HHS Public Access

Author manuscript

Am J Ophthalmol. Author manuscript; available in PMC 2018 January 01.

Published in final edited form as:

Am J Ophthalmol. 2017 January ; 173: 70–75. doi:10.1016/j.ajo.2016.09.030.

Trends in Prevalence of Diagnosed Ocular Disease and Utilization of Eye Care Services in American Veterans

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Abstract

Purpose—To assess trends in prevalence of diagnosed ocular disease and utilization of eye care services in the VA healthcare system.

Design—Prevalence study

Methods—We performed a retrospective study of all eligible Veterans in the VA Capitol Health Care Network from 2007 to 2011. The VA database was used to abstract demographic and socioeconomic variables including age, race, gender, marital status, service connection, prescription copay, homelessness, VA facility. Primary outcome measures were prevalence of diagnosed ocular disease and utilization of eye care. Ocular diagnoses were determined by ICD-9 codes and utilization by prescription medication fills, visits to eye care clinics, and cataract surgery frequency.

Results—The average age of Veterans ranged from 59.8–60.9, the majority of Veterans were male (88.1– 89.8%), and there was a high proportion of African Americans (29.5–30%). The prevalence of all ocular diagnoses increased from 20.5% in 2007 to 23.3% in 2011 ($P < 0.01$), a 13.7% increase. Similarly, the prevalence of diagnosed cataract increased by 35.7% ($P=0.02$) from 7.1% in 2007 to 9.6% in 2011. Diagnosed glaucoma prevalence increased by 9.4% ($P = 0.03$) from 6.7 to 7.4%. The percent of patients seen in eye clinics increased 11.6%% in the five-year study

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period to 24.0% in FY 2011 (P = 0.05). Utilization of ophthalmic medications increased 20% (P < 0.01). The rate of cataract surgery did not change significantly during the study period.

Conclusions—The prevalence of diagnosed eye conditions among American Veterans is increasing, as is the utilization of eye care services. Cataract surgery rates did not increase, which may indicate a need to increase availability of these services.

Introduction

As the U.S. Veteran population ages, ensuring that this population has access to routine eye care and surveillance and treatment for ocular diseases will require increased resources for the Department of Veterans Affairs (VA) healthcare system. The Veterans Health Administration is the largest integrated health care system in the United States with over 1700 sites of care, serving 8.76 million Veterans each year,[1] nearly half of which are over the age of 65[2]. Given the higher prevalence of age related eye diseases that come with an aging population, there is a growing need for eye care services in the VA. Indeed, from 2006–2010 there was a 19.4% increase in number of Veterans seen in VA optometry or ophthalmology clinics nationally, with some regions seeing more than a 50% increase in eye clinic utilization[3]. Regular eye care is necessary to prevent potentially blinding conditions which come at high cost in terms of individual disability as well as cost to the VA[4] .

Currently, information about the characteristics of Veterans with eye conditions and prevalence trends for specific eye conditions is lacking. Few studies have assessed the prevalence of ocular disease in the Veteran population [3,5,6] and none to our knowledge have focused on the overall diagnosed prevalence of ocular disease in Veterans at multiple sites. Determination of the diagnosed prevalence of ocular disease in Veterans is of particular importance so that the VA can appropriately allocate resources to treat and prevent potentially blinding conditions. Furthermore, recent legislation allowing Veterans to seek care privately[7] means that the prevalence of ocular disease in this population is more relevant to the general medical community. To our knowledge this is the first study to assess comprehensively the prevalence of ocular disease among patients in multiple VA sites over multiple years.

Methods

We conducted a retrospective review of Veterans in the VA Capitol Health Care Network (VISN 5) from 2007–2011. Data for this study were obtained from the VA pharmacy and health care utilization databases for patients seen from FY 2007 – FY 2011 in VISN 5, the service region that encompasses Maryland, Washington DC, Northern Virginia, Northeastern West Virginia, and portions of Pennsylvania. This area is served by four VA hospitals and by a network of freestanding VA hospital-affiliated outpatient medical clinics. This study was approved by the Institutional Review Board of the University of Maryland, Baltimore, and the VA Research Committee of the VA Maryland Health Care System. Data used for this study included administrative encounter records of inpatient and outpatient health services provided within VA facilities as well as medications dispense by VA pharmacies. Records include information on patient demographic characteristics, ICD-9 diagnostic codes, types and locations of inpatient and outpatient health services, and medications dispensed.

