

SPECIAL ARTICLE

# Use of High-Cost Operative Procedures by Medicare Beneficiaries Enrolled in For-Profit and Not-for-Profit Health Plans

Eric C. Schneider, M.D., Alan M. Zaslavsky, Ph.D.,  
and Arnold M. Epstein, M.D.

## ABSTRACT

### BACKGROUND

It is widely believed that for-profit health plans are more likely than not-for-profit health plans to respond to financial incentives by restricting access to care, especially access to high-cost procedures. Until recently, data to address this question have been limited.

### METHODS

We tested the hypothesis that the rates of use of 12 common high-cost procedures would be lower in for-profit health plans than in not-for-profit plans. Using standardized Medicare HEDIS data on 3,726,065 Medicare beneficiaries 65 years of age or older who were enrolled in 254 health plans during 1997, we compared for-profit and not-for-profit plans with respect to rates of cardiac catheterization, coronary-artery bypass grafting, percutaneous transluminal coronary angioplasty, carotid endarterectomy, reduction of femur fracture, total hip replacement, total knee replacement, partial colectomy, open cholecystectomy, closed cholecystectomy, hysterectomy, and prostatectomy. We adjusted the comparisons for sociodemographic case mix and for characteristics of the health plans other than their tax status, including the plans' location.

### RESULTS

The rates of carotid endarterectomy, cardiac catheterization, coronary-artery bypass grafting, and percutaneous transluminal coronary angioplasty were higher in for-profit health plans than they were in not-for-profit health plans; the rates of use of other common costly operative procedures were similar in the two types of plan. After adjustment for enrollee case mix and other characteristics of the plans, the for-profit plans had significantly higher rates than the not-for-profit plans for 2 of the 12 procedures we studied and had lower rates for none. The geographic locations of the health plans did not explain these findings.

### CONCLUSIONS

Contrary to our expectations about the likely effects of financial incentives, the rates of use of high-cost operative procedures were not lower among beneficiaries enrolled in for-profit health plans than among those enrolled in not-for-profit health plans.

From the Department of Health Policy and Management, Harvard School of Public Health (E.C.S., A.M.E.); the Section on Health Policy, Division of General Medicine, Brigham and Women's Hospital (E.C.S., A.M.E.); and the Department of Health Care Policy, Harvard Medical School (A.M.Z.) — all in Boston. Address reprint requests to Dr. Schneider at the Department of Health Policy and Management, Harvard School of Public Health, 677 Huntington Ave., Boston, MA 02115, or at [eschneid@hsph.harvard.edu](mailto:eschneid@hsph.harvard.edu).

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**E**NROLLMENT IN MANAGED-CARE ORGANIZATIONS continues to be an important option for Medicare beneficiaries. Approximately 4.5 million Medicare beneficiaries are enrolled in a managed-care plan, and many policy makers are advocating federal actions that will increase enrollment.<sup>1,2</sup> In the past two decades, the managed-care industry has changed dramatically. The proportion of health-plan members enrolled in for-profit health plans has increased from one quarter in the 1980s to more than 60 percent in 1998.<sup>3</sup>

Health plans are expected to control costs by realigning financial incentives and deterring potentially ineffective care. However, critics worry that for-profit health plans, sensitive to shareholders' pressure to increase profits, will limit the provision of needed health care to enrollees.<sup>4-6</sup> High-cost operative procedures might be an attractive target for cost reduction, but if health plans impede access to operative procedures that are more effective than nonoperative treatments, worse health outcomes could result.

Until recently, the data available to assess the use of procedures within managed care were limited. However, the Balanced Budget Act of 1997 has required all health plans that enroll Medicare beneficiaries to report such data to the Centers for Medicare and Medicaid Services (CMS) annually.<sup>7</sup> We used this data base to test the hypothesis that the rates of use of high-cost procedures would be lower in for-profit health plans than in not-for-profit health plans.

