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Eye Care Disparities and Health Related Consequences in Elderly Patients with Age-Related Eye Disease

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Abstract

The elderly population in the United States (age 65 and older) is growing rapidly, estimated by the U.S. Census Department to reach 83.7 million by 2050.[1] Visual impairment increases with age among all racial and ethnic groups.[2] In the elderly, the most common culprits for vision loss are cataract, glaucoma, and age-related macular degeneration (AMD).[2] In the developed world, vision loss from cataract has been dramatically reduced by increased access to cataract surgery. However, AMD and glaucoma lead to irreversible vision loss without early diagnosis and intervention. In the U.S., cases of AMD are expected to double by 2050, reaching 17.8 million among patients age 50 or older.[3] Similarly, cases of glaucoma are expected to reach 5.5 million by 2050, an increase of over 90% from 2014.[3] The visually impaired elderly face disparities in access to eye care, and subsequent general medical and psychosocial complications.

Keywords

Age-related macular degeneration; cataracts; elderly; eye disease; glaucoma; health care disparities

Introduction

The elderly population is expanding as life expectancy and overall health have dramatically improved during recent years. Americans born in 2013 could expect to live 78.8 years, as compared to 75.2 in 1990 and only 68.2 years in 1950.[4] Similarly, overall death rates from heart disease and cancer have fallen every year since 1999.[5] However, not all elderly patients benefit equally from those advances. The elderly are more likely than the general population to experience difficulty accessing health care services. Older adults are more likely to have chronic health conditions and live in poverty.[6] Visual impairment and blindness in the elderly present an additional barrier to achieving maximum mental and physical health in their later years of life. Unfortunately, many older adults do not receive regular screening eye examinations or treatment for preventable causes of blindness. In the elderly, cataract, AMD, and glaucoma are major causes of vision loss, and each of these conditions can be either treated or slowed if diagnosed early. As the elderly population grows, the burden of these age-related diseases is rising. Similarly, as the minority population expands, those diseases that disproportionately affect minority patients will also become more prevalent. It

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is projected that by 2050, Hispanic and African American patients will each account for 20% of cases of glaucoma.[3] African American and Hispanic patients are also disproportionately affected by other chronic illnesses including diabetes and hypertension, and vision loss creates an additional barrier to receiving necessary medical care. Across all racial and ethnic groups, elderly patients are the most likely age group to experience visual impairment and blindness.[3] Older adults account for the majority of prescription medications, health care service utilization, and overall health care spending. In particular, age-related eye disease accounts for approximately 8.3 billion in medical expenditures each year.[7] Secondarily, visual impairment in older adults produces difficulty with mobility, challenges for medication management, poor psychological health, overall worse health outcomes, and increased health care spending. Therefore, promoting the visual health of the elderly is not only a public health concern, but also an economic one.

Access to Eye Care Services

The elderly face many challenges and are victims of many disparities in access to eye care when compared with younger patients. Access to eye care in this population is critical for diagnosis and treatment of preventable causes of vision loss such as cataract, as well as to allow early intervention for irreversible diseases like AMD and glaucoma. Decreased access to care occurs secondary to racial, geographic, and socioeconomic factors in elderly patients with eye disease.

Multiple reports have demonstrated socioeconomic barriers to eye care. In a large population-based study of 6775 community dwelling elderly patients in the Netherlands, AMD was the most common cause of blindness in patients over 75, followed by glaucoma and cataract.[8] A majority (53%) of the elderly patients with visual impairment due to untreated cataract indicated that they had never before seen an ophthalmologist.[8] Those with untreated cataracts were more likely to be older (> 85), homebound due to health reasons, and have lower scores on the Mini Mental Status Exam compared to subjects who had previously undergone cataract surgery, suggesting that older age and cognitive impairment may prevent patients from seeking appropriate care.[8] Similarly, none of the patients with untreated cataract had achieved university or higher vocational education.[8] In a study of 19 states conducted by the Centers for Disease Control (CDC) from 2006–2008, 16.8% of elderly persons without a high school education reported moderate or extreme vision loss, as compared to 10.5% of those with more than a high school education.[2] Similar results from the Age-Related Eye Disease study showed that having a higher level of education was associated with lower risk for large drusen, geographic atrophy, and neovascular AMD (NVAMD), as had been demonstrated in previous reports.[9–11]

