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Nonmedical Out-of-Pocket Patient and Companion Expenditures Associated With Glaucoma Care

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Abstract

Purpose: Nonmedical out-of-pocket cost to both patients and their companions of office visits for routine glaucoma care has not been extensively studied in the United States. We evaluate potential key predictors of patient expenditures that are critical to assessing the cost-effectiveness of glaucoma health care delivery.

Materials and Methods: In total, 300 patients responded to the survey in 3 clinics in 2 clinical practice settings. Main outcome measures included both average visit and yearly expenditures.

Results: Of the 300 patients, the majority were female (n = 187, 62.3%) and African American (n = 171, 57.0%). The median age was 66 years. The median [range; mean (SD)] expenditure per patient visit was $22.10 ($11.1, $42.9; $44.1 (72.8)). Patients with companions paid $38.77 more in average visit expenditure (β: 0.87, $P < 0.001$). The average visit expenditure for retired patients was $17.37 less when compared with nonretired patients (β: − 0.4, $P = 0.004$). Patients living in a rural or suburban area paid $43.91 and $14.13 more per visit, respectively (β: 0.73, $P = 0.0004$; β: 0.31, $P = 0.03$), compared with patients living in an urban area. Patients with noncommercial insurance paid $24.01 less in average visit expenditure (β: − 0.66, $P = 0.0008$). The median yearly patient expenditure was $96.70 [$44.6, $222.7; $210.4 (333.9)]. Patients with companions paid $192.37 more in yearly expenditure (β: 0.9, $P < 0.001$) than those without companions, whereas retired patients paid $80.83 less in yearly expenditure (β: − 0.39, $P = 0.03$) than nonretirees. Patients with noncommercial insurance paid $109.34 less in yearly expenditure (β: − 0.63, $P = 0.01$).

Conclusions: Although a small part of the total cost of glaucoma care, nonmedical out-of-pocket costs constitute a substantial non- covered medical expense to most patients in the United States. Patients who are employed, come with companions, live in non- urban areas, or are on Medicare have greater expenditures.

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Keywords

glaucoma; expenditures; telemedicine; out-of-pocket

Glaucoma is the second leading cause of blindness in the world[1] and is a leading cause of treatable blindness in African Americans[2] and Hispanic Americans.[3] In the United States, direct medical costs for glaucoma care were estimated to be 2.9 billion dollars in 2004,[4] and are expected to rise with increasing prevalence of the disease. Notably, office visits and ancillary testing comprise one half and one third of the cost of glaucoma care, respectively.[5] This comes at a substantial cost to the payer as well as to the patient in terms of nonmedical out-of-pocket expenses.[6]

Most studies reporting the cost of glaucoma care have been conducted from the payer and/or health system perspective. Few studies have adopted a patient/companion perspective and reported on patient expenditures such as direct nonmedical costs (eg, transportation) and indirect costs (eg, lost wages) borne directly by patients and their companions.[7] No prior work to our knowledge has assessed patient expenditures in glaucoma clinics in the United States.

We define patient expenditures as all nonmedical costs borne by the patient as part of the office visit including travel cost, lost wages, foregone leisure time, and companion cost.[7] The objective of our study is to determine the patient expenditures associated with glaucoma care in the United States. Knowledge of this information may be critical to the assessment of the cost-effectiveness of alternative models of health care delivery.

MATERIALS AND METHODS

We adapted a previously validated cross-sectional survey used in the United Kingdom.[7] The study was in accordance with HIPAA regulations, informed consent was obtained from all individual participants included in the study, and the study and survey were approved by the University of Maryland Institutional Review Board. We administered the survey in 2 hospital-based glaucoma clinics and one community-based glaucoma subspecialty practice in the mid-Atlantic region from June to August 2014.

Recruitment and Survey Administration

We invited patients who came for a regularly scheduled office visit to participate in a survey about the nonmedical out-of-pocket costs of glaucoma care. Patients attending visits within the postoperative period were excluded. Inclusion criteria were age 18 or older and diagnosis of glaucoma or glaucoma suspect. Patients who were unable to consent to the survey were excluded. Companions were defined as anyone who came with the patient to the patient visit.