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## METHODS

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### DATA AND STUDY SAMPLE

Since 1998, all health plans wishing to participate in the Medicare+Choice program have annually reported data, including a confidential identifier for each beneficiary, to the CMS Health Plan Employer Data and Information Set (HEDIS). The 1998 Medicare HEDIS file included data from 292 health plans on 4,035,142 beneficiaries who were 65 years of age or older and who were enrolled in those plans during 1997. It also included data on whether or not individual enrollees received each of 12 high-cost operative procedures: cardiac catheterization, coronary-artery bypass grafting, percutaneous transluminal coronary angioplasty, carotid endarterectomy, reduction of femur fracture, total hip replacement, total knee replacement, partial colectomy, open cholecystectomy, closed cholecystectomy, hysterectomy

(among women), and prostatectomy (among men). Each health plan collected data according to National Committee for Quality Assurance specifications, and data collection procedures were audited.<sup>8</sup>

We deleted data from health plans that reported fewer than 30 enrollees (15 plans, with a total of 149 enrollees) or that could not be matched to InterStudy data, as described below (23 plans, with a total of 107,663 enrollees). Another 201,265 enrollees were excluded because a ZIP Code did not match Census data. Our study sample thus consisted of 254 health plans that enrolled 3,726,065 beneficiaries.

### SOCIODEMOGRAPHIC CHARACTERISTICS OF THE ENROLLED POPULATIONS

We classified each enrolled beneficiary according to the following sociodemographic categories: age (65 to 69, 70 to 80, or more than 80 years of age at the end of 1997), race or ethnic group (white, black, Hispanic, or other), Medicaid eligibility, residence (rural or urban), level of income, and level of education. Beneficiaries were classified as eligible for Medicaid if they were enrolled in Medicaid for at least one month of the calendar year. Income was assessed as the percentage of residents 65 years of age or older in the beneficiary's ZIP Code who were receiving public assistance, according to 1990 Census data. ZIP Codes were then classified into quintiles accordingly. Education was assessed as the proportion of residents 65 years of age or older in the beneficiary's ZIP Code who had attended at least some college, with ZIP Codes similarly classified into quintiles. If an enrollee's ZIP Code could not be matched to Census data, that enrollee was excluded from the analysis; fewer than 5 percent of the enrollees were excluded for this reason.

### CHARACTERISTICS OF THE HEALTH PLANS

We obtained, from the InterStudy Competitive Edge 8.2 data base,<sup>3</sup> data on the characteristics of the health plans, including their tax status (i.e., for-profit or not-for-profit), total number of enrollees, number of Medicare enrollees, policy with regard to the enrollment of Medicaid recipients, years in operation, model type (independent practice association, network [including some plans classified as "other"], mixed, or group or staff), and region (New England, mid-Atlantic, southern Atlantic, eastern north central, western north central, southern central, mountain, and Pacific). We matched these data to the Medicare health-plan file by plan

name, city, and state. Matches were verified by comparing the list of counties that the CMS maintains for each Medicare plan with the list of counties in the InterStudy data base. Discrepancies between files were resolved by contacting the health plans directly. The InterStudy data matched the HEDIS data for 254 of the 277 health plans with HEDIS data (92 percent).

**STATISTICAL ANALYSIS**

First, for each health plan in our sample, we calculated the mean prevalence of each of the sociodemographic characteristics of its enrollees (or, in the case of income and education, the proportion in the lowest quintile). Next, we calculated the mean prevalence among the health plans of each of the plan characteristics (including the sociodemographic case mix), along with the interquartile range of the prevalence among the plans and the means among the for-profit and not-for-profit plans specifically. For each health plan, we calculated the rate of use of each procedure per 10,000 enrollees. We calculated the difference in the mean procedure rate at for-profit and not-for-profit health plans, the 95 percent confidence interval for the difference, and the difference in rates expressed as a percentage of the rate among for-profit plans.

To adjust for potential confounding factors, we used two distinct analytic approaches. Both approaches involved regression models to adjust for individual enrollee characteristics (e.g., case mix), followed by an additional adjustment for the characteristics of the health plan. The first approach focused on the plan as the unit of analysis. The second approach focused on the county as the unit of analysis and applied an adjustment method (similar to a propensity-score adjustment) to reduce the effect of differences among counties in the distributions of for-profit and not-for-profit enrollment.

