Resource Utilization and Costs of Age-Related Macular Degeneration

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Data were analyzed from the 1999-2001 Medicare Beneficiary Encrypted Files for patients with age-related macular degeneration (AMD), an ophthalmic condition characterized by central vision loss. Classifying AMD subtype by International Classification of Diseases, Ninth Revision, Clinical Modifications (ICD-9-CM) (Centers for Disease Control and Prevention, 2003) code, resource utilization rates increased with disease progression. Individuals with more severe disease (wet only or wet and dry AMD) had greater costs than did those with less severe disease (drusen only or dry only). Costs among patients with wet disease increased yearly at rates exceeding inflation, possibly due in part to increased rates of treatment with photodynamic therapy among these individuals and the aging of the population.

INTRODUCTION

AMD is an ophthalmic condition characterized by acquired lesions of the macula region. These pathologic changes usually appear in individuals age 50 or over and result in alteration of central visual function. Lesions are associated with abnormalities of the retinal pigment epithelium and/or the sensory retina (cone and rod photoreceptors), and may be related to the appearance of drusen (hyaline deposits beneath the retinal pigment epithelium). The appearance of drusen alone does not cause vision loss, although change in drusen size or number is associated with increased risk for development of AMD.

There are two basic forms of AMD: atrophic (dry) and exudative (wet). Dry AMD, the more common form of the disease, occurs in approximately 85 to 90 percent of patients with AMD and is generally slow to progress. An advanced form of dry AMD, geographic atrophy, occurs in about 5 percent of patients and may be characterized by a gradual loss of visual function. Wet AMD, which is characterized by choroidal neovascularization (CNV), is usually more severe and is responsible for 90 percent of vision loss attributed to AMD. It occurs in only about 10 percent of patients with AMD (Macular Degeneration Partnership, 2005). A recent report from the Age-Related Eye Disease Study (AREDS) indicated that approximately 8 million persons in the U.S. age 55 or over have some form of intermediate or advanced AMD (Clemons et al., 2003).

Wet AMD is commonly associated with clinically significant loss of vision, regardless of either the original location or characteristics of the CNV. Treatment options for AMD are limited. Currently, three approved treatment options exist for patients with exudative AMD: (1) laser photocoagulation, (2) ophthalmic photodynamic therapy (PDT) with verteporfin, and (3) pegaptanib sodium injection. Many AMD patients do not meet the criteria for treatment, i.e., they have early or intermediate AMD without CNV (American Academy of Ophthalmology, 2005). For those who do meet the criteria and are

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treated, patients may still experience high rates of recurrence in treated vessels, the need for repeat procedures, and/or clinically significant vision loss (Fine et al., 2000; O'Neill et al., 2001). In addition to these currently used therapies, other therapies are being investigated.

In addition to increasing morbidity and decreasing patient quality of life, AMD is likely associated with substantial medical care costs. However, much of the literature on the costs of visual impairment has focused on glaucoma, cataracts, and diabetic retinopathy. These conditions are more prevalent than AMD in the U.S. population age 50 or over. Prevalence of glaucoma is 8 percent among individuals with diabetes and 4 percent in people without diabetes; prevalence of cataracts is 34 versus 20 percent in individuals with and without diabetes, respectively; and prevalence of diabetic retinopathy is 10 percent (Centers for Disease Control and Prevention, 2004). In contrast, the prevalence of AMD is approximately 3 percent in older Americans, regardless of diabetes status (Centers for Disease Control and Prevention, 2004). In a review of cost of illness issues in AMD, O'Neill and colleagues (2001) reported that few data are available on the direct costs of AMD. Given the age distribution of AMD, most patients in the U.S. receive coverage of medical services from Medicare; thus, Medicare data could be considered the most appropriate source of information on resource utilization and costs of AMD. The objective of this study was to evaluate resource utilization, treatment patterns, and medical care costs for AMD patients using Medicare claims data and to compare results for patients with dry versus wet disease.

METHODS

Data were analyzed from the 1999, 2000, and 2001 Medicare Beneficiary Encrypted Files (BEF). The BEF represents a random 5-percent sample of all Medicare enrollees and is representative of all U.S. citizens age 65 or over. The random sample used for this claims data set is selected based on the same algorithm each year. Thus, the same patients are included in the BEF data each year (unless they die) as well as new patients entering each year; therefore, longitudinal treatment patterns can be evaluated. The BEF data consist of seven claims components: (1) Inpatient; (2) Outpatient; (3) Durable Medical Equipment; (4) Hospice; (5) Home Health Agency; (6) Skilled Nursing Facility (nursing home); and (7) Physician/Supplier (Part B) claims.

