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Does Managed Care Affect Quality? Appropriateness, Referral Patterns, and Outcomes of Carotid Endarterectomy

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Abstract

Objective—To assess the impact of managed care(MC) on several dimensions of quality of surgical care among Medicare beneficiaries undergoing carotid endarterectomy(CEA).

Methods—This was a population-based, observational study of all CEAs(N=9308) in NY. Clinical data were abstracted from medical charts to assess appropriateness and deaths/strokes within 30 days of surgery. Differences in patients, appropriateness, and outcomes were compared using chi square tests and risk-adjusted outcomes compared using regression.

Results—Fee-For-Service(FFS, N=8691) and MC(N=897) CEA patients were similar in indications for surgery, perioperative risk, and most comorbidities. There were no differences in inappropriateness between FFS and MC(8.6% v. 8.4%). MC patients were less likely to have a high volume surgeon(20.1% v. 13.5%) or hospital(20.5% v. 13.0%;p<.05). There were no differences in risk-adjusted rates of death/stroke(OR=0.97;95% CI, 0.69–1.37).

Conclusions—Medicare MC plans did not have a positive impact on inappropriateness, referral patterns or outcomes of CEA.

Keywords

managed care; fee-for-service; Medicare; carotid endarterectomy; appropriateness; outcomes; referral patterns; volume; health services overuse

INTRODUCTION

Managed care spread throughout the health industry in the 1980s and became the dominant form of health insurance in the 1990s.¹ Advocates claimed that the new arrangements created by these organizations would reduce or at least control health care costs while improving the quality of health care.^{2,3} The latter objective would be achieved by a variety of specific interventions, including pre-certification of elective procedures to assure their appropriateness and selective referral of patients to high-quality doctors and hospitals. Managed care plans have both financial and quality of care incentives to prevent overuse of procedures and poor surgical outcomes. We sought to assess whether managed care affected any of several

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dimensions of health care quality by examining its impact on the use of carotid endarterectomy (CEA) among Medicare beneficiaries in New York State in the late 1990s.

CEA, surgery to prevent stroke, is an ideal procedure with which to investigate this question for several reasons. It is a common and costly inpatient procedure with significant risks of immediate complications. By the end of the 1990s, a large body of data was available from published randomized controlled trials (RCTs)⁴⁻⁹ and national guidelines that established the circumstances under which the procedure produced benefits for patients.^{10,11} Because the procedure is nearly always performed electively, managed care plans had the opportunity to employ several of their readily available programs (including pre-authorization) to influence the appropriateness of patients selected for the procedure, as well as selective referral to (or contract with) high-quality surgeons or hospitals. Because approximately three quarters of CEAs are performed among patients 65 years of age or older, the Medicare population provides an ideal group in which to examine this procedure.

This study sought to determine whether Medicare patients enrolled in Medicare+Choice managed care plans (the precursor of Medicare's current managed care plans) had: 1) lower rates of inappropriate CEAs, 2) their operations performed more frequently by high volume surgeons or hospitals, or 3) better perioperative outcomes compared with patients enrolled in fee-for-service Medicare.

METHODS

Study Population

The New York Carotid Artery Surgery (NYCAS) study examined all Medicare beneficiaries who underwent CEA (ICD-9 CM 38.12) between January 1, 1998 to June 30, 1999 in New York (NY) State. Details of the NYCAS study have been previously described.¹² We used Medicare Part A claims to identify patients with traditional fee-for-service (FFS) Medicare coverage (N=9761). Because beneficiaries enrolled in managed care (MC) plans do not have Part A claims, we employed the following strategy to find these managed care cases. First, we identified 1844 CEAs done in NY on patients ≥ 65 years using the NY state hospital discharge database (SPARCS) that did not have Part A claims. Second, using the Medicare eligibility files, we excluded those who were not known Medicare enrollees (199). MC was defined as any Medicare+Choice approved MC plan including: HMO/staff, group, network, IPA or mixed models. We searched the Medicare enrollment file to determine a patient's insurance coverage (FFS v. MC) for the month of surgery or the month prior if the surgery occurred within the first 10 days of the month (to allow for lag in updating the enrollment files). This yielded a total of 11,406 potentially eligible FFS and MC cases. Copies of the inpatient medical records were requested by Island Peer Review Organization (IPRO--the Medicare quality improvement organization in NY). The study was approved by the Mount Sinai Institutional Review Board.