Survey Contents

Demographic factors assessed included gender, ethnicity, geographic location (urban, suburban, or rural), employment status, income, and level of education. In addition, we

collected both primary and secondary insurance information from a chart review. The survey included all out-of-pocket patient and companion expenditures related to the visit including the cost of transportation, travel time, leisure time, childcare, and lost wages. To assess travel cost, patients were asked about the methods that they used to come to and from the physician's office, and the cost of bus fare, cab fare, parking charges, and/or car mileage. To assess potential lost wages, patients and companions reported their hourly wage, hours per week that they worked, the amount of time they took off of work, and if there was a loss of earnings related to their clinic visit (see Text file, Supplemental Digital Content 1, http://links.lww.com/IJG/A99 which provides complete survey contents). Loss of earnings was calculated from these self-reported responses. Loss of wages was self-reported from companions based on what they lost due to accompanying the patient to the appointment that day. Median household income was determined using patient zip code information linked to 2012 US Census zip code-level data.[8] We collected clinical data from a patient chart review including diagnosis, visual field defects, intraocular pressure, visual acuity, duration of disease, prior laser therapy, prior surgical therapy, number of office visits in the past 12 months (including visits made solely for testing), and ocular medications. The most recent visual field was graded for severity using Brusini Glaucoma Staging System (GSS2) staging model[9] and dichotomized to visual fields that were GSS Stage 2 or better or Stage 3 or worse. Field reliability was not graded.

We determined the cost of transportation by car using mileage reimbursement rates from the Maryland Department of Budget and Management.[10] Public transportation costs were accounted for by determining the fare or equivalent fare for those receiving fare subsidies.

For adult patients and companions who were not taking time off of work, leisure time was recorded as a monetary equivalent. As per convention,[11] leisure time is defined as 30% of the US federal minimum wage[12] ($7.25) for all patients or companions who did not lose wages as a result of attending the appointment. We calculated this for a 2-hour appointment time, the average appointment time at all clinics, including testing and workup.

Mean visit expenditure (*MVE*) includes the actual amount paid for transportation (*TR*) or mileage (*M*), parking charges (*P*), wages lost from work (*W*), leisure time (*LT*), and other costs, such as the cost of babysitters/nannies (*O*). The community-based glaucoma subspecialty practice did not have parking charges.

$$(TR) + (M) + (P) + (W) + (LT) + (O) = (MVE).$$

The mean visit and yearly expenditure for patients who came with companions includes both the patient expenditure and their respective companion's expenditure. We calculated yearly expenditure (*YE*) by multiplying the mean visit expenditure (*MVE*) by the number of visits in the past 12 months (*V*) for each patient.

$$(MVE)(V) = (YE).$$

Statistical Analysis

We report variables as either medians (25th, 75th percentile) or as percentages. Univariate analysis was performed with the mean visit and yearly expenditure including the leisure time as the outcome variable. Covariates that were statistically significantly associated with the mean visit and yearly expenditure were included in the final multivariable generalized linear model (GLM) with gamma distribution. The gamma GLM model parameter coefficients are not measured in dollars, which limits their use for estimating the cost increase or decrease associated with a model covariate. We present results based on the point average marginal effect (ME) estimates from the GLM regression model. The point average ME is a function of the GLM model parameter coefficients. The ME for a given model covariate is measured in dollars and thus represents the increased or decreased costs associated with the covariate. Because of the sample size and the distribution of the cost data, there was no data support for using standard methods (eg, bootstrap method, Fieller theorem) to calculate a confidence interval on the ME. All analyses were performed using SAS (version 9.2, SAS Institute Inc., Cary, NC) with a type I error of 0.05. The results in each row of Table 2 are based on a regression model that includes the intercept and 1 covariate, that is, the covariate listed in the particular row. These are unadjusted results, whereas the results in Table 3 are covariate-adjusted results.

RESULTS

As shown in Table 1, of the 300 participants in the study, the majority were female (n = 187, 62.3%) and African American (n = 171, 57.0%). The median age of all respondents was 66 years. The number of retired respondents was 135 (45.0%) and 89 (29.7%) were employed. In total, 138 (46.0%) patients attended the doctor's visits with companions. The median number of visits per 12 months was 4.0. The median [range; mean (SD)] expenditure per patient visit was $22.10 [$11.1, $42.9; $44.1 (72.8)]. The median yearly patient expenditure was $96.70 [$44.6, $222.7; $210.4 (333.9)]. All patients approached to complete the survey were English-speaking, although this was not a requirement of the study.