Geographic disparities also exist in rates of vision loss and visual impairment in the elderly. In the same study by the CDC, rates of visual impairment ranged from 5.4% in Tennessee to 16% in Georgia.[2] The percentage of older adults in the US who reported having an eye exam in the previous year ranged from 69.5% in Missouri to 80.5% in Florida.[2] A similar survey conducted from 2006 to 2009 across 21 states demonstrated significant geographic variation in eye care utilization.[12] In Massachusetts, the prevalence of a yearly eye exam among Hispanic patients was 80%, while in North Carolina it was only 30%.[12] After controlling for

age, sex, race/ethnicity, and education, the probability of having an eye exam in the previous year ranged from 39% in Colorado to 71% in Massachusetts among those with income less than $35,000 per year.[12] In all states studied except Massachusetts, patients with income level greater than $35,000 were more likely to have had an eye exam in the last year as compared to those with lower income.[12] Overall, there are limited data to explain these findings. It is unclear whether this variation is due to a decreased number of providers, differences in payment structures and insurance coverage such as the Massachusetts health care exchanges, or variations in public programs that provide transportation and support for the elderly.[2] Previous data have demonstrated that individuals living in rural areas have lower rates of dilated eye exams as compared with those in urban areas; however, population density has not been found to consistently predict access to care.[13] Among those older adults with vision loss, 23.5% stated that cost or insurance concerns had prevented them from seeking care.[2]

Those elderly patients living in nursing homes or other institutions are at greater risk for eye care disparities than their community-dwelling counterparts of the same age.[14–16] Nursing home residents are three times more likely to suffer from visual impairment and almost five times more likely to be legally blind, defined as having a best corrected visual acuity (BCVA) of 20/200 or worse in the better seeing eye.[15] In a study of 159 nursing home residents in upstate New York, nearly 25% of residents had BCVA of 20/70 or worse, and of those, 15% met criteria for legal blindness.[14] In a similar study in Baltimore, 499 nursing home residents from 30 different homes were compared with 5300 non-institutionalized adults from the same communities.[16] Nursing home residents had a 15.6 times higher rates of legal blindness in whites and a 13.1 times higher rates of blindness in African Americans as compared with community dwelling adults of the same age.[16] In that same study, over 40% of cases of blindness were treatable or preventable with intervention, the most important of which was cataract surgery.[16] AMD and glaucoma were also major sources of visual impairment.[16] Newell, et al. performed vision and glaucoma screening in 604 patients from nineteen nursing homes across Oklahoma and found that 37% had a BCVA of 20/200 or worse in one or both eyes.[17] Additionally, 15% of residents were found to have elevated intraocular pressure of greater than 24 mmHg.[17] Only 11% of patients had been examined by either an optometrist or ophthalmologist in the previous two years.[17] Another review of nursing home charts from patients older than 60 revealed that only 42% had been seen by an eye care professional in the previous 2 years.[15] Overall, elderly patients, particularly those who are institutionalized, have difficulty obtaining access to the eye care system and therefore treatment that could be sight saving.[15,18]

Targeted nursing home interventions, such as the addition of support staff for surgical scheduling or increased education among nursing home providers, have demonstrated success in improving these disparities. The Salisbury Eye Evaluation in Nursing Home Groups (SEEING) project studied the effect of vision rehabilitation programs in 28 nursing homes across the Eastern Seaboard.[19] Nursing homes were randomized to either usual care or targeted invention to improve screening and treatment of cataract.[19] After matching for size and payment type of the facilities, 31% of residents with visual impairment secondary to cataract successfully underwent surgery in those homes randomized to targeted intervention, compared with only 2% in the facilities performing usual care.[19] Residents

with visually significant cataracts were older, had lower Mini Mental Status Exam scores, and had a longer overall length of stay in the nursing home; these residents also were more likely to be African American.[19] This demonstrates that policy interventions and increased education can dramatically decrease barriers to cataract surgery and improve the visual health of patients in these institutions.