IPRO successfully obtained the medical charts of 10,817 of potentially eligible cases (94.8%). Among these, we excluded 628 cases that were: same side re-operations (308), surgery combined with a major procedure besides CABG (210), or no CEA was performed (110). For the analyses presented here, we excluded 601 additional cases because critical clinical information necessary to make an appropriateness assessment was missing from the medical charts (551) or the case represented a scenario not rated by the consensus panel (50). Among these excluded cases 18.0% had MC and 82.0% had FFS insurance. Therefore, the NYCAS study contains complete information on 9588 CEAs among Medicare beneficiaries: 8691 among Fee-For-Service (FFS) patients and 897 among those with MC coverage.

Data Collection and Measurement

Detailed clinical information was abstracted from hospital charts by trained nurse abstractors including: sociodemographics, neurological, medical and surgical history, admission neurologic exam, functional status, laboratory values, medications, and diagnostic imaging test results. Reasons for surgery were grouped into symptomatic and asymptomatic indications. Symptomatic indications included any of the following within 12 months of CEA: carotid Transient Ischemic Attack (TIA), amaurosis fugax, crescendo TIA, or strokes (major, minor, or in-evolution). Patients who did not have any symptoms referable to a carotid artery stenosis within 12 months prior to surgery were considered asymptomatic (including those with vertebrobasilar TIAs). Comorbidity was defined as high (end stage disease, severe disability, 13 or ≥ 3 Revised Cardiac Risk Index risk factors¹⁴), moderate (two cardiac risk factors), low (≤ 1 risk factors).¹⁴⁻¹⁵ Surgical specialty was determined from AMA and state licensing board databases. Hospital teaching status and location (metropolitan statistical area size) were obtained from the American Hospital Association. Abstractors needed to pass a series of quality assurance and inter-rater reliability tests. Assessing the impact of insurance on quality of CEA care was a substudy that emerged late in the project, so abstractors were blinded to this as potential study hypothesis at the time of abstraction. All of the data elements reported on here had substantial to near perfect agreement (Kappas from 0.60 to 1.0).

Appropriateness Ratings

We used the CEA appropriateness ratings we have described previously.¹⁵ These ratings were generated using the RAND appropriateness method in which a national panel in 1998 of nine experts from the field of vascular surgery, neurosurgery, neurology, internal medicine, radiology, and vascular medicine reviewed, rated, discussed, and re-rated 1557 mutually exclusive indications for surgery—a validated process used previously.¹⁵⁻¹⁸ The results of all of the main North American trials were known at the time the expert panel deliberated. CEA was considered “appropriate” when the benefits exceeded the risks, “uncertain” when the benefits equaled the risks, and “inappropriate” when the risks outweighed the benefits. Each expert rated each indication on a 9 point scale (1–3=inappropriate, 4–6=uncertain, and 7–9=appropriate). An indication was considered inappropriate if the median panel rating was between 1 and 3 and there was no disagreement.¹⁵⁻¹⁸ Disagreement was present when three or more panel members rated an indication as inappropriate (1 to 3) and three or more rated it as appropriate (7 to 9).

Outcomes

Information about perioperative deaths, strokes, and transient ischemic attacks (TIAs) was abstracted from the inpatient medical record of the index admission and all readmissions within 30 days of surgery. Experienced research nurses abstracted data on complications from a review of admission notes, daily hospital notes, discharge summaries, and reports of brain imaging tests. Two study physicians (including one neurologist) independently reviewed the records of all patients identified as having stroke or TIA complications. Initial agreement was 95%, and disagreements were resolved by consensus or a third reviewer if necessary.

Analysis Plan

Differences in patient, surgeon and hospital characteristics, rates of inappropriateness, and outcomes of MC v. FFS patients were compared using chi square, students T, and wilcoxon rank sum tests, as appropriate. To examine whether MC patients were more likely to be referred to high volume surgeons or hospitals, we used chi square tests comparing quintiles of surgeon and hospital volume. Similar results were obtained when modeling volume by tertiles and quartiles.