In the first approach, we adjusted the rate of use of each procedure by health plans by fitting two regression models. In the first model, we used data on individual patients to predict the rate of use, adjusted for the sociodemographic case mix of the plans, by fitting a linear regression model for individual enrollees' use of each procedure. The independent variables included enrollee characteristics (age, sex, race or ethnic group, Medicaid eligibility, level of income, level of education, and type of residence) and a dummy variable for each health plan. This technique allowed us to predict the rate of use of each of the 12 procedures by each health plan, given

a standard population. We compared the means of these adjusted rates between for-profit plans and not-for-profit plans by using a two-sample t-test and calculated the confidence intervals for the difference. We fitted a second regression model to the case-mix-adjusted rates of use by each plan and adjusted for other InterStudy health-plan characteristics in addition to tax status (total enrollment, model type, years in operation, and region). In this second model, we interpreted the coefficient of tax status as an adjusted difference between the two groups of plans.

Even with the adjustments for enrollee case mix and health-plan characteristics, the results might still be confounded by the geographic location of the health plans, since the rates of procedure use are known to vary among small geographic areas of the

**Table 1. Characteristics of the Health Plans.\***

Variable	All Plans (N=254)	For-Profit Plans (N=166)	Not-for-Profit Plans (N=88)	P Value
	<i>no. (%)</i>			
Total no. of enrollees				0.006
<100,000	81 (32)	62 (37)	19 (22)	
100,000–400,000	105 (41)	69 (42)	36 (41)	
>400,000	68 (27)	35 (21)	33 (38)	
No. of Medicare enrollees†				0.11
<15,000	124 (51)	88 (56)	36 (43)	
15,000–40,000	60 (25)	38 (24)	22 (26)	
>40,000	58 (24)	32 (20)	26 (31)	
Enrollment of Medicaid recipients				0.001
Yes	128 (50)	71 (43)	57 (65)	
No	126 (50)	95 (57)	31 (35)	
Model type				<0.001
Independent practice association	107 (42)	79 (48)	28 (32)	
Network	17 (7)	11 (7)	6 (7)	
Mixed	112 (44)	72 (43)	40 (45)	
Group or staff	18 (7)	4 (2)	14 (16)	
Average age of plan				<0.001
<5 yr	23 (9)	19 (11)	4 (5)	
5–20 yr	175 (69)	127 (77)	48 (55)	
>20 yr	56 (22)	20 (12)	36 (41)	
Region				0.002
New England	22 (9)	10 (6)	12 (14)	
Mid-Atlantic	35 (14)	22 (13)	13 (15)	
Southern Atlantic	48 (19)	36 (22)	12 (14)	
Eastern north central	32 (13)	22 (13)	10 (11)	
Western north central	12 (5)	8 (5)	4 (5)	
Southern central	32 (13)	30 (18)	2 (2)	
Mountain	24 (9)	15 (9)	9 (10)	
Pacific	49 (19)	23 (14)	26 (30)	

\* Because of rounding, not all percentages total 100.

† Data were not available for 12 health plans (8 for-profit and 4 not-for-profit).

United States.<sup>9-11</sup> Moreover, according to the payment formula used by the CMS, health plans receive a higher average premium payment if they enroll beneficiaries from counties that have a historically higher rate of use of health care services than other counties. Differences in the rates of procedure use between for-profit and not-for-profit health plans could be due to the plans' selection of counties, rather than their efforts to modify procedure use. We therefore used a second analytic approach to compare the use of procedures among enrollees in for-profit plans and those in not-for-profit plans within the same county. We defined the group of beneficiaries in all the plans with a given tax status in each county as the unit of analysis: thus, the beneficiaries enrolled in for-profit plans in a particular county constituted one such unit, and those enrolled in not-for-profit plans in that county another unit. We first adjusted for differences in the socio-demographic case mix of these "county-tax-status" units by entering data on individual characteristics into a linear regression model, in a manner similar

to the first step of the previous analysis. To adjust for plan characteristics other than tax status, we assigned to each beneficiary the characteristics of his or her health plan other than region (with adjustment by county weighting, described below) and entered those characteristics into the models.