Physical and Functional Disability

Poor vision is an independent risk factor for physical and functional disability in the elderly. Vision loss secondary to age-related eye disease is associated with difficulties in Activities of Daily Living (ADLs) including bathing, dressing, toilet hygiene and Instrumental Activities of Daily Living (IADLs) including housework, preparing meals, shopping, and transportation within the community.

The Salisbury Eye Evaluation (SEE project) evaluated the relationship between ADLs, IADLs, and visual impairment in a random sample of over 2000 adults age 65 or older in Salisbury, Maryland.[20] The results demonstrated that visual acuity worse than 20/40 had a negative impact on social and religious activity, and led to difficulty with performance of ADLs and IADLs.[20] Among those elderly patients, African Americans and women were at greatest risk for reporting decreased participation in social or religious activities secondary to vision loss.[20] In a survey of 782 adults aged 55 and older, West, et. al. found a similar relationship between visual acuity and functional ability.[21] For every line lost on the visual acuity chart, the likelihood of patients reporting difficulty walking a half-mile or walking up and down stairs increased by an average of 10%.[21] Crews and colleagues analyzed data from 9447 patients aged 70 or older obtained through the Second Supplement on Aging, collected by the CDC and National Institutes of Health.[22] Among these patients, diminished vision was associated with decreased leisure activities including visiting friends or attending church and decreased ADL and IADL performance.[22] Patients with vision loss were 3 times more likely to report difficulty walking, 3.1 times more likely to have difficulty managing their medications, 3.5 times more likely to have difficulty preparing meals, and 2.8 times more likely to have difficulty rising from a chair.[22] Analysis of data from The Massachusetts Health Care Panel Study, a survey of community dwelling adults age 65 or older in Massachusetts, demonstrated that vision loss resulted in significant difficulty with grocery shopping, paying bills, climbing stairs, performing housework, or walking half a mile compared to those elderly without vision loss.[23] Specifically, the presence of vision loss in AMD and field loss in glaucoma were associated with functional disability.[24] The presence of AMD was an independent risk factor for functional disability and impaired ADL performance, after adjusting for walking disability, hospital admissions, and other comorbidities.[25] In a year-long analysis of over 1000 individuals aged 65 or older living in the community, those with visual impairment were 2.5 times more likely to experience functional decline than unimpaired elderly patients after adjusting for age, sex and cognitive status (95% CI 1.37–4.48).[26] Those with IADL disability at baseline with visual impairment were 1.8 times more likely to experience decline when compared to patients with similar baseline IADL disability but without eye disease (95% CI 1.08–2.92).[26] The relative risk of death in one year was 2.64 for patients with visual impairment compared to those without visual impairment (95% CI 1.54–4.54).[26]

Rates of disability are even higher among patients living in nursing homes. Those institutionalized patients with low vision are at greater risk of disability than their peers without eye disease. In a study of nursing home residents in New York, 86% of those with moderate or severe visual impairment were at least partially dependent in their mobility as determined by the Monthly Nurses Assessment scale, compared with only 57% of those without visual impairment.[14] This relationship existed in those residents with legal blindness (20/200), but persisted even when considering those residents with only moderate visual impairment of 20/70 or worse.[14] The decline in ADLs associated with visual impairment in the elderly may contribute to increased mortality in this population.[27]

Psychosocial Health

Rates of depression in the elderly are as high as 7% and account for 1.6% of total disability among patients 60 years or older, according to the World Health Organization.[28] Those rates are even higher in elderly patients with vision loss, especially those with cataract and AMD.[29] Vision loss and associated depression lead to decreased social engagement among the elderly. In one study of visually impaired elderly patients, minimal visual impairment (defined by the authors to include patients able to read large but not regular sized print at close range) was associated with a 19% greater prevalence of low social engagement, with rates higher than 50% in those with severe vision loss.[30] In a study of AMD alone, mental health, dependency, and quality of life scores were linked with visual acuity.[31] Brody and colleagues found that 32.5% of elderly AMD patients met criteria for depression, twice the rate of elderly patients without AMD.[32] These findings are comparable to those in patients living with cancer or cerebrovascular disease.[32–34] These depressive symptoms have further effects on overall health. In general, untreated depression is associated with increased risk of institutionalization, increased mortality, and functional disability.[35–37] Visual impairment even further increases those risks. Patients with comorbid vision loss and depression are more likely to smoke, have poor health, be physically inactive, have difficulty with self-care, and have decreased social participation compared to those patients without vision loss.[38] Visually impaired elderly patients with severe depressive symptoms were more likely to have fair or poor health as compared to visually impaired patients without depression, with an adjusted odds ratio of 26.5%.[38] Severity of depression correlated with decreased IADL and ADL capabilities in these patients.[38] In another study, approximately 40% of people over age 65 reported mild or moderate depression, while rates of depression in those patients with visual impairment approached 60%.[39] Depression and vision loss were associated with a greater risk of having difficulty walking, climbing stairs, shopping, or socializing compared to patients with depression alone.[39] The presence of AMD has been independently associated with depressive symptoms and can lead to reduced general health and social functioning.[40]