We used multiple logistic regression with generalized estimating equations (to account for clustering) to investigate differences in risk-adjusted rates of combined death or non-fatal stroke between FFS and managed care patients. Two risk-adjustment approaches were used. Model 1 assessed the independent impact of insurance type after controlling for prognostic factors from a previously validated CEA-specific risk model (including symptom status, active coronary artery disease, contralateral stenosis, type of anesthesia and arteriotomy repair).²¹ Model 2 controlled for the covariates that were not balanced between the two insurance groups (age, race, past stroke, hypertension, COPD, diabetes, surgeon volume, surgeon years since graduation, hospital volume, and metropolitan statistical area size). Surgeon volume was highly collinear with board specialty (and more closely related to outcomes), so specialty was not included in Model 2. An alternate model that included surgical specialty (instead of surgeon volume) produced similar results. All analyses consider two-sided p values of .05 as statistically significant and were performed using SAS 9.0 (SAS Institute, Cary, NC).

RESULTS

Patient Characteristics and Clinical Indications for CEA

The sociodemographic and clinical characteristics of the combined 9588 FFS and MC cases are shown in Table 1. There were no significant differences in patient characteristics with respect to sex, comorbidity scores, cerebrovascular disease, heart disease, diabetes, kidney disease, degree of disability, among patients with FFS compared to MC insurance. FFS patients were one-half year older on average (74.6 v. 74.1 years, $p=.02$). There were also more FFS patients at the extremes of age (<65 or ≥ 85 years), in part, because patients <65 years old with end stage kidney disease or disability are covered by FFS Medicare. There were more non-Whites in the MC group (9.6% v. 6.8%; $p<.001$). There were also small, but significantly higher rates of hypertension and chronic obstructive pulmonary disease among FFS cases. As shown in Table 2, the clinical indications for CEA and severity of carotid disease (ipsi- and contralateral stenosis, disability score) were similar in the two groups.

Appropriateness of CEA

Figure 1 shows that there were no differences in rates of inappropriate surgery between FFS and MC cases (8.6% v. 8.4%, $p=.55$). Nor were there any differences in inappropriateness when stratifying by clinical indication for surgery (asymptomatic v. symptomatic) or surgical specialty. The reasons for inappropriate CEA between FFS and MC were also the same (data not shown).

Surgeon Referral Patterns

The 9588 cases were performed by 488 surgeons divided among the following specialties: general surgery (45.4%), vascular (26.8%), cardiothoracic (11.5%), neurosurgery (7.6%), and missing (8.8%). Just over half of cases (52.7%) were performed by vascular surgeons, 33.6% by general surgeons, 6.9% by cardiothoracic surgeons, and 5.4% by neurosurgeons (Table 3). The median annualized number of cases per surgeon was 31 (IQR, 14–54). Overall, patients with FFS were operated on by surgeons with higher annual Medicare volume compared to their MC counterparts (mean 52.7 v. 38.9 cases/surgeon, $p<.0001$), largely due to fewer MC patients being operated on by surgeons in the top two volume quintiles (Table 3). MC patients were more likely to be operated on by surgeons at the extremes of experience (≤ 10 years from graduation from medical school) or ≥ 41 years from graduation, $p<.0001$). The likelihood of being operated on by a vascular or general surgeon, the two most common types of surgeons performing CEA, was similar across insurance groups. MC patients had modestly fewer cases done by neurosurgeons and more by cardiothoracic surgeons, though these two specialties accounted for only 12.2% of cases.

Hospital Referral Patterns

CEA was performed in 166 hospitals, and 39.1% were teaching hospitals. Median hospital volume was 74 cases per year (IQR, 41–161). FFS patients were also more likely to be operated on in higher volume hospitals (109.9 v. 89.8 cases/year, $p<.0001$), mostly due to fewer MC cases being done at the highest quintile facilities (Table 3). There were no differences in the percentage of cases performed at teaching hospitals. While two-thirds of cases overall (66.2%) were performed in large cities (≥ 1 million residents), a larger proportion of MC cases were performed in hospitals in these large cities (87.9%) v. FFS (64.0%, $p<.0001$).

Perioperative Outcomes

There were no differences in unadjusted rates of the combined endpoint of perioperative death or non-fatal stroke between FFS and MC cases (4.2% v. 4.4%, $p=.81$). Rates of death, non-fatal stroke, and myocardial infarction were also similar (Figure 2). Nor were differences in risk-adjusted rates of death or stroke between FFS and MC patients (Model 1 OR=0.97; 95% confidence interval, 0.69–1.37 and Model 2 OR=0.93 CI, 0.65–1.31). Model 2 included adjustment for metropolitan statistical area (MSA) size. Secondary analyses that further adjusted Model 1 (based on a validated CEA-specific risk model) for MSA size produced similar results.