After calculating adjusted rates for each county's enrollees in for-profit and not-for-profit plans, we assigned a weight to each county observation with use of the formula  $W_c = [n_{cF} + n_{cN}] \times [n_{cF} \div (n_{cF} + n_{cN})] \times [n_{cN} \div (n_{cF} + n_{cN})]$ , where  $n_{cF}$  and  $n_{cN}$  are sample counts from for-profit and not-for-profit plans in county  $c$ , respectively. In this formula, the first factor represents the total sample size in the county and the other factors the fractions of enrollment in for-profit (second factor) or not-for-profit (third factor) plans. This formula gives the greatest relative weight to highly populated counties where health-plan enrollment is relatively equally distributed between for-profit and not-for-profit plans. Mean differences (weighted averages) among counties between the two types of plans were assessed with the use of a weighted, paired t-test and the corresponding confidence interval. The use of these weights is essentially equivalent to a propensity-score adjustment.<sup>12</sup> All the analyses were performed with SAS statistical software. For the weighted analyses, we used PROC SURVEYMEANS to obtain appropriate estimates of the standard error.<sup>13</sup> A P value of less than 0.05 was considered to indicate statistical significance.

RESULTS

CHARACTERISTICS OF THE HEALTH PLANS

The for-profit health plans in our study had a lower total number of enrollees per plan and a lower number of Medicare enrollees per plan than the not-for-profit plans (Table 1). They were more likely to be structured as independent practice associations and to have been in operation for a shorter period of time than the not-for-profit plans, and they were more prevalent in the southern Atlantic, north central (eastern and western), and southern central regions than elsewhere.

The 166 for-profit health plans enrolled 69 percent of the study sample, and the 88 not-for-profit health plans enrolled the other 31 percent. The average case mix of the for-profit and not-for-profit health plans differed (Table 2). The for-profit health plans enrolled a significantly higher mean percentage of black beneficiaries than the not-for-profit

**Table 2. Sociodemographic Case Mix of For-Profit and Not-for-Profit Health Plans.\***

Variable	For-Profit Plans (N=166)	Not-for-Profit Plans (N=88)	Overall Interquartile Range	P Value†
<i>mean percentage</i>				
Age at end of 1997				
65–69 yr	35	34	32–39	0.19
70–80 yr	50	50	48–52	0.80
>80 yr	14	16	12–16	0.03
Female sex	58	59	56–60	0.71
Race or ethnic group				
White	84	89	82–95	0.004
Black	11	6	2–12	<0.001
Hispanic	2	2	0–2	0.06
Other	2	3	1–2	0.16
Eligible for Medicaid	4	5	2–5	0.47
Low level of income‡	18	15	3–25	0.22
Low level of education§	25	16	9–32	<0.001
Rural residence	6	9	2–10	0.009

\* Sixty-nine percent of the study population was enrolled in for-profit plans, and 31 percent in not-for-profit plans.

† P values are for the comparison of the means of for-profit plans and not-for-profit plans and were calculated with use of the t-test.

‡ The percentages shown are for the lowest-level-of-income quintile of ZIP Codes, based on the proportion of residents 65 years of age or older who were receiving public assistance.

§ The percentages shown are for the lowest-level-of-education quintile of ZIP Codes, based on the proportion of residents 65 years of age or older who had at least some college education.

plans (11 percent vs. 6 percent,  $P < 0.001$ ) and a significantly higher percentage of beneficiaries with a low level of education (25 percent vs. 16 percent,  $P < 0.001$ ). Not-for-profit health plans enrolled a higher percentage of rural residents than did for-profit plans (9 percent vs. 6 percent,  $P = 0.009$ ).