The sample included all Veterans in the VA Capitol Health Care Networks who had at least two contacts (inpatient or outpatient) with the VA system in each year from FY 2007 to FY2011. Demographic and VA healthcare characteristics recorded included age, race, gender, marital status, service connection, prescription copay, homelessness, VA facility location, diabetes diagnosis, and psychotic disorder diagnosis. Race was assigned based on designation at any point in the study period. Patients were classified as diabetic if they had ≥2 inpatient or outpatient records with diagnostic codes of 250.0–250.9, 357.2, 362.0, or 366.41, a method previously validated for VA data.[8] Ophthalmic diagnoses were abstracted from ICD-9 codes assigned at each visit. Ophthalmic diagnoses of interest included glaucoma, ophthalmic complications of diabetes, and cataract. ICD-9 codes used for these diagnoses were derived from a previous paper on prevalence of eye disease among diabetics in the VA system[5] and are listed in Appendix 1. Eye care services utilization was assessed by frequency of clinic visits to ophthalmology or optometry (VA clinic stop codes 407 and 408), prescription fills, and cataract surgery utilization. The cataract surgery utilization rate was calculated as the rate of cataract surgeries performed per diagnosed cataract. Ocular medications were categorized using the VA pharmacy classification system[9] and we specifically assessed if a Veteran had been prescribed at least one prescription fill of glaucoma medications (VA pharmacy code OP109), eye lubricants for dry eye (OP500), and overall ocular medication use (OPXXX). Frequency of cataract surgeries were recorded using both CPT codes (66850–66984) and ICD-9 Procedure codes (13.2x–13.5x). Service connection in the VA system indicates that the diagnosis being treated is connected to the Veterans' service and care related to that illness is covered by the VA insurance system. Veterans with greater than 50% service connection do not pay a prescription copay.

The frequency of each variable including demographics, prevalence, and utilization was determined in each individual year. Select ocular diagnoses were stratified by race and age for each fiscal year. The prevalence of diabetic retinopathy was calculated both overall as well as among diabetics. The change of frequency in each variable as a percentage was determined from FY 2007 to FY2011 for each variable using regression analysis. Statistical significance of trends was determined and represented on Tables 1– 3. SPSS (IBM, Chicago, IL) was used for statistical analysis.

Results

The total number of VA patients with two or more contacts with the VA system in the VA Capitol Health Care Network increased from 130,709 in FY2007 to 144,395 in FY2011, an increase of 10.5%. The majority of subjects were white males and the mean age ranged from 59.8–60.9 years (Table 1). Overall the proportion of females and Caucasians increased over this study period, and the proportions of African Americans and males declined. Proportionately the number of Veterans who were homeless, had a prescription copay, and came from outside the VA Maryland Health Care System (VAMHCS) increased.

Diagnoses

The prevalence of all major ocular diseases in the study period increased from 20.5% in 2007 to 23.3% in 2011 ($P < 0.01$, Table 2), an increase of 13.4%. The highest prevalence of

any category was disorders of refraction and accommodation which increased from 8.5% in 2007 to 13.1% in 2011 (P < 0.01), a 54.1% increase in prevalence. Cataract was the most common diagnosis other than refractive error (6.7–9.6%) followed by glaucoma (6.74–7.38%). The prevalence of cataract increased 35.7% (P = 0.02) and glaucoma 9.4% (P = 0.03) from FY 2007 – FY 2011. Ophthalmic complications of diabetes ranged from 2.0–2.4% in the study period and did not change significantly (P = 0.17). Among diabetics, the rate of ophthalmic complications of diabetes ranged from 10.5–12.4%, and also did not change significantly (P=0.19). Among patients less than 50, the prevalence of glaucoma was 2.3–2.5% with no significant change (P = 0.32) and cataract was 0.7–1.3%, also without change (P=0.08). The prevalence of glaucoma in patients 50–65 from 2007 to 2011 increased from 7.6% to 8.7% (P<0.01), a 14.5% increase. Cataract prevalence increased from 7.2% to 11.7% (P = 0.01), a 62.5% increase. Similarly, in patients older than 65 years of age, the prevalence of glaucoma increased 10.2% from 8.8% to 9.7% (P<0.01) and cataract increased 21.8% from 11% to 13.4% (P=0.03).

