetes HbA_{1c} testing								
No. eligible		4232				10 196		
OR	0.78	1.0 [Reference]	1.29	1.73	2.25	1.0 [Reference]	1.36	1.59
95% CI	0.39-1.56		1.07-1.55	1.41-2.11	0.29-17.45		1.06-1.74	1.24-2.03
P value	.48		.009	<.001	.44		.02	<.001
Adjusted percentage[b]	56	62	68	74	97	94	95	96
Pneumococcal vaccination								
No. eligible		32 266				28 337		
OR	0.92	1.0 [Reference]	1.12	1.17	0.76	1.0 [Reference]	1.13	1.26
95% CI	0.80-1.07		1.05-1.19	1.09-1.26	0.54-1.06		1.03-1.25	1.14-1.39
P value	.28		<.001	<.001	.10		.01	<.001
Adjusted percentage[b]	47	49	52	53	84	87	89	90
Influenza vaccination								
No. eligible		33 071				19 240		
OR	0.86	1.0 [Reference]	1.14	1.16	0.69	1.0 [Reference]	1.09	1.18
95% CI	0.74-1.00		1.07-1.21	1.08-1.26	0.49-0.96		1.00-1.20	1.07-1.29
P value	.05		<.001	<.001	.03		.05	.001
Adjusted percentage[b]	64	67	70	70	66	74	76	77
Mammography								
No. eligible		12 159				2832		
OR	0.50	1.0 [Reference]	1.13	0.98	0.73	1.0 [Reference]	1.19	1.28
95% CI	0.39-0.65		1.02-1.25	0.87-1.11	0.33-1.62		0.87-1.63	0.97-1.69
P value	<.001		.02	.79	.44		.28	.08
Adjusted percentage[b]	32	48	51	48	81	85	87	88
CRC screening								
No. eligible		8314				29 550		
OR	0.67	1.0 [Reference]	0.98	0.98	0.64	1.0 [Reference]	1.12	1.02
95% CI	0.49-0.92		0.88-1.10	0.86-1.12	0.51-0.81		1.04-1.20	0.95-1.09
P value	.01		.77	.78	<.001		.002	.67
Adjusted percentage[b]	42	51	51	51	62	72	74	72
Papanicolaou test[c]								
No. eligible						2698		
OR					0.76	1.0 [Reference]	1.57	1.08
95% CI					0.27-2.13		1.05-2.35	0.77-1.52
P value					.60		.03	.66
Adjusted percentage[b]					89	92	95	92

Abbreviations: CI, confidence interval; CRC, colorectal cancer; HbA_{1c}, hemoglobin (glycated) A_{1c}; OR, odds ratio; VHA, Veterans Health Administration.
[a] All models were adjusted for age, sex (where applicable), race/ethnicity, education, income, marital status, self-rated health, clinical complexity, visit frequency, and year.
[b] Adjusted percentages indicate the adjusted proportion receiving recommended care for each weight category.
[c] Papanicolaou test was not considered for the Medicare sample because of uncertainty about the benefits of screening in patients older than 65 years.

obese and normal weight) are below our thresholds for detecting statistical significance, they are limited to 0 to 1 percentage points.

Higher subcategories of obesity (class II [BMI, 35.0-39.9] and class III [BMI≥40]) similarly did not have significantly lower odds of care and frequently had higher odds of care relative to the normal-weight category. As expected, the ORs comparing obese with normal-weight patients were sometimes slightly higher in models excluding adjustments for visit frequency and clinical complexity. Sensitivity analyses excluding all individuals estimated to have a high probability of death did not meaningfully change our results. Lastly, allowing weight status to interact with sex and race also did not change these patterns in any meaningful fashion (ie, sex and race did not appear to modify the association between weight status and quality of care).

COMMENT

Although prior research has raised the possibility that obese patients may receive lower quality of care, we found no evidence that obese or overweight patients are less likely to receive recommended care than normal-weight patients. Our results are consistent across 8 different performance measures and across large samples from both the Medicare and VHA populations.