**RATES OF USE OF HIGH-COST PROCEDURES**

The unadjusted rate of use of high-cost operative procedures was consistently lower among beneficiaries enrolled in not-for-profit health plans than among those enrolled in for-profit plans (Table 3). The mean difference in procedure rates between the two types of plan ranged from 31.6 per 10,000 enrollees for cardiac catheterization to 0.8 per 10,000 enrollees for open cholecystectomy. The differences between the two types of plan in the rates of cardiac catheterization, coronary-artery bypass grafting, percutaneous transluminal coronary angioplasty, and carotid endarterectomy were statistically significant ( $P < 0.05$ ). When the differences were expressed as a percentage of the for-profit rate, not-for-profit plans had rates of procedures that ranged from 24.6 percent less than for-profit plans (in the case of cardiac catheterization) to 7.5 percent less (open cholecystectomy). For 6 of the 12 procedures, the not-for-profit rate was more than 20 percent lower than the for-profit rate.

After adjustment for the sociodemographic case mix of the health plans, the differences in the rates of procedure use were generally similar to the unadjusted differences, although some of the differences were slightly larger (Table 4). Additional adjustment for other characteristics of the health plans reduced most of the differences in the rates of procedure use but increased the magnitude of three of the differences. All the procedure rates remained higher in the for-profit plans, although only 2 of the 12 differences (partial colectomy and closed cholecystectomy) were statistically significant after adjustment for health-plan characteristics other than tax status.

In our regression analysis, the model type, the region within the United States, and the length of time the plan had been in operation were the leading confounding factors. Staff-model plans were more likely than plans of other model types to be not-for-profit and to have lower rates of procedures; for-profit plans were more likely than not-for-profit plans to be located in the southern United States, where procedure rates are generally higher; and plans between 5 and 20 years of age were more likely to be for-profit

**Table 3. Unadjusted Rates of Use of High-Cost Procedures in For-Profit and Not-for-Profit Health Plans.\***

Procedure	For-Profit Plans	Not-for-Profit Plans	Difference (95% CI)	Percent Difference
Cardiac catheterization	128.5	96.9	31.6 (9.0 to 54.2)‡	24.6
Coronary-artery bypass grafting	45.1	34.8	10.3 (2.5 to 18.1)‡	22.8
Percutaneous transluminal coronary angioplasty	39.5	31.0	8.5 (1.0 to 16.1)‡	21.5
Carotid endarterectomy	22.3	16.9	5.4 (1.0 to 9.9)‡	24.2
Reduction of femur fracture	27.8	25.2	2.6 (-2.9 to 8.2)	9.4
Total hip replacement	18.3	15.9	2.4 (-5.1 to 10.0)	13.1
Total knee replacement	29.5	24.4	5.1 (-1.0 to 11.2)	17.3
Partial colectomy	22.7	18.7	4.0 (-1.0 to 9.0)	17.6
Open cholecystectomy	10.6	9.9	0.8 (-1.6 to 3.1)	7.5
Closed cholecystectomy	28.9	23.1	5.8 (-0.2 to 11.9)	20.1
Hysterectomy	12.6	10.0	2.6 (-0.3 to 5.5)	20.6
Prostatectomy	29.1	24.7	4.3 (-1.4 to 10.1)	14.8

\* Values for the difference and the percent difference were rounded after the difference had been calculated. CI denotes confidence interval.  
 † The values shown are the means of the plan means.  
 ‡  $P < 0.05$  for the comparison between for-profit plans and not-for-profit plans.

it and to have higher procedure rates than plans in other age categories.

**RATES AFTER ADJUSTMENT FOR DIFFERENCES IN GEOGRAPHIC LOCATION**

Health plans included in the study enrolled beneficiaries in 2813 counties, but in only about two thirds (1780) of these counties was there enrollment in both for-profit and not-for-profit plans. Of note, the latter counties contained 99.1 percent (3,692,543) of the health-plan enrollees in the study. Table 5 shows that the rates of most, if not all, procedures were significantly higher among enrollees in for-profit plans than among enrollees in not-for-profit plans, after matching and weighting for the geographic distribution of enrollment. Adjustment for individual sociodemographic characteristics had little effect on differences in the rates of procedures. Adjustment for health-plan characteristics reduced the differences, but the rates of all the procedures were still higher among for-profit enrollees than among not-for-profit enrollees, and the differences remained statistically significant. In analyses that