Utilization

The percentage of Veterans who had been seen in either optometry or ophthalmology clinics increased from 21.5% to 24.0% from 2007 to 2011 (P = 0.05, Table 3), an 11.6% increase in clinic utilization. Similarly, utilization of all ophthalmic medications increased by 20.6% from 8.5% to 10.2% (P<0.01). The average number of eye care visits was 0.4–0.5 in the study period. The absolute number of cataract surgeries increased 21.9% from 811 to 989, but there was no statistically significant change in the rate of cataract surgeries in the population.

When stratified by age, the percentage of Veterans less than 50 who were seen in eye clinic increased from 13.6% to 15.3% (P=0.01). Glaucoma medication use ranged from 0.5–0.6% with no change (P = 0.06). Eye lubricant use in this group increased from 1.7% to 2.5% (P<0.01), and medication use overall increased from 3.6 to 4.3% (P<0.01). The rate of cataract extraction in this age group ranged from 0.2– 0.3 with no significant change (P = 0.18). Among Veterans 50–65, eye clinic utilization increased from 26.6% to 29.4% (P = 0.04). Glaucoma medications increased from 2.7% – 3.1% (P =0.02), eye lubricant use increased from 3.8 to 6.2% (P<0.01), and overall medication use increased from 8% to 11% (P<0.01). The rate of cataract surgery in patients aged 50–65 increased from 0.6% to 0.8% (P = 0.04). For patients greater than 65, the rate of eye clinic utilization increased from 22.6% to 24.1% (P = 0.03). Glaucoma medication utilization ranged from 6.1 to 6.5% with no significant change (P = 0.08), whereas use of eye lubricants increased from 4.3% to 6% (P < 0.01) and utilization of all medications increased from 11.9% to 14% (P<0.01). The rate of cataract extraction ranged from 0.9 to 1% with no significant change (P = 0.45).

Similarly, when analyzed by race, the rate of eye clinic utilization among white patients ranged from 23.0% – 23.7% with no significant trend (P = 0.93). Glaucoma medication utilization in this population ranged from 3.1% to 3.4% with no change (P = 0.08). Eye lubricant utilization increased from 3.4% to 4.9% in the study period (P<0.01), and overall medication utilization increased from 8.6%–10.1% (P<0.01). There was no change in the rate of cataract surgery among white patients (0.6% – 0.7%, P=1). Among African

Americans, eye clinic utilization increased significantly from 30.8% to 33.8% (P=0.01). Glaucoma medication use ranged from 6–6.4% with no significant change (P=0.08). Eye lubricant use increased from 5.8% to 8.4% (P<0.01), and overall medication use increased from 13.3% to 16.2% (P < 0.01). There was no change in the rate of cataract extraction among African American patients in the study period (Range 1% – 1.1%, P=0.06).

The cataract surgery utilization rate (cataract surgeries performed per diagnosed cataract) was calculated to be 7.3% overall as well as for patients greater than 65 for FY 2011. When stratified by race, cataract surgery utilization was 9.1% for African Americans, 6.1% for white patients, and 7.1% for Other races in FY 2011.

In FY 2011, there were 22,959 Veterans who met the inclusion criteria for the study between the ages of 61–65, compared to 11,922 from the ages of 66–70. The same pattern holds for FY2007-2010 as well. Utilization of VA eye clinic increases until age 65, when the percentage of Veterans seen in eye clinic ages 61–65 is 31.0%. This then declines for older age categories.

Discussion

The diagnosis of eye conditions is increasing in the US Veteran population along with the utilization of eye care services. Of note, rates of refractive error, cataract and glaucoma have all increased while diabetic retinopathy has not. Despite the increase in diagnosed cataract, no associated increase in surgical rates of cataract extraction were seen overall, suggesting a possible delay in the provision of these services, that patients are seeking surgical care elsewhere, or a combination of these factors.

As the Veteran population overall is increasing, our analysis looked only at the percentage of Veterans with individual diagnoses in a given year. In absolute terms, the number of Veterans with these diagnoses is increasing at an even faster rate. For example, the number of Veterans with glaucoma increased from 8815 (6.7%) in FY2007 to 10431 (7.4%) in FY 2011 (Table 2). In absolute terms, this is an 18.1% increase in prevalence of glaucoma in the 5-year study period. In relative terms, as we have analyzed the data, the increase is from 6.7% to 7.4% is a 10.4% increase over time. This increase in the absolute numbers of Veterans with ocular diagnoses may require additional resources from the VA system in the future.