Cataract has likewise been associated with poor psychological health.[41,42] However, cataract surgery may have the capacity to attenuate depression and improve health-related quality of life.[43,44] In a study of 464 patients aged 65 or older, 95% had improved visual acuity and 36% had improved physical functioning at 12 months following cataract surgery.[43] This further highlights the importance of diagnosis and treatment of reversible vision loss in the elderly population.

Medical Comorbidity and Mortality

In the elderly, vision loss is often one of a myriad of comorbid conditions, and its presence can complicate medical care. Patients with vision loss rely on others for transportation to appointments and medication management. Most health care professionals are not trained to address the specific needs of those with visual impairment, and policy interventions in this area are lacking. As a result, the presence of vision loss leads to general health care disparities and higher rates of morbidity and mortality. Vision loss in the elderly is associated with a higher prevalence of chronic health conditions, falls, injuries, and death.[2] Visual impairment in the elderly has also been associated with difficulty walking, climbing steps, and more self-reports of declining health.[39]

This difficulty with walking and ADLs posed by visual impairment naturally creates a predisposition to dangerous falls. Falls are a source of morbidity and mortality in all elderly patients, but those with vision loss are at an especially increased risk.[45,46] Patients with neovascular (NVAMD) reported 0.37 falls per person-year compared with 0.16 among those without NVAMD.[45,47] The age-adjusted incidence rate ratio for injurious falls in patients with NVAMD was 1.77.[47] Older women with NVAMD were almost 2 times more likely to have an injurious fall compared to those without NVAMD.[45,47] Visual field loss in glaucoma has also been demonstrated to increase the risk of falls in the elderly.[48,49]

In addition to the physical challenges posed by vision loss, elderly patients with eye disease have increased difficulty managing their medications. Patients over 65 are the largest consumers of medications, accounting for 30% of prescriptions and 40% of over-the-counter drug use.[50] Furthermore, few studies have characterized the effects of low vision on medication management. A survey by the American Foundation for the Blind demonstrated that vision loss and subsequent inability to read prescription labeling resulted in taking the wrong medication, taking incorrect doses, increased visits to the emergency room, and dependence on others for medication management.[51] Watanabe et al., demonstrated that even elderly patients with excellent visual acuity had difficulty reading labels on over the counter medications.[52] Other studies have demonstrated that the elderly with eye disease require more time to read prescription labels and may benefit from changes in bottle design or larger font size.[53] A survey of patients in New York demonstrated that 47% of patients had difficulty reading labels on their medications due to either poor eyesight, inability to understand English, or small writing on the label.[54] Unfortunately, there are currently no laws or regulations regarding accessibility of prescription drug labeling for visually impaired patients.

Finally, the effects of vision loss on medical health are apparent in health care costs. Medicare beneficiaries with coded diagnoses of vision loss incur significantly higher costs than those with normal vision, approximately 90% of which were non-eye related medical costs.[55] When extrapolated to the entire Medicare population, blindness and vision loss were associated with 2.14 billion dollars in non-eye-related medical costs in the year 2003.[55] Progression of vision loss, rather than severity of visual impairment, was most strongly associated with higher Medicare costs.[55] Progressive vision loss in this population was associated with greater risk of injury, depression, admission to long-term care facilities, and

the utilization of skilled nursing facilities.[55] However, these particular complications explained only 27–41% of those excess costs incurred by patients with eye disease.[55]

Discussion

With the continued growth of the elderly population, the health care system faces unique challenges in providing care to these patients with numerous medical comorbidities. Among those, eye disease is a major factor in this population, with AMD, glaucoma, and cataract as the major sources of vision loss in the elderly. Unfortunately, the elderly with age-related eye disease face many disparities in ophthalmologic screening and treatment. These disparities are particularly pronounced in those elderly who are institutionalized, minorities, have less than a high school education, or who are living in poverty.