**Table 4. Effect of Adjustment on Differences between For-Profit and Not-for-Profit Health Plans in the Rates of Use of High-Cost Procedures.\***

Procedure	Difference Adjusted for Case Mix (95% CI)†	Difference Adjusted for Case Mix and Health-Plan Characteristics (95% CI)‡
	rate per 10,000 enrollees§	
Cardiac catheterization	31.0 (8.7 to 53.3)¶	15.2 (-9.2 to 39.5)
Coronary-artery bypass grafting	10.7 (3.1 to 18.3)¶	7.6 (-1.0 to 16.2)
Percutaneous transluminal coronary angioplasty	9.0 (1.6 to 16.4)¶	6.0 (-2.3 to 14.3)
Carotid endarterectomy	6.0 (1.6 to 10.4)¶	2.3 (-2.5 to 7.1)
Reduction of femur fracture	6.0 (0.5 to 11.4)¶	5.3 (-0.9 to 11.4)
Total hip replacement	3.0 (-4.5 to 10.5)	2.3 (-6.2 to 10.9)
Total knee replacement	5.1 (-0.9 to 11.2)	5.7 (-0.9 to 12.4)
Partial colectomy	4.4 (-0.6 to 9.4)	6.0 (0.3 to 11.6)¶
Open cholecystectomy	0.8 (-1.5 to 3.2)	0.6 (-2.1 to 3.3)
Closed cholecystectomy	6.1 (0.1 to 12.1)¶	7.0 (0.4 to 13.6)¶
Hysterectomy	2.7 (-0.2 to 5.6)	2.2 (-1.0 to 5.4)
Prostatectomy	3.8 (-1.9 to 9.6)	3.3 (-3.1 to 9.8)

\* CI denotes confidence interval.

† Adjustments were made for age, sex, and race or ethnic group, Medicaid eligibility, area-defined level of income, area-defined level of education, and type of residence (rural or urban).

‡ Additional adjustments were made for numbers of enrollees, type of plan model, years in operation, and region.

§ The values shown are the means of the plan means.

¶ P<0.05 for the comparison between for-profit plans and not-for-profit plans.

stratified counties according to the proportion of enrollees in for-profit plans, the rates of most procedures were consistently higher among for-profit enrollees than among not-for-profit enrollees in counties with primarily for-profit enrollment, those with primarily not-for-profit enrollment, and those with relatively similar enrollments in for-profit and not-for-profit plans (data not shown).

## DISCUSSION

There is widespread concern that the financial incentives of managed care will lead health plans, particularly for-profit health plans, to restrict Medicare beneficiaries' access to important health care services, such as high-cost operative procedures. Despite this concern, we found no evidence that enrollees in for-profit health plans were less likely to receive such procedures. This was true for both "low-discretion" procedures, such as reduction of femur fracture (for which there is a general consensus that

the benefits of the procedure outweigh its risks in most cases), and "high-discretion" procedures, such as hysterectomy (for which in many cases there is less consensus about the benefits and risks of the procedure).<sup>14</sup>

Our results are somewhat counterintuitive. Health plans can select from a long list of strategies to influence the use of clinical services.<sup>15,16</sup> If the economic incentive to restrict costs is more intense in for-profit plans than in not-for-profit plans because of the need to reward stockholders, why would for-profit plans fail to achieve lower rates of procedures? Differences in leadership may play a part. Leaders of not-for-profit health plans may be more adept than leaders of for-profit plans at implementing the clinical programs that can reduce the need for procedures. Leaders of for-profit plans may focus primarily on obtaining price discounts or trimming ancillary services, rather than on reducing the number of procedures itself. They may also be more sensitive to adverse publicity or legal liability that might arise if they restrict the use of high-cost procedures. Of course, our results are also consistent with the possibility that for-profit and not-for-profit plans perceive similar incentives to control costs and use similar approaches.

The CMS pays health plans more for beneficiaries who reside in counties with historically high costs than it does for beneficiaries who reside elsewhere, so it seemed plausible to us, at the outset of this study, that for-profit health plans would preferentially enter those high-cost counties. Since higher costs may be associated with higher rates of procedure use, it seemed critical to address this possibility. However, the results suggest that the different geographic locations of the health plans did not explain our primary findings.