The nonresponse rate to our survey's questionnaire was 17.1% (n = 62). The median age of nonresponders was 69.5 years. In total, 50 (80.6%) nonresponders were African American, 7 (11.3%) were white, and 5 (8.1%) were other. A total of 27 (43.5%) nonresponders were male and 35 (56.5%) female (P = 0.39). The response rate among African Americans was 77.4% compared with 91.5% for non- African Americans (P < 0.001). The average age of nonresponders was 65.2 ±11.8 compared with responders' average age of 68.5 ± 13.8 (P = 0.09) (see Text file, Supplemental Digital Content 2, http://links.lww.com/IJG/A100 which provides complete nonresponder data).

The majority (82%) of companions were family members. In total, 58% of companions were not employed, and among those that were employed, the majority were employed in professional or clerical jobs. Patient reasons for the companion attending the office visit were: 22% of patients reported "vision problems," 23% reported "car/driving problems," 20% reported "dilation," whereas 18% listed "moral support." Various other reasons were provided by the remaining (< 10%) of patients.

Table 2 reports the univariate analysis for yearly expenditure, whereas Table 3 reports the multivariable analysis and the covariate-adjusted associations between the outcomes and the risk factors using the γ GLM and the point average ME.

Compared with unemployed nonretired patients, mean visit expenditure for retired patients was statistically significantly less (β: − 0.4, $P = 0.004$; ME = − $17.37). For patients with companions, mean visit expenditure was significantly higher compared with patients without companions (β: 0.87, $P < 0.001$; ME = $38.77). Compared with patients with Medicare as their primary insurance, patients with other insurance (neither commercial nor Medicare) paid significantly less in mean visit expenditure (β: − 0.66, P = 0.0008; ME = − $24.01). Patients living in a rural or suburban area paid significantly more in mean visit expenditure (β: 0.73, $P = 0.0004$, ME = $43.91; β: 0.31, $P = 0.03$, ME = $14.13) compared with patients living in an urban area.

Retired patients also paid less in yearly expenditure (β: − 0.39, $P = 0.03$; ME = − $80.83), whereas yearly expenditure for patients with companions was significantly higher than patients without companions (β: 0.9, $P < 0.001$; ME = $192.37). Patients with other insurance paid significantly less in yearly expenditure (β: − 0.63, $P = 0.01$; ME = − $109.34). Compared with patients living in urban areas, patients living in rural or suburban areas paid more in yearly expenditure (β: 0.48, $P = 0.06$, ME = $127.32; β:0.34, $P = 0.05$, ME = $73.73).

In total, 208 (69.3%) patients utilized their cars for transportation, 38 (12.7%) used the bus, 18 (6.00%) used fare subsidies, 8 (2.67%) patients walked, 14 (4.67%) used a taxi, and 14 (4.67%) used >1 form of transportation. Rural, suburban, and urban patients paid, on an average, $64.38, $25.40, and $6.67 in mileage reimbursements, respectively.

Medicare patients had a mean of 5.91 ± 4.67 visits, whereas patients with commercial and other insurance had means of 4.92 ± 3.70 and 6.00 ± 5.17, respectively. Patients living in urban settings had a mean visit number of 6.22 ± 4.85, those living in suburban settings had a mean of 5.29 ± 4.15, and those living in rural settings had a mean of 3.67 ± 2.20.

DISCUSSION

We quantified the patient and companion nonmedical out-of-pocket expenditures associated with receiving routine glaucoma care in this sample. We found the mean expenditure per visit to be $22.10, with an interquartile range of $11.10 to $42.90. The yearly expenditure averaged $96.70, with an interquartile range of $44.60 to $222.70. Ultimately, patients who were younger, came with companions, had Medicare as insurance, lived in a rural or suburban area, and were employed, paid more in our analysis.

The main predictors of patient expenditures associated with glaucoma office visits in our study were retired status, age, presence of a companion, Medicare as primary insurance, and living in a suburban or rural area. Expenditures associated with glaucoma visits were lower among retired persons, likely because they did not lose wages as a result of attending the appointment. Similarly, older patients were more likely to be retired, and lower mean visit and annual expenditures were associated with greater age. Whereas retirees paid less,

nonmedical out-of-pocket expenditures could make an important difference in the cost of living for such individuals with limited income. Although nonresponders were more likely to be African American in the studied population, the overall response rate among African Americans was relatively high at 80.6%. Given that race was not a significant predictor of cost in our study, this difference would not substantially alter the data. Although other differences between responders and nonresponders that we did not measure could influence results, the overall response rate of 82.9% is high.