For the institutionalized elderly, policy intervention and support for nursing staff can dramatically increase access to care in this population. At present, approximately 3.6% of the elderly population lives in a nursing home.[56] This percentage increases dramatically with age, approaching 11% for patients 85 and older.[56] As the overall population ages and the proportion of the elderly population above 85 expands, nursing home care is likely to play an increasingly prevalent role in health care for the elderly. The addition of a support system to assist with scheduling and transportation has demonstrated efficacy to increase uptake rates of cataract surgery and improve overall visual health in this population.

While glaucoma and AMD require more long term monitoring, the early diagnosis and treatment of these diseases can prevent devastating complications of vision loss including falls, disability, depression, and early death. Increased education of nursing home staff and physicians to the visual needs of elderly patients will likely contribute to overall improvements in psychological and physical health.

The effects of vision loss on overall health are poorly understood. Patients with visual impairment may be limited in their transportation to medical appointments, ability to manage their medications, and limited in their ability to exercise and promote their own health. Secondarily, vision loss is associated with depression, which can further promote decreased physical and social engagement and lead to higher rates of morbidity and mortality. Vision loss increases the risk of falls, which in turn leads to additional physical disability, mobility limitations, and overall poor health consequences. The early diagnosis of eye disease in this population and treatment for refractive error and cataract can attenuate this cycle of physical impairment produced by vision loss.

Medication management in the elderly in a complex issue, but there is clear evidence that patients with vision loss have difficulty reading their prescription bottles and recognizing their medications. Approximately 30% of hospital admissions in the elderly are drug-related, with 11% of those related to medication nonadherence and 10–17% related to adverse drug reactions[57]. The use of blister packs or other forms of prepackaged dosing has demonstrated increased medication adherence but these forms of packaging are not widely available for all medications or all doses.[58–60] Electronic pill boxes with talking capabilities can eliminate the need for reading of medication labels, but rely on proper loading and configuration by

the patient or a caregiver. In addition, these devices are expensive and typically not covered by insurance. The use of eye drops in addition to oral medications further complicates medication adherence and the use of such technology to overcome these barriers. Additional studies are needed to determine specific barriers to medication adherence related to visual impairment and the appropriate policy interventions to make medication labels more accessible to the elderly. Providers should be aware that elderly patients with seemingly good visual acuity may still require additional assistance to read and understand their medication instructions. Prescribers and pharmacists should be sensitive to the needs of the visually impaired and provide instructions with large fonts and sharp contrast to improve readability.

The composite effect of visual impairment in the elderly is one of physical disability, functional limitation, poor psychological health, and overall increases in medical comorbidity and mortality. Patients with vision loss experience higher rates of chronic health conditions, injuries, and death. Vision loss usually exists as one of a various number of comorbid conditions in elderly patients. As such, eye care is often undervalued by both patients and providers in favor of more obvious medical issues. Travel to an eye-care specialist is often required for patients living in nursing homes and assisted living facilities. Those trips can be costly and may place the patient at additional risk associated with travel. As such, patients and providers should be educated about the value of eye-care services in the elderly and carefully weigh the risks and benefits of ophthalmologic screening and treatment. Careful attention to the visual needs of the elderly can reduce rates of emergency room and hospital admission and improve overall medication compliance. With rising health care costs, it is important to better address the needs of these patients to reduce health care spending on preventable complications of eye disease. Visual impairment in the elderly is not only an ophthalmologic concern, but a public health concern. With targeted intervention and thoughtful care, the elderly with age-related eye disease can receive appropriate treatment and maintain a higher level of function and overall health into their later years of life.

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