Previous studies have assessed the utilization of eye care services in the VA population at single sites.[3,6] Notably, Maa et al found that 26% of all patients presenting to a specific optometry or ophthalmology clinic either had glaucoma or suspect glaucoma, 3.2% had diabetic retinopathy and 5.9% had visually significant cataract[3]. Our sample differs from these prior studies in that we assessed the prevalence in the entire population of Veterans seen in the VA Capitol Health Care Network, whereas they assessed only those patients who presented to one site for routine eye exams. Patients presenting to a specialty eye clinic may have a higher prevalence of ocular disease and are more likely to be diagnosed with ocular disease. This could in part explain why our study found a lower prevalence of glaucoma and suspect glaucoma or diabetic retinopathy than Maa et al. The prevalence of cataract in our

study was higher than reported by Maa et al likely because of difference in definition; the Maa study only reported on visually significant cataracts in their analysis.

The prevalence of glaucoma as determined by population-based prevalence surveys in the US population above the age of 40 is estimated to be 1.86% [10]. The rate is higher when using Medicare claims data: the prevalence of glaucoma or suspect glaucoma among Medicare beneficiaries in 2008 was 11.9% [11]. In the current study, the prevalence of diagnosed glaucoma and suspect glaucoma in Veterans over 65 (Medicare eligible age) was 9.7%, lower than reported in Medicare patients. Furthermore, given the higher percentage of African Americans in this population of 29.5% to 30% one might expect a higher diagnosed prevalence of glaucoma. The prevalence of diagnosed cataract was also substantially lower in the VA population as compared to other estimates. Our study found the diagnosed prevalence of cataract to be 7.1–9.6% in the study period, less than the overall prevalence in the above 40 US civilian population of 17.2%[12]. The diagnosed prevalence in Veterans over 65 in this sample was 11– 13.4%, less than the approximately 23% diagnosed prevalence in the Medicare population.[13] Many factors could explain these differences including older age among the overall Medicare population pool, differences in ethnic makeup (glaucoma is more prevalent in older African Americans and Hispanics), a subset of Medicare eligible Veterans choosing to seek care elsewhere, and coding practices. The age stratified data show that there is a decrease in the overall number of Veterans being treated beyond age 65 as well as the proportion of Veterans seen in eye clinic. This may indicate that Veterans overall choose to seek care outside of the VA once they are eligible for Medicare, which could explain the lower diagnosed prevalence of age related ocular disease such as glaucoma and cataract. Prior work confirms that Veterans with Medicare may seek their care outside of the VA system [14,15].

The diagnosed prevalence of glaucoma and cataract are increasing overall, specifically in the 50–65 and greater than 65 age group. When stratified by race, cataract is increasing in all race categories and glaucoma is increasing in the African American group. This could be due to an increased utilization of eye care services, which is noted in all age groups and in non-white racial categories. Increased diagnosed prevalence of glaucoma may be due to the addition of glaucoma specialists in the VA system, new instruments (such as OCT for optic nerve head imaging) to diagnose glaucoma, more uninsured Veterans seeking care in the VA system during the Great Recession of 2007–2009, demographic changes, or a true increase in the prevalence of glaucoma. To our knowledge, there has not been a change in coding practices, distribution of providers, or in electronic health record that would have affected the diagnosed prevalence from 2007–2011.

Whereas the prevalence of glaucoma and glaucoma suspect diagnoses and overall eye clinic visits increased in the study period, glaucoma medication fills did not. This may indicate that increased utilization of eye care during this time period led to the identification of less severe disease or it could indicate a change in how eye care visits were coded over the time period. The increase in the utilization of ophthalmic medications over time appears to be largely due to the increase in the prescription of eye lubricants for dry eye. This also may be related to increased utilization of eye care.