Expenditures were higher among patients who attended the appointment with companions compared with those who did not attend with a companion. This indicates that there are real economic costs associated with companions attending patient visits. Expenditures among patients with Medicare were generally higher than patients without Medicare as the primary insurance. On an annual basis, this may be because Medicare patients had more appointments per year than those with commercial insurance, increasing the annual cost. Compared with patients living in urban areas, patients living in rural or suburban areas had greater expenditures per visit and per year despite having fewer visits per year. This population has a longer distance to travel to appointments and may lack alternative transportation options that would be available in urban areas. This is yet another potential support for the use of teleglaucoma in this population, which would decrease the barrier of the distance and time required to get adequate monitoring and care.

Patients in our study had a higher number of visits per year on an average as compared with prior investigations.[5,13] We observe that these previous works focused on patients with primary open-angle glaucoma, whereas our sample included patients with angle-closure glaucoma and secondary glaucomas. These patients may have had more severe disease and required closer follow-up, hence more visits on an average. Another potential reason for the greater visits per year may be due to some patients opting for separate visits for testing. Given the higher number of visits per year in this sample, the mean visit expenditure may be more representative of patient cost than the yearly expenditure.

With a few exceptions noted below, most available studies reporting factors associated with glaucoma expenditures either did not identify factors associated with higher patient expenditures or focused on direct medical costs.[14]

A pilot study of teleophthalmology conducted in Finland by Tuulonen et al[15] found that patients saved an average of $55 in travel costs when they attended a rural health care center utilizing teleglaucoma rather than attending a university center, in addition to reducing traveling and time spent at the appointment. This study is consistent with our findings; patients residing in rural areas in this study paid a comparable amount ($64.38) in mileage reimbursement to Tuulonen $55 saved in travel costs. A similar study in the United Kingdom conducted by Sharma and colleagues reported patient expenditures of £12.90 to £16.20 (~$19.17 to 24.07 USD)[16] across 6 hospital-based urban clinics. This is consistent with the average visit expenditure found in this study of $22.10.

Our results highlight the need to both account for and potentially reduce patient and companion expenditures in obtaining glaucoma care. Nonmedical out-of-pocket patient

expenditures may have a greater effect on patient adherence to office appointments than direct medical costs[17] as patients bear those costs completely, whereas direct costs are partially or completely covered by insurance. The British National Health Service has identified the reduction of routine glaucoma visits as a major area of future research and notes that an alternative glaucoma care system would focus care on patients with increased risk and would decrease the number of office visits.[18] Alternative care systems that utilize telemedicine could substantially decrease the cost of care, and potentially improve patient satisfaction, as patients prefer traveling shorter distances to more convenient teleophthalmology locations.[15]

Only patients who were already scheduled for clinic visits were recruited for the study. Thus, a limitation of the study is that patients for whom in-person visits were cost-prohibitive could not be included. The cost for such patients might be higher, and thus the potential patient expenditure may be higher. We were not able to determine the copay or coinsurance for each patient, which is a component of patient cost. We observe that these costs may still be present in a teleglaucoma system. Although the cost of transportation itself is accounted for in this study, travel time and its associated cost was not assessed. As the study was done in 3 clinics in 2 clinical practice settings in the mid-Atlantic region, it may not be representative of the entire United States, but we observe that the diversity in practice location provides a patient population from urban, suburban, and rural areas. Whereas study respondents had a higher level of education[19] and were more likely to be African American than the United States glaucoma pop- ulation,[20] neither race nor education was a significant predictor of cost in our study.

Alternative models of glaucoma care utilizing telemedicine have been proposed in countries such as the Netherlands, Kenya, Canada,[21–23] and in the United States.[24] Vision centers using telemedicine are now mature in southern India at the Aravind Eye Care System and such models have been shown to improve access to care.[25] Knowledge of patient expenditures will be crucial in determining the cost-effectiveness of these models of health care delivery for glaucoma. Clinicians may consider the additional out-of-pocket costs in determining the frequency of follow-up for glaucoma patients. This information is important to the scientific community as a whole as well as researchers who wish to define areas of cost improvement in glaucoma long-term care.

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Table 1.