Numerous studies have examined patterns of health care delivery in for-profit and not-for-profit hospitals and hemodialysis centers, but there are fewer such studies of health plans.<sup>17-20</sup> Previous research suggests that for-profit plans use fewer hospital days and may use preventive services less frequently than not-for-profit plans.<sup>21,22</sup> Studies of differences in the quality of care have produced inconsistent results.<sup>23-25</sup>

Our study has some limitations. It was not designed to determine the specific management features of health plans that might lead to different rates of use of procedures. We lacked data on diagnoses and coexisting disease among the enrollees, although previous research has shown that there is

**Table 5. Within-County Differences in the Rates of Use of High-Cost Procedures among Enrollees in For-Profit and Not-for-Profit Health Plans.\***

Procedure	Difference Matched and Weighted According to County (95% CI)†	Difference Adjusted for Case Mix (95% CI)‡	Difference Adjusted for Case Mix and Health-Plan Characteristics (95% CI)§
	rate per 10,000 enrollees¶		
Cardiac catheterization	47.7 (31.4 to 63.9)	47.5 (31.5 to 63.4)	26.5 (14.1 to 38.9)
Coronary-artery bypass grafting	12.4 (4.8 to 20.1)	12.1 (5.1 to 19.2)	6.3 (0 to 12.7)
Percutaneous transluminal coronary angioplasty	13.1 (5.3 to 20.8)	12.8 (5.5 to 20.1)	2.6 (-2.8 to 8.0)
Carotid endarterectomy	6.9 (3.4 to 10.4)	6.6 (3.2 to 9.9)	4.2 (1.1 to 7.3)
Reduction of femur fracture	13.1 (8.0 to 18.1)	12.2 (6.3 to 18.2)	6.4 (1.1 to 11.6)
Total hip replacement	7.3 (2.6 to 12.0)	7.2 (2.6 to 11.8)	5.4 (0.8 to 9.9)
Total knee replacement	9.5 (3.9 to 15.1)	9.5 (4.1 to 14.9)	8.3 (3.1 to 13.6)
Partial colectomy	11.8 (7.9 to 15.6)	11.6 (7.7 to 15.6)	8.4 (4.8 to 12.0)
Open cholecystectomy	3.9 (1.9 to 6.0)	3.8 (1.7 to 5.9)	1.9 (-0.1 to 3.8)
Closed cholecystectomy	10.0 (5.0 to 14.9)	9.7 (4.9 to 14.5)	7.7 (3.4 to 11.9)
Hysterectomy	5.3 (2.9 to 7.7)	5.3 (3.0 to 7.5)	2.5 (0.6 to 4.3)
Prostatectomy	9.7 (2.9 to 16.6)	9.8 (3.1 to 16.6)	6.3 (0.2 to 12.3)

\* CI denotes confidence interval.

† Rates for enrollees in for-profit and not-for-profit plans were calculated, and then matching weights were applied to the rates in each county.

‡ Before weighting, adjustments were made for age, sex, and race or ethnic group, Medicaid eligibility, area-defined level of income, area-defined level of education, and type of residence (rural or urban).

§ Additional adjustments were made for numbers of enrollees, type of plan model, and years in operation.

¶ The values shown are the weighted means of the differences according to county between rates of use in for-profit and not-for-profit plans.

|| P<0.05 for the comparison between for-profit plans and not-for-profit plans.

little difference in the health status or prevalence of coexisting illness among Medicare beneficiaries in for-profit and not-for-profit health plans.<sup>23,26</sup> In addition, we have no data to say whether higher or lower rates of procedure use are optimal.

In summary, we found that the rate of use of 12 high-cost operative procedures was not lower among Medicare beneficiaries enrolled in for-profit health plans than among those enrolled in not-for-profit health plans. Our analysis shows the importance of efforts by the CMS to collect HEDIS data

and the potential value of these data for ongoing monitoring of differences in the use of services among health plans.

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