Cataract surgery increased for the 50–65 age group, but not for the greater than 65 age group, which may be seeking surgical care elsewhere, or it could be that Veterans over 65 have already had cataract surgery. Proportionally a greater percentage of African Americans in this sample underwent cataract surgery, and the cataract surgery utilization rate was higher for African American Veterans than for White Veterans or those of other races. Whereas prior studies have shown that cataract surgery utilization rates are lower for African Americans, our study shows a higher utilization for African American patients than other racial designations. Cataract surgery utilization has recently been estimated at 11.15% and 6.71% for Whites and African Americans respectively.[16] Our findings show nearly the opposite, that cataract surgery utilization at 9.1% among African Americans and 6.1% among Whites. This may be because minority Veterans who highly identify with Veteran status may prefer the VA to other systems of care.[17] If this is the case, then that would explain the higher diagnosed prevalence of cataract as well as the higher cataract surgery utilization rate in African Americans.

Utilization of eye care services, as measured by visits to optometry and ophthalmology, among Veterans in our study consistently increased each year in the study period for all age groups and was 22.6 – 24.1% for Veterans greater than 65 in the study period. This is still markedly less eye care utilization in the VA than in Medicare, which has been estimated to be 30% for African American beneficiaries and 45% for Caucasians [13]. The lower rate of utilization in the VA is particularly notable given that the prevalence of diabetes among Veterans (19–20%) is greater than the population average. Low utilization of eye care may be because Veterans greater than 65 choose to have their eye care outside of the VA system[14,15], or that there is, in fact, underutilization of eye care services among the Veteran population. One explanation for the concurrent increase in prevalence of glaucoma, cataract, and disorders of refraction with increase in utilization is that the Veteran population may be underserved and that undetected early and moderate stage disease is diagnosed with greater utilization. Diagnosis and treatment of these earlier cases may lead to prevention of blindness and ultimately cost savings[18].

Both the prevalence of diabetes as well as the diagnosed prevalence of ophthalmic complications of diabetes did not change significantly in this study. The prevalence of diabetes is comparable to prior studies of Veterans.[8,19] Whereas cataract and glaucoma are age-related ocular diseases, diabetic retinopathy might be expected to follow the prevalence of diabetes, which itself is stable.

Administrative databases allow for analysis of large numbers of patients, but come with certain limitations. The study relied primarily on ICD-9 diagnosis codes to determine prevalence of ocular disease, which may have contributed reporting and coding errors. Such errors would likely result in an artificially lower measured prevalence of disease. However, we compared our prevalence estimates to Medicare data which also used ICD-9 billing codes. Furthermore. VA outpatient data, specifically for ophthalmology clinical data has a high level of agreement with the medical record[20]. VA administrative data has been used extensively by VA researchers to conduct VA and other funded studies of the quality and outcomes of VA medical treatments. We did not determine the number of Veterans who may

have accessed care outside of the VA system, although future studies should consider including Medicare data.

This is the first study attempt to assess the trends in diagnosed prevalence and utilization of ocular disease in the VA system. While the generalizability to the entire VA system may be limited by differences in demographics between the VA Capitol Health Care Network and other regions, we note that this region covers five states, including urban, suburban, and rural areas, and a diverse multiethnic Veteran population.

The prevalence of ocular diagnoses, particularly cataract and glaucoma, and corresponding utilization of eye care services has recently increased among Veterans served by VA healthcare providers in the mid-Atlantic region. If this trend continues and is representative of national trends, the VA may face an increasing need eye care in future years. Increased need for eye care may challenge existing VA constraints on numbers of providers and treatment facilities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Dr. Saeedi is funded by a K23 Career Development Award from the National Eye Institute (K23EY025014). This study was funded by the VA Capitol Healthcare Network (VISN 5) Mental Illness Research, Education, and Clinical Center (MIRECC). The authors have no relevant financial disclosures. This work reflects the authors' personal views and in no way represents the official view of the Department of Veterans Affairs or the U.S. Government.

