

A Quantitative Analysis of the Relationship between Medicare Payment and Service Volume for Glaucoma Procedures from 2005 through 2009

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Purpose: To calculate the association between Medicare payment and service volume for 6 commonly performed glaucoma procedures.

Design: Retrospective, longitudinal database study.

Subjects: A 100% dataset of all glaucoma procedures performed on Medicare Part B beneficiaries within the United States from 2005 to 2009.

Methods: Fixed-effects regression model using Medicare Part B carrier data for all 50 states and the District of Columbia, controlling for time-invariant carrier-specific characteristics, national trends in glaucoma service volume, Medicare beneficiary population, number of ophthalmologists, and income per capita.

Main Outcome Measures: Payment-volume elasticities, defined as the percent change in service volume per 1% change in Medicare payment, for laser trabeculoplasty (Current Procedural Terminology [CPT] code 65855), trabeculectomy without previous surgery (CPT code 66170), trabeculectomy with previous surgery (CPT code 66172), aqueous shunt to reservoir (CPT code 66180), laser iridotomy (CPT code 66761), and scleral reinforcement with graft (CPT code 67255).

Results: The payment-volume elasticity was nonsignificant for 4 of 6 procedures studied: laser trabeculoplasty (elasticity, -0.27 ; 95% confidence interval [CI], -1.31 to 0.77 ; $P = 0.61$), trabeculectomy without previous surgery (elasticity, -0.42 ; 95% CI, -0.85 to 0.01 ; $P = 0.053$), trabeculectomy with previous surgery (elasticity, -0.28 ; 95% CI, -0.83 to 0.28 ; $P = 0.32$), and aqueous shunt to reservoir (elasticity, -0.47 ; 95% CI, -3.32 to 2.37 ; $P = 0.74$). Two procedures yielded significant associations between Medicare payment and service volume. For laser iridotomy, the payment-volume elasticity was -1.06 (95% CI, -1.39 to -0.72 ; $P < 0.001$); for every 1% decrease in CPT code 66761 payment, laser iridotomy service volume increased by 1.06%. For scleral reinforcement with graft, the payment-volume elasticity was -2.92 (95% CI, -5.72 to -0.12 ; $P = 0.041$); for every 1% decrease in CPT code 67255 payment, scleral reinforcement with graft service volume increased by 2.92%.

Conclusions: This study calculated the association between Medicare payment and service volume for 6 commonly performed glaucoma procedures and found varying magnitudes of payment-volume elasticities, suggesting that the volume response to changes in Medicare payments, if present, is not uniform across all Medicare procedures. *Ophthalmology* 2015;122:1049-1055 © 2015 by the American Academy of Ophthalmology.

Glaucoma is a leading cause of blindness, prevalent in 2.2 million people across the United States.¹ It represents the most common cause of blindness in Hispanic persons, the second most common cause in black persons, and the third most common cause in white persons.² Among all Americans with visual impairment, an estimated 6.1% have primary open-angle glaucoma, and estimates predict that 3.4 million Americans will have glaucoma by 2020.³ As a disease of aging, glaucoma represents a significant portion of annual Medicare expenditures: in 2000, \$1.2 billion was spent on glaucoma treatment, second only to cataract-related expenditures among major eye diseases.⁴ Rising Medicare spending on eye care remains a concern amidst national

policy discussions about effective means to curb healthcare spending.

Congress first introduced the modern-day physician fee schedule for rendered Medicare services in the Omnibus Budget Reconciliation Act of 1989, then later introduced the sustainable growth rate formula in 1997 to contain Medicare spending based on overall economic growth. Since the implementation of the Medicare Physician Fee Schedule (MPFS), the Health Care Financing Administration (now Centers for Medicare and Medicaid Services [CMS]) and the Congressional Budget Office assumed that in response to fee reductions, physicians would recuperate one half of lost revenue by increasing the volume and complexity of

services, which the Health Care Financing Administration termed the 50% behavioral offset.⁵ This assumption was based largely on empirical work conducted by the Physician Payment Review Commission (now the Medicare Payment Advisory Commission).^{6,7} However, the last major study to examine this relationship used data from 1994 to 1996, and there is a dearth of quantitative studies on the association between Medicare payment and service volume for glaucoma procedures.

The purpose of this study was to provide a timely, 5-year, quantitative analysis of Medicare payment and glaucoma service volume using data for the entire United States. We included 6 commonly performed glaucoma procedures in our analysis: laser trabeculoplasty (Current Procedural Terminology [CPT] code 65855), trabeculectomy without previous surgery (CPT code 66170), trabeculectomy with previous surgery (CPT code 66172), aqueous shunt to reservoir (CPT code 66180), laser iridotomy (CPT code 66761), and scleral reinforcement with graft (CPT code 67255).