Indeed, we found that a higher BMI was associated with higher odds of receiving care for several measures. In both the Medicare and VHA populations, obese and overweight groups had higher odds of lipid screening and HbA_{1c} testing among patients with diabetes. In addition, we found higher odds of vaccination among overweight and obese patients in both populations, as well as higher odds of mammography among overweight Medicare beneficiaries and higher odds of CRC and cervical cancer screening among overweight VHA patients.

Because underlying success rates for these measures were generally high, differences in the adjusted proportion receiving recommended care were relatively small for several measures, potentially limiting the practical significance of such differences. An exception is that among Medicare beneficiaries with diabetes, obese patients had a notably higher rate of recommended lipid screening and HbA_{1c} testing relative to normal-weight patients. Within the VHA, where overall success rates are very high on these and other measures, our findings confirmed that obese patients were, in the very least, comparable recipients of high quality of care.

Prior research on Papanicolaou tests and mammography relied almost exclusively on self-reported receipt of care, which is subject to systematic reporting error. For example, obese patients who feel that physicians are negatively biased may also have a greater tendency to underreport care. Our measures for these quality indicators were based on either chart abstraction or claims data, minimizing potential bias from patient self-reporting. Moreover, to our knowledge this study is the first to use either claims or medical record data to examine the association between obesity and quality of care in nationally representative populations. Of 15 quality measures between the 2 samples however, we used self-reported data for 3: pneumococcal vaccination, influenza vaccination, and CRC screening in the Medicare sample. Nevertheless, all 3 self-reported measures were paired with a version based on chart review in the VHA sample and the similarity of findings lends confidence to our conclusions.

With respect to cancer screening, our findings may also differ from some previous studies because our samples were on average older. Although we cannot speak to the existence of disparities in a younger, general population, we targeted an age range that is disproportionately affected by cancer and the complications of diabetes, pneumonia, and influenza. One prior study found that obese patients were less likely to receive an influenza vaccination.[8] A recent study in a multinational European sample, however, found that obese patients were more likely to be vaccinated,[9] consistent with our findings in 2 different US populations.

Our findings are in keeping with recent research showing that the gap between obese and normal-weight individuals has narrowed over time for cardiovascular mortality and for risk factors such as high cholesterol.[38,39] Obese and normal-weight patients alike have benefitted from improved treatments and risk factor modification, and a narrowing of such disparities could be driven solely by the fact that the obese group had a higher baseline prevalence of disease and, hence, experienced larger improvements over time. Our study examined processes of care, offering a preliminary assessment as to whether clinicians are actually more aggressive with obese patients in risk factor modification. Our findings for lipid and glucose monitoring in the Medicare population with diabetes are consistent with the possibility that these health gaps may have narrowed, in part, because of extra attention given to cardiovascular risk factor modification among obese patients.

This study has limitations. First, we measured success along 8 specified indicators for the quality of preventive health care. Although these indicators reflect common conditions and needs, there is much more to health care quality than what these indicators reflect, and obese patients may have experienced inferior care along other dimensions of medical care.

Second, successes and failures along these measures reflect the contributions of patients as well as clinicians, and we cannot be sure what factors explain observed differences in the receipt of care.

Third, height and weight were self-reported in the MCBS data. Studies have shown, however, that self-reported and measured height and weight are highly correlated among older individuals, likely due to diminished cultural pressures.[40] Moreover, findings in the Medicare sample were similar to those in the VHA sample, in which height and weight were measured.

Lastly, it is important to note that our findings may not be generalizable to quality of care in younger populations, in which the stigma and stereo-

types associated with obesity may be more salient.

Although the prevention of obesity is considered a public health priority, the majority of US adults are already overweight or obese, so it is equally vital to ensure that these patients receive equitable and effective treatment. We found no evidence in 2 large and important US patient populations that obese and overweight patients receive lower quality of care than normal-weight patients on common preventive services. To the contrary, being obese or overweight was associated with marginally higher rates of recommended care for several measures. While it may be true that physicians often harbor negative attitudes toward obesity, such attitudes may not be borne out in lower quality of care.

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Study concept and design: Chang, Asch, Werner.
Acquisition of data: Chang.
Analysis and interpretation of data: Chang, Asch, Werner.
Drafting of the manuscript: Chang.
Critical revision of the manuscript for important intellectual content: Chang, Asch, Werner.
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