

The Visual Status of Older Persons Residing in Nursing Homes

Cynthia Owsley, PhD, MSPH; Gerald McGwin, MS, PhD; Kay Scilley, PhD; G. Christine Meek, BS; Allison Dyer, BS; Deidre Seker, MS

Objective: To characterize habitual visual acuity, contrast sensitivity, spectacle use, and eye care utilization in a large sample of older adults residing in nursing homes.

Methods: Of 33 nursing homes identified in Birmingham, Alabama, 17 served as sites. Eligibility criteria included age 55 years or older, English-speaking, and Mini-Mental State Examination score of 13 or higher. Habitual distance and near visual acuity and contrast sensitivity were measured for each eye and binocularly. Residents and a family member/guardian were interviewed about spectacle use and eye care utilization. Medical records provided information on demographics, chronic medical conditions, date of last eye examination, duration of residence in the nursing home, and health insurance.

Results: Of 380 enrollees, 57% had distance visual acuity in the better eye worse than 20/40; 10% had visual acuity of 20/200 or worse. Near visual acuity was slightly worse on average by a line than distance acuity. Three-fourths of residents had abnormal binocular contrast sensitivity. The medical record had no record of or reference to an eye examination for 66% of enrollees despite 90% having health insurance.

Conclusion: The high rate of visual impairment in nursing homes underscores the need to understand its causes and to evaluate interventions to address this public health challenge.

Arch Ophthalmol. 2007;125(7):925-930

PREVIOUS RESEARCH HAS DOCUMENTED that residents of nursing homes in the United States and other industrialized countries have high vision impairment rates. Depending on the study population and methods of measuring and defining vision impairment, these rates have ranged from 3 to 15 times higher than corresponding estimates for community-dwelling older adults of the same age.¹⁻¹⁰ Much of this impairment is due to correctable conditions, including refractive error and cataract.^{1,11,12} These cases of remediable vision impairment and preventable blindness are not limited to residents with serious cognitive impairment but are also present in those with more minor cognitive deficits. The vision impairment rates in nursing homes may be particularly exacerbated in racial/ethnic minorities, with one study indicating that African American individuals in the sample were 50% more likely to be blind compared with white individuals, even though 40% of this blindness was treatable or preventable.¹ Reasons for these high vision impairment rates among nursing home residents are not fully understood. A variety of factors may contribute, including that

persons with vision impairment may be more likely to be admitted to nursing homes,¹³ nursing home residents may have limited accessibility to doctors' offices because of lack of transportation and escort availability,¹⁴ residents may not wear spectacles even though they have them,¹⁵ family and health care professionals may believe that cognitively impaired persons do not personally benefit from treatments to improve vision, and there is a shortage of eye care professionals who routinely serve clientele living in nursing homes.²

CME course available at
www.archophthalmol.com

Herein, we report the results of a cross-sectional study on a large sample of older adults residing in nursing homes in the Birmingham, Alabama, area (N = 380) with respect to habitual visual acuity, contrast sensitivity, use of spectacles, and eye care utilization.

METHODS

The institutional review board at the University of Alabama at Birmingham approved the

Author Affiliations:
Departments of Ophthalmology (Drs Owsley, McGwin, and Scilley and Mss Meek, Dyer, and Seker), Epidemiology and International Health (Dr McGwin), and Surgery (Dr McGwin), University of Alabama at Birmingham.

Table 1. Demographic and Medical Characteristics of 380 Study Enrollees

Characteristic	No. (%)
Age, y	
60-69	38 (10.0)
70-79	122 (32.1)
80-89	162 (42.6)
90-99	56 (14.8)
≥100	2 (0.5)
Race/ethnicity	
African American	100 (26.3)
White, non-Hispanic	279 (73.4)
Hispanic	1 (0.3)
Sex	
F	307 (80.8)
M	73 (19.2)
Education	
Grade school	102 (26.8)
Some high school	85 (22.4)
High school graduate	118 (31.1)
Some college	49 (12.9)
College graduate	12 (3.1)
Graduate or professional degree	3 (0.8)
MMSE score (mental status)	
27-30	49 (12.9)
23-26	80 (21.1)
20-23	101 (26.7)
16-19	82 (21.6)
13-15	67 (17.7)
No. of medical conditions, mean (SD)	5.6 (3.0)
Length of stay in nursing home, y, mean (SD)	1.9 (2.0)
Health insurance	
Both Medicaid and Medicare	205 (54.0)
Medicaid and/or Medicare plus private insurance	64 (16.8)
Medicaid only	5 (1.3)
Medicare only	37 (9.7)
Private insurance only	31 (8.2)
Self-pay	5 (1.3)
Other	17 (4.5)
No information available	16 (4.2)