Characteristics of the Study

Characteristics	Median (25th, 75th Percentile) or [N (%)]
Age (y)	66 (57, 75)
Sex (%)	
Male	113 (37.7)
Female	187 (62.3)
Greater than high school diploma (%)	
Yes	124 (41.3)
No	176 (58.7)
Median household income ($)	57,949 (36,532, 72,868)
Location (%)	
University	165 (55.0)
Private practice	135 (45.0)
Race (%)	
African American	171 (57.0)
White	114 (38.0)
Other	15 (5.0)
Employment (%)	
Employed	89 (29.7)
Retired	135 (45.0)
Unemployed nonretired	76 (25.3)
Companion (%)	
Yes	138 (46.0)
No	162 (54.0)
GSS3 or worse (%)	
Yes	134 (48.6)
No	142 (51.4)
Primary insurance type (%)	
Commercial	104 (34.7)
Medicare	155 (51.7)
Other	41 (13.6)
Secondary insurance type (%)	
Commercial	112 (37.3)
Self-pay	132 (44.0)
Other	56 (18.7)
Visits in 12 mo	4.0 (3.0, 7.0)
Average visit expenditure including leisure time ($) *	22.1 (11.1, 42.9)
Yearly expenditure including leisure time ($) *	96.7 (44.6, 222.7)
Household settings (%)	
Urban	147 (49.0)
Suburban	129 (43.0)

Characteristics	Median (25th, 75th Percentile) or [N (%)]
Rural	24 (8.0)

* Value reported is the median of the mean visit and yearly expenditure.

GSS3 indicates Glaucoma Staging System, stage 3.

Table 2.

Univariate Analysis With Yearly Expenditure Modeled With Gamma Distribution

Characteristics	β	SE	*P*
Age (y)	− 0.02	0.005	0.001
Sex			
Male	0.09	0.13	0.50
Female	0		
Greater than high school diploma			
Yes	0.34	0.13	0.008
No	0		
Median household income ($1000)	0.01	0.002	< 0.001
Location			
University	− 0.34	0.13	0.008
Private practice	0		
Race			
African American	− 0.29	0.13	0.02
Other	0		
Employment			
Employed	0.32	0.17	0.06
Retired	− 0.28	0.16	0.07
Unemployed nonretiree	0		
Companion			
Yes	0.62	0.13	< 0.001
No	0		
Visual field defect of GSS3 or worse			
Yes	− 0.08	0.13	0.57
No	0		
Primary insurance type			
Commercial	0.41	0.14	0.004
Other	− 0.14	0.19	0.47
Medicare	0		
Secondary insurance type			
Self-pay	0.46	0.17	0.008
Commercial	0.01	0.18	0.95
Other	0		
Household settings			
Rural	0.77	0.24	0.001
Suburban	0.57	0.13	< 0.001
Urban	0		

GSS3 indicates Glaucoma Staging System, stage 3.

Table 3.

Multivariable Analysis With Yearly Expenditure and Average Visit Expenditure Modeled with Gamma Distribution

	Mean Visit Expenditure			Yearly Expenditure		
Characteristics	**β**	***p****	**ME ($)†**	**β**	***p****	**ME ($)†**
Age (y)	− 0.01	0.02	− 0.85	− 0.01	0.04	− 5.01
Greater than high school diploma						
Yes	0.02	0.83	1.12	0.15	0.33	33.48
No	0			0		
Median household income ($1000)	0.004	0.08	0.14	0.003	0.25	0.55
Location						
University	− 0.09	0.44	− 4.20	0.07	0.67	14.17
Private practice	0			0		
Race						
African American	− 0.24	0.08	− 10.79	− 0.01	0.94	− 3.00
Other	0			0		
Employment						
Employed	0.35	0.02	16.20	0.12	0.50	27.25
Retired	− 0.40	0.004	− 17.37	− 0.39	0.03	− 80.83
Unemployed nonretiree	0			0		
Companion						
Yes	0.87	< 0.001	38.77	0.90	< 0.001	192.37
No	0			0		
Primary insurance type						
Commercial	− 0.34	0.03	− 15.93	− 0.24	0.25	− 52.87
Other	− 0.66	0.0008	− 24.01	− 0.63	0.01	−109.34
Medicare	0			0		
Secondary insurance type						
Self-pay	0.65	< 0.001	28.57	0.32	0.13	68.79
Commercial	0.12	0.39	5.72	0.06	0.74	13.03
Other	0			0		
Household settings						
Rural	0.73	0.0004	43.91	0.48	0.06	127.32
Suburban	0.31	0.03	14.13	0.34	0.05	73.73
Urban	0			0		

*Hypothesis test for statistical significance of GLM regression coefficient (ie, β).

†ME calculated for gamma GLM regression coefficient.

GLM indicates generalized linear model; ME, marginal effect.