DISCUSSION

We used detailed clinical data from a statewide, population-based cohort study of 9588 Medicare beneficiaries who underwent CEA (a common, elective vascular surgical procedure) performed in 166 hospitals by 488 surgeons to examine several potential differences in the appropriateness, referral patterns, and outcomes of surgical care between patients with FFS v. MC insurance. Though rates of inappropriate surgery were low in both groups, we found no differences in inappropriateness between the two groups overall. This result was consistent across clinical indications for CEA and by surgical specialty.

Overuse of CEA is a good potential tracer for evaluating the effectiveness with which MC might influence health care quality for several reasons. It is an expensive, potentially risky elective procedure that usually requires prior authorization. High rates of inappropriate CEA were also reported by several prominent studies.^{17,22} The evidence base for determining who benefits from CEA is very strong with several large, international RCTs directly addressing this issue.^{4–9} In addition, national subspecialty guidelines outlining appropriate candidates for CEA were widely available and highly publicized.^{10,11} In an earlier analysis of the NYCAS dataset, we found that following the publication of the RCTs and national subspecialty practice guidelines, rates of inappropriate CEA dropped from 32% to 8%, suggesting that referring physicians and surgeons were heavily influenced by these data.¹² Health plans had access to the same data and practice guidelines as these physicians did, as well as several commercial products for rating appropriateness. We infer from the fact that there was no difference in rates of inappropriate surgery between FFS and MC plans, that there was no effective case-level assessment of appropriateness by MC plans. However, the current study can not determine if MC plans tried to influence patient selection but failed, or never tried at all. It is also possible that for procedures for which there is a large evidence base of RCTs and national practice guidelines, such national-level recommendations would be expected to dominate any local, internal utilization review mechanisms that MC plans may have attempted.

MC patients were less likely to have their procedure performed by a high volume surgeon or hospital. The reasons for this finding are unknown. MC plans could have excluded high volume providers from their networks (or required higher co-payments to use them). Conversely, some high volume providers may have declined MC contracts. This appears unlikely as the highest

volume hospitals and surgeons still had a significant proportion of MC cases. While the study period precedes the work of the Leapfrog Group and other advocates of volume-oriented selective referral patterns,^{23,24} the favorable association between provider volume and outcomes has been suspected for several years prior to the study period.²⁵ Plans could have had access to provider volume from the NY State hospital discharge database if they were interested. It is also worth noting that there is no certificate of need policy in NY that limited the number of hospitals or surgeons who performed CEA, which partly explains the wide variation in caseload we found.

The lack of difference in rates of perioperative death or stroke between the two insurance groups could be explained by the fact that there were no direct mechanisms that would have given MC plans provider-specific outcome data. While New York has been a national leader in promoting efforts to measure and publicly report hospital and surgeon-specific complication rates for cardiovascular procedures like CABG and coronary angioplasty, there was no such systematic reporting of CEA outcomes during this period. The fact that there was no difference in outcomes between MC and FFS despite the fact that there were statistical differences in the use of the highest volume providers is probably due to the fact that the absolute differences in the use of the highest quintile volume providers between the two insurance groups were modest (absolute difference of 6.6% and 7.5%), so the impact on outcomes (even in the presence of a volume-outcome relationship) would be expected to be small. Multivariable analyses that adjusted for differences in provider volume did not find any differences in complication rates between MC and FFS.

The literature examining the impact of MC is vast and mixed. Systematic reviews have concluded that there are no consistent differences in quality of care.²⁶ While many studies have focused on differences in health care utilization rates, only a few have rigorously examined differences in appropriate use of care.²⁶ Those that have largely examined underuse of indicated care. Gaudagnoli et al. found that indicated coronary angiography was underused in Medicare patients after myocardial infarction with MC insurance (compared to FFS) but there were no differences in inappropriateness.²⁷ No prior studies have reported differences in risk-adjusted rates of surgical complications by insurance type.