Abbreviation: MMSE, Mini-Mental State Examination.

study protocol, and the study followed the tenets of the Declaration of Helsinki. Of the 33 licensed nursing homes in and around Birmingham identified for potential recruitment, 17 participated as sites for this project. The balance were not used as sites because they were either greater than a 30-minute journey by car from University of Alabama at Birmingham, there was already a large interventional research study ongoing in the facility, or the administrator declined participation on behalf of the facility.

All 17 facilities had optometric services available to residents in that a licensed optometrist visited the facility on a routine basis (eg, monthly, bimonthly) to provide eye care services. On admission to the nursing home, the resident and/or the resident's sponsor (a family member or state-appointed guardian) had the option of electing for the resident to receive these services. Before the provision of any care not typically covered by the resident's insurance, the sponsor was contacted to determine if the sponsor would cover the expense. In Alabama, for those persons insured with Medicaid (the carrier for the vast majority of nursing home residents in Alabama), the cost of 1 comprehensive eye examination and new spectacles every 2 years is covered, and if there is a diagnosis, eye care costs for treating that condition will also be covered.

Potentially eligible residents were first identified by the nursing unit charge nurse as persons who would be able to answer simple questions about vision and daily activities in the nursing home, were at least 55 years of age, and spoke English. Written informed consent was obtained from all participants and also the resident's sponsor after explaining the nature and possible consequences of the study. Following consent, the Mini-Mental State Examination (MMSE)¹⁶ was administered by a trained project staff member; those scoring lower than 13 were excluded from final enrollment since comprehension of simple requests and questionnaire items was critical to valid measurement in the protocol. Previous research has indicated that persons with mild to moderate cognitive impairments (those with MMSE scores as low as 13) can reliably report on their health and well-being when questionnaire items and responses are presented in a simple format and administered by interview.¹⁷⁻¹⁹

The medical record was used as a source for demographic variables (age, sex, race/ethnicity, and education, which were also verified by interview); current chronic medical conditions, including specific eye conditions listed in the medical record; the date of the last eye examination if one had been carried out; months of residence in the nursing home; and health insurance status.

Residents were asked about the current and previous use of spectacles. Distance and near visual acuity and contrast sensitivity were assessed in each eye separately and together. Testing was carried out in either the resident's room or another private area with adequate lighting. The resident used whatever correction he or she would normally use for tasks at that distance in everyday life. Distance acuity was assessed using the Early Treatment of Diabetic Retinopathy Study (ETDRS) chart²⁰ using its standard protocol and expressed as logarithm of the minimum angle of resolution (logMAR). Near acuity was assessed using the Lighthouse Near Visual Acuity Test (modified ETDRS) administered at 40 cm according to its standard protocol. Contrast sensitivity was evaluated using the Pelli-Robson chart²¹ and its standard protocol and scored by the letter-by-letter method.²² Results of visual function testing were made available to the eye care professional working in the facility if there was no record of the resident having had an eye examination within the past 6 months.

The resident's sponsor was interviewed by telephone to obtain information on the resident's spectacle use and whether vision-related concerns were a reason why the person moved to a nursing home.

RESULTS

Of the 17 participating facilities, 16 were for-profit facilities (14 corporate and 2 privately owned) and 1 was a non-profit facility (religiously affiliated). The number of licensed beds in facilities ranged from 64 to 230 (mean [SD], 134 [47]). Of the 795 persons approached for recruitment, 593 agreed to be screened for eligibility. Those who refused to be screened were similar to those who agreed to screening with respect to sex distribution but were more likely to be Asian, older by 1 year on average, and resided a shorter time (by 1 month on average) in the nursing home (all $P < .05$). Of the 593 persons screened for eligibility, 380 persons met the