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Table 1

Demographic information for Veterans in the VA Capitol Health Care Network from FY 2007 to FY 2011

Variable	Fy07	Fy08	Fy09	Fy10	Fy11	B	P-value
	N=130709	N=130779	N=137958	N=141555	N=144395		
	Total/Mean (% of sample)						
Age	60.9 ± 16.4	60.6±16.6	60.2± 16.5	59.9±16.8	59.8±16.9		
Gender							
Male	117380 (89.8%)	116368 (89.0%)	121300 (88.5%)	124998 (88.3%)	127247 (88.1%)	−0.41	0.01
Female	13329 (10.2%)	14411 (11.0)	15758 (11.5%)	16557 (11.7%)	17148 (11.9%)		
Race							
White	58737 (44.9%)	58791 (45.0%)	61913 (45.2%)	64069 (45.3%)	65549 (45.4%)	0.13	0.01
African American	38908 (30.0%)	39042 (29.9%)	40918 (29.9%)	42201 (29.8%)	42545 (29.5%)	−0.11	0.04
Other	33064 (25.3%)	32946 (25.2%)	34227 (25.0%)	35285 (24.9%)	36301 (25.1%)	−0.07	0.19
Married	62455 (47.8%)	63102 (48.3%)	65155 (47.5%)	66664 (47.1%)	68039 (47.1%)	−0.26	0.10
Service Connection	89586 (68.5%)	87565 (66.9%)	93146 (70.0%)	96849 (68.4%)	98928 (68.5%)	0.15	0.73
Prescription Copay	20858 (16.0%)	21900 (16.7%)	25384 (18.5%)	27816 (19.7%)	30155 (20.9%)	1.28	< 0.01
Homeless	3655 (2.8%)	3861 (3.0%)	4429 (3.2%)	5048 (3.6%)	5781 (4.0%)	0.30	< 0.01
VISN 5 facility							
Maryland	47387 (36.3%)	48867 (37.4%)	47972 (35.0%)	48186 (34.0%)	48295 (33.4 %)	−0.92	0.05
Washington, DC, Virginia & West Virginia	83322 (63.7%)	81932 (62.6%)	89086 (65.0%)	93369 (66.0%)	96100 (66.6%)		
Diabetes	25471 (19.4%)	25465 (19.5%)	26005 (19.0%)	27002 (19.1%)	27664 (19.9%)	0.06	0.67

Table 2

Ocular Diagnoses in veterans in the VA Capitol Health Care Network FY 2007 to FY 2011

Variable	Fy07	Fy08	Fy09	Fy10	Fy11	B	P- value
	N=130709	N=130779	N=137958	N=141555	N=144395		
Disease Category	**Total/Mean (% of sample)**						
Disorders of refraction and accommodation	11067 (8.5%)	12046 (9.2%)	14150 (10.3%)	16078 (11.4%)	18854 (13.1%)	1.13	< 0.01
Glaucoma	8815 (6.7%)	9003 (6.9%)	9494 (6.9%)	9921 (7.0%)	10431 (7.4%)	0.14	0.03
Ophthalmic complications of Diabetes	2896 (2.2%)	3180 (2.4%)	3065 (2.2%)	2952 (2.1%)	2908 (2.0%)	−0.07	0.148
Cataract	9215 (7.1%)	8827 (6.7%)	11292 (8.2%)	12050 (8.5%)	13529 (9.6%)	0.68	0.02
ANY ophthalmic diagnosis	26804 (20.5%)	27552 (21.1%)	29677 (21.5%)	31460 (22.2%)	33611 (23.3%)	0.67	< 0.01

Table 3

Eye Care Clinic, Medication, and Procedure Utilization from FY 2007 to FY 2011

Variable	Fy07	Fy08	Fy09	Fy10	Fy11	B	P- value
	N=130709	N=130779	N=137958	N=141555	N=144395		
Clinic Utilization							
Seen in ophthalmology or optometry during FY (%)	28187 (21.5%)	28560 (21.8%)	30053 (21.8%)	31746 (22.4%)	33974 (24.0%)	0.56	0.05
Medication Utilization							
Glaucoma medications	7319 (5.6%)	7765 (5.9%)	7604 (5.5%)	6271 (4.4%)	9662 (6.6%)	0.07	0.83
Eye lubricants (i.e. Artificial Tears)	4508 (3.5%)	4796 (3.7%)	5557 (4.1%)	6419 (4.5%)	7380 (5.1%)	0.42	< 0.01
ANY ophthalmic medication	11056 (8.5%)	11468 (8.8%)	12414 (9.0%)	13388 (9.5%)	14727 (10.2%)	0.42	< 0.01
Procedure Utilization							
Cataract Extraction	811 (0.6%)	831 (0.6%)	862 (0.6%)	965 (0.7%)	989 (0.7%)	0.03	0.06