Other investigators have also reported a lack of alignment between theoretical health plan financial and quality incentives and actual plan behavior. Rates of CEA (and other high-cost cardiac procedures) were higher in for-profit health plans (compared to non-profit ones) suggesting that health plans were not restricting care.²⁸ Medicare (and privately insured) patients in managed care plans in NY were less likely to undergo CABG surgery at a low-mortality hospitals despite the public reporting of CABG outcomes data.²⁹

Several potential limitations are worth noting. First, our results may not be generalizable to other states or patient populations. However, New York State accounts for 14% of the Medicare population,²⁹ 8% of all CEAs performed nationwide,^{31,32} and three-quarters of CEAs are performed on Medicare beneficiaries.¹⁴ Second, the degree of MC competition during the study period in NY, would be considered moderate. During this period the MC penetration in NY was similar to that of the average state in the US during the period. Third, there may have been some misclassification of insurance, though insurance status was based on both hospital insurance data and the Medicare eligibility files and any misclassification should be randomly distributed. Fourth, though the expert judgments that generated the appropriateness ratings are subjective, the internal consistency, reliability, and validity of this methodology for procedures with a strong evidence base of RCTs is very good.^{18,33–35} Fifth, the NYCAS study only had data on patients who had surgery, so we can not comment on any potential influences of MC on pre-surgical screening of patients who were potentially eligible for CEA but did not undergo it due to utilization review or any other MC plan management controls. We also did not know

patients' zip code so could not directly calculate proximity to a high volume provider. However, we controlled for the metropolitan statistical area size of the index hospital as surrogate measure of access to a high volume provider. The vast majority of MC patients were operated on in cities of 1 million residents or more (87.9%) (compared to FFS, 64.0%), making lack of access to a high volume or low complication rate provider an unlikely explanation. Finally, these data reflect practice in 1998 and the first half of 1999. The underlying evidence-base of RCTs of CEA and national practice guidelines recommending their use have been stable over time.^{10, 11, 19-20, 36}

In summary, while MC plans had the time, opportunity, evidence-based guidelines, and financial and quality incentives to rationalize the use of CEA, they did not have a positive impact on inappropriateness, referral to high volume providers, or clinical outcomes. Whether these findings reflect the fact that MC plans tried to exert such influence but failed or did not try at all is a worthy subject for future research. Finally, current Medicare Advantage and other MC plans may want to take advantage of the strong evidence base of RCTs, national practice guidelines, and growing appropriateness literature to help assure rational use of CEA by their beneficiaries. Health plans may also be able to use publicly available data on provider volume and/or in-hospital mortality rates to inform policies to selectively refer members to high quality surgeons and hospitals.

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P=.55 for comparison of FFS v. MC

Figure 1.
Comparing appropriateness of carotid endarterectomy between Fee-For-Service and Managed Care cases (N=9588)

P value > 0.51 for all pairwise comparisons of differences in outcomes between FFS v. MC

Figure 2.
Complication within 30 days of carotid endarterectomy: Fee-For-Service v. Managed Care
(N=9588)

Table 1

Characteristics of Fee-For-Service and Managed Care Patients Undergoing CEA (N=9588)

Patient Characteristics	Fee-For-Service (%) (N=8691)	Managed Care (%) (N=897)	Total (%) (N=9588)	P Value
Sociodemographics				
Age (yrs)				
Mean age (sd)	74.6 (6.9)	74.1 (5.8)	74.6	.02
< 65	4.9	0.6	4.5	<.0001
65–74	44.4	56.4	45.5	
75–84	43.7	38.2	43.2	
≥ 85	7.0	4.8	6.8	
Male	55.7	57.5	55.9	.29
Female	44.3	42.5	44.2	
Race/ethnicity				
White	93.2	90.4	92.9	<.0001
Black	2.5	3.0	2.5	
Hispanic	2.2	1.9	2.2	
Other	2.1	4.7	2.4	
Revised Cardiac Risk Index Score				
0	18.7	18.6	18.7	.84
1	44.7	45.8	44.8	
2	28.2	28.0	28.2	
≥ 3	8.4	7.6	8.3	
Comorbidity class				
None	18.3	18.3	18.3	.65
Low	43.2	44.5	43.3	
Moderate	27.4	27.5	27.4	
High	11.0	9.7	10.9	
Comorbid conditions				
Past stroke	20.9	18.6	20.7	.11
Past TIA	29.9	29.4	29.8	.78
Cerebrovascular disease	43.6	42.0	43.4	.36
Coronary artery disease	62.0	60.2	62.9	.28
Congestive heart failure	9.7	10.4	9.8	.51
Hypertension	78.2	81.2	78.5	.05
Diabetes mellitus	29.9	32.0	30.1	.18
Insulin-dependent diabetes	7.5	6.8	7.4	.45
Creatinine >2 preoperatively	4.9	5.8	5.0	.23
COPD	19.8	13.7	19.2	<.0001

Patient Characteristics	Fee-For-Service (%) (N=8691)	Managed Care (%) (N=897)	Total (%) (N=9588)	P Value
Severe disability (Rankin 4 or 5)	2.6	2.1	2.6	.37
Ipsilateral carotid artery stenosis				
100%	0.9	0.8	0.9	.45
70–99%	93.5	94.6	93.6	
50–69%	4.0	3.4	4.0	
0–49%	1.6	1.2	1.5	
Contralateral carotid artery stenosis				
100%	5.1	5.5	5.1	.75
70–99%	23.8	24.5	23.8	
50–69%	10.4	11.2	10.5	
0–49%	60.8	58.9	60.6	

Ipsilateral stenosis refers to the operated carotid artery for asymptomatic cases and the symptomatic artery for symptomatic ones.

The P values in the Table indicate that extent to which there were statistically significant differences between Fee-For-Service and Managed Care patients on a given variable (e.g., sociodemographics or clinical factors). Comparisons were based on chi square, student's t, and Wilcoxon rank sum tests as appropriate.

Table 2

Clinical Indications for CEA in Fee-For-Service (FFS) and Medicare Care (MC) Patients (N=9588)

Clinical Indication for Surgery *	Total N	Total %	FFS %	MC %
Carotid TIAs or amaurosis fugax:	1763	18.4	18.2	17.5
Crescendo carotid TIAs	15	0.2	0.2	0.1
Stroke-in-evolution	15	0.2	0.2	0.0
Minor stroke:	718	7.5	7.3	8.9
Major stroke:	144	1.5	1.6	1.3
Asymptomatic carotid artery:				
Asymptomatic: CEA alone	6573	68.6	68.6	68.4
Asymptomatic: CEA and CABG	280	2.9	2.9	3.3
Vertebrobasilar TIAs	80	0.8	0.8	0.8
Major Indications for Surgery **				
Asymptomatic	6653	69.4	69.4	68.2
Symptomatic	2655	27.7	27.7	27.4
Asymptomatic: Combined CEA and CABG	280	2.9	3.3	2.9

There were no significant differences in FFS v. MC in the distribution of indications for surgery regardless of how broadly clinical indications were grouped or not.

Row % are rounded to nearest tenth, and may not exactly add up to 100%.

* P=.63

** P=.73

Table 3

Characteristics of Surgeons and Hospitals Performing CEA on FFS and MC Patients

Patient Characteristics	Fee-For-Service (%) (N=8691)	Managed Care (%) (N=897)	Total (%) (N=9588)	P Value
Surgeon Characteristics				
Surgeon CEA volume (cases/year)				
Quintile 1: (1–11)	20.2	22.6	20.4	<.0001
Quintile 2: (12–22)	19.8	21.4	20.0	
Quintile 3: (23–37)	19.6	24.0	20.0	
Quintile 4: (38–69)	20.2	18.5	20.0	
Quintile 5: (70–298)	20.1	13.5	19.5	
Board specialty				
Vascular surgery	52.7	52.3	52.7	<.0001
General surgery	33.6	34.6	33.7	
Neurosurgery	5.4	2.1	5.1	
Cardiothoracic surgery	6.9	9.4	7.1	
Missing	1.4	1.7	1.5	
Yrs since graduation from med. school				
≤ 10	7.5	10.7	7.8	.002
11–20	34.0	33.4	34.0	
21–30	35.4	33.0	35.2	
31–40	19.4	17.9	19.2	
≥ 41	3.7	5.1	3.8	
Hospital Characteristics				
Hospital CEA volume (cases/year)				
Quintile 1: (1–32)	20.4	20.3	20.4	<.0001
Quintile 2: (33–54)	18.6	25.4	19.2	
Quintile 3: (55–100)	19.8	19.2	19.7	
Quintile 4: (101–175)	20.7	22.1	20.8	
Quintile 5: (176–303)	20.5	13.0	19.8	
Teaching Hospital	39.2	37.7	39.1	.37
Metropolitan Statistical Area				
<500,000 residents	15.8	8.0	15.0	<.0001
500,000–1,000,000	20.3	4.1	18.8	
1 to 2.5 million	19.7	21.3	19.8	
>2.5 million	44.3	66.6	46.4	

P values indicate that extent to which there were statistically significant differences between Fee-For-Service and Managed Care patients on a given variable (e.g., surgeon or hospital characteristics).