Methods

Data Sources

Medicare service volume data were obtained using the CMS Part B National Summary Data Files⁸ and Part B Carrier Summary Data Files.⁹ These files contain the total number of allowed services by CPT code, which includes billed services for the physician or surgeon, assistant surgeon, and ambulatory surgery center facility service charge. The national data file includes all procedures performed on Part B Medicare beneficiaries in the United States, and the carrier data file contains all procedures performed within each Medicare Part B carrier, organizations contracted by CMS that exercise jurisdiction over a defined geographical area, usually a state, to administer Medicare policies. Payment data was extracted from the MPFS,¹⁰ which lists the fee schedule and relative value units for procedures by CPT code. All fees were adjusted for inflation according to the Consumer Price Index¹¹ using 2005 as the base year.

For each carrier, CMS has published data from 2005 through 2011. In this study, we included data from 2005 up to 2009 but not beyond because of a change in the MPFS's payment formula midway through 2010. The conversion factor for relative value units into a dollar amount was updated on June 1, 2010, resulting in a different fee schedule for the second half of the year compared with that of the first half.¹² Because volume data are provided by year, data for 2010 and 2011 were excluded to ensure accurate matches in the timing of payment and service volume data.

Regression Analysis

To describe the relationship between Medicare payment and glaucoma service volume, we conducted a retrospective longitudinal analysis of Medicare Part B carriers representing all 50 states and the District of Columbia. Using a fixed-effects regression model, a standard technique used by the Physician Payment Review Commission and other research groups to assess the volume response to payment changes,^{7,13,14} we calculated payment-volume elasticities—defined as the percent change in Medicare service volume per 1% change in Medicare payment—for CPT code 65855 (laser trabeculoplasty), CPT code 66170 (trabeculectomy without previous surgery), CPT code 66172 (trabeculectomy with previous surgery), CPT code 66180 (aqueous shunt to reservoir), CPT code 66761 (laser iridotomy), and CPT code 67255 (scleral

reinforcement with graft). This definition of elasticity is adopted from the standard definition of price elasticity used in the health economics literature.¹⁵ In our model, the Medicare Part B carrier where the surgery was performed served as the independent unit of analysis.

Across carriers, there exists a large degree of variation in the absolute volume of glaucoma services because of patient factors such as demand, population, and demographics, and physician factors such as the number of ophthalmologists and practice behaviors. Rather than comparing the level of glaucoma service volume and Medicare payment, the fixed-effects model calculates the association between changes in service volume and payment while controlling for both carrier-specific characteristics and national trends in glaucoma service volume. Taking advantage of adjustments in the MPFS formula by the Geographic Practice Cost Index that accounts for regional variations in practice costs,¹⁶ the regression model focuses on the differences in year-to-year Medicare payment changes across carriers. Variation in the Medicare fee schedule across both years and carriers creates a natural experiment to isolate the association between Medicare payment and service volume within a single carrier.¹⁷ A dummy variable representing each Medicare Part B carrier was included in the regression model to account for intercarrier heterogeneity that was stable over time, such as time-invariant regional variations in patient demand and demographics and physician practices. We included an additional time variable to control for national trends in service volume because of factors that affected the entire country. The regression model also controlled for carrier-level changes in Medicare beneficiary population, number of ophthalmologists, and income per capita obtained from the Area Health Resources File,¹⁸ in addition to heteroscedasticity to account for non-normally distributed standard errors as determined by the modified Wald test.

Mathematically, the carrier and time fixed-effects regression model can be represented as follows:

$$V_{ijk} = \beta_0 + \beta_1 P_{ijk} + \beta_2 A_{jk} + \beta_3 B_{jk} + \beta_4 C_{jk} + \alpha_j - \gamma_k + \varepsilon_{ijk}$$

In this model, V_{ijk} is the service volume and P_{ijk} is the Medicare fee for procedure i in carrier j and year k . A_{jk} , B_{jk} , and C_{jk} represent the number of Medicare beneficiaries, number of ophthalmologists, and income per capita, respectively, in carrier j and year k . β_0 is the fixed-effects parameter representing the y -intercept, α_j is the fixed-effects parameter that represents the stable characteristics of each carrier, γ_k is the correction for the national trend in service volume, and ε_{ijk} is the error term. β_1 , β_2 , β_3 , and β_4 are the regression coefficients to be estimated and represent the effect of their respective covariates on service volume. Because each variable was log transformed, β_1 can be interpreted as the percent change in service volume per 1% change in Medicare payment, or the payment-volume elasticity. Statistical analyses were conducted using StataMP 13 (StataCorp LP, College Station, TX) with 2-sided significance testing and statistical significance set at $P = 0.05$. Institutional review board approval was not obtained because this research did not involve human subjects, human-derived materials, or human medical records and did not fall under the Department of Health and Human Services Office for Human Resource Protections regulation 45 CFR part 46.

Results

National Trends

From 2005 to 2009, the 3 highest paid glaucoma procedures by Medicare were trabeculectomy with previous surgery (\$1097.49–\$1171.62), trabeculectomy without previous surgery

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