For this study, data from the Outpatient and Part B (Physician/Supplier) files from all patients with two or more claims for AMD (ICD-9-CM 362.5) were included. Two separate claims with an AMD diagnosis code were required as patients with a single claim for this diagnosis may be related to a rule-out visit for AMD. Furthermore, patients were included in the analysis only if they had one or more claims with ICD-9-CM diagnosis codes for specific subtypes of AMD, namely dry (ICD-9-CM 362.51), wet (362.52), or drusen (362.57). Based on these diagnosis codes, patients were classified as having dry AMD, wet AMD, both dry and wet AMD, or drusen only. Patients were classified in the drusen only group if they did not have claims specific for either wet or dry AMD. This group was included in the analysis because of the increased risk for development of AMD compared to a general population. Any AMD patient may have also had a concomitant diagnosis

of drusen; however, patients with a concomitant drusen diagnosis comprised less than 8 percent of each group.

Resource utilization for AMD patients was determined from Outpatient and Part B claims. Costs were derived from Medicare payments. All data analysis was performed using SAS® Version 8.1 (SAS Institute Inc., 2002).

RESULTS

Table 1 presents demographic characteristics of the Medicare BEF patients by AMD subtype and study year (1999, 2000, or 2001). With the exception of drusen-only patients, the proportion of patients with AMD generally increased with age. The greatest proportion of patients in the drusen only category (the earliest stage of AMD) occurred in the 75 to 79 age group. Approximately two-thirds of patients were female and the overwhelming majority (>90 percent) was white.

Table 2 presents resource utilization data from 1999 for the included AMD patients. Resource utilization is presented for all four AMD subtypes. Further, for patients classified as wet only or wet and dry who received PDT, resource utilization is presented separately. In most instances, drusen only patients had the highest rates of resource utilization for diagnostic services. These diagnostic services per patient included retinal ultrasound (0.069) for drusen only, visual refraction (0.56), and visual field examinations (0.13). However, drusen only patients had lower rates of indocyanine-green angiography (0.0024), a procedure used in detecting occult neovascularizations, compared to wet only (0.065) or wet and dry (0.091) AMD patients. Drusen only patients also had lower rates of ophthalmologist visits (1.4), generalist physician visits (0.80), and specialist consultations (0.15) compared to the other specified subgroups. Patients with dry only had similar rates of resource utilization to drusen only patients.

In 1999, both wet only and wet and dry AMD patients had similar rates of resource utilization for certain diagnostic tests, including retinal ultrasound and visual field examinations. However, wet only patients had lower rates than wet and dry patients for visual refraction (0.25 versus 0.37) and indocyanine-green angiography (0.065 versus 0.091). Similarly, wet only AMD patients had lower average annual numbers of ophthalmoscopy (0.82) and of fundus photographs (0.91) compared to values for wet and dry patients (1.39 and 1.43, respectively). With respect to therapeutic procedures, both groups had similar rates of photocoagulation (0.10 versus 0.11) and similar annual number of PDT procedures (0.12 versus 0.16). Wet and dry patients had higher annual numbers of ophthalmologist visits (1.97), generalist physician visits (2.28), and specialist consultations (0.64) compared to all other groups.

Striking differences were seen among wet only and wet and dry patients who received one or more PDT procedures during the year versus those that did not receive any PDT. Patients receiving at least one PDT procedure were also more likely to undergo photocoagulation, fluorescein angiography, indocyanine-green angiography, ophthalmoscopy, and fundus photography. In contrast, patients who did not receive any PDT procedures were more likely to receive retinal ultrasound or visual field examination.

Annual costs reflect these differences in resource utilization. Costs for drusen only and dry only AMD patients for 1999 are similar ($204 to $206). Wet only AMD patients had annual costs two and one-half times those of dry only AMD patients

Table 1

Demographic Characteristics of Medicare Beneficiary Encrypted File Patients, by Age-Related Macular Degeneration Subtype and Year: 1999-2001

Demographic	All Patients	Drusen Only	Dry Only[1]	Wet Only[2]	Dry and Wet[3]
1999	*N*=58,594	*N*=7,788	*N*=38,376	*N*=7,441	*N*=4,989
Age			Percent		
<65 Years	1.1	2.2	1.0	1.2	0.5
65-69 Years	7.6	13.0	7.0	6.5	5.1
70-74 Years	16.3	23.4	15.4	15.2	13.3
75-79 Years	23.8	26.4	23.3	22.7	25.5
80-84 Years	24.2	20.0	24.4	26.0	26.5
>84 Years	27.0	15.0	28.9	28.6	29.0
Sex					
Male	32.7	31.8	32.5	34.2	33.0
Female	67.4	68.2	67.5	65.8	67.0
Race					
White	94.7	92.4	94.9	94.7	96.9
Black	2.3	3.8	2.2	2.0	0.8
Other	3.0	3.8	2.9	3.3	2.3
2000	*N*=61,977	*N*=7,788	*N*=40,301	*N*=8,070	*N*=5,793
Age					
<65 Years	1.0	1.8	1.0	1.1	0.4
65-69 Years	7.1	12.4	6.6	6.2	4.7
70-74 Years	15.8	22.4	15.1	14.6	13.3
75-79 Years	23.6	26.2	23.3	23.2	23.0
80-84 Years	24.5	21.5	24.5	25.7	27.0
>84 Years	28.0	15.7	29.6	29.3	31.6
Sex					
Male	32.5	31.6	32.2	34.3	33.6
Female	66.5	68.4	67.8	65.7	66.4
Race					
White	94.8	92.4	94.8	95.3	97.0
Black	2.1	3.6	2.1	1.6	0.7
Other	3.1	4.0	3.1	3.1	1.8
2001	*N*=60,896	*N*=6,942	*N*=39,162	*N*=8,290	*N*=6,502
Age					
<65 Years	1.0	2.1	0.9	1.0	0.5
65-69 Years	6.2	10.7	5.7	5.9	4.8
70-74 Years	15.0	21.8	14.5	12.8	12.9
75-79 Years	23.0	25.4	22.6	22.7	23.4
80-84 Years	25.4	22.6	25.3	26.4	28.2
>84 Years	29.4	17.5	31.0	31.2	30.3
Sex					
Male	32.5	30.9	32.2	35.0	32.9
Female	67.5	69.1	67.8	65.0	67.1
Race					
White	95.6	93.1	95.5	96.0	97.9
Black	2.1	3.8	2.2	1.5	0.9
Other	2.3	3.1	2.3	2.5	1.2

[1] The proportion of dry only patients who also have a diagnosis of drusen is 4.1 percent in 1999, 4.5 percent in 2000, and 4.9 percent in 2001.

[2] The proportion of wet only patients who also have a diagnosis of drusen is 4.6 percent in 1999, 5.2 percent in 2000, and 5.5 percent in 2001.

[3] The proportion of wet and dry patients who also have a diagnosis of drusen is 7.2 percent in 1999, 7.5 percent in 2000, and 8.2 percent in 2001.

SOURCE: Halpern, M.T., Schmier, J.K., Exponent Inc., Covert, D., Alcon Research Ltd. and Venkataraman, K., AstraZeneca, LP, 2006.

($513), while wet and dry patients had annual costs almost four times those of dry only AMD patients ($767).

Resource utilization patterns for 2000 (Table 3) and 2001 (Table 4) are similar to those from 1999. Patients with drusen only and dry only AMD had similar rates of resource utilization, and had higher rates of most diagnostic tests compared those with wet only or wet and dry AMD. Conversely, drusen only and dry only AMD patients had lower rates of indocyanine-green angiography and photocoagulation procedures, fewer generalist physician visits, and fewer specialist consultations compared to the other specified subgroups. Comparing wet

Table 2

Medicare Age-Related Macular Degeneration (AMD) Resource Utilization and Costs, by AMD Subtype: 1999

			Wet Only			Wet and Dry		
AMD Subtype	Drusen Only *N*=7,788	Dry Only *N*=38,376	All *N*=7,441	Wet Only, No PDT *N*=6,955	Wet Only, PDT *N*=486	All *N*=4,989	Wet and Dry, No PDT *N*=4,566	Wet and Dry, PDT *N*=423
Diagnostic Procedures[1]								
Fluorescein Angiography	0.14	0.2	1.08	0.84	4.51	1.7	1.41	4.79
Fundus Photography	0.21	0.24	0.91	0.73	3.6	1.43	1.19	4.02
Indocyanine-Green Angiography	0.0024	0.0016	0.065	0.049	0.29	0.091	0.067	0.35
Ophthalmoscopy	0.54	0.41	0.82	0.77	1.5	1.39	1.31	2.26
Retinal Ultrasound	0.069	0.069	0.051	0.053	0.023	0.062	0.066	0.023
Visual Field Exam	0.13	0.1	0.1	0.11	0.054	0.12	0.12	0.082
Visual Refraction	0.56	0.46	0.25	0.25	0.24	0.37	0.38	0.33
Therapeutic Procedures[1]								
Photocoagulation	0.012	0.0084	0.1	0.097	0.2	0.11	0.11	0.15
Photodynamic Therapy (PDT)	0	0	0.12	0	1.85	0.16	0	1.84
Physician Interactions[1]								
Ophthalmologist Visits	1.4	1.31	1.38	1.37	1.53	1.97	1.95	2.19
Generalist Visits	0.8	0.89	1.32	1.28	1.99	2.28	2.25	2.65
Consultations	0.15	0.17	0.36	0.33	0.81	0.64	0.61	0.97
Total Reimbursement[2]	$205.93	$204.43	$512.52	$392.25	$2,233.74	$767.03	$612.95	$2,430.30

[1] Annual rate of resource utilization per patient.

[2] Annual cost per patient.

SOURCE: Halpern, M.T., Schmier, J.K., Exponent Inc., Covert, D., Alcon Research Ltd. and Venkataraman, K., AstraZeneca, LP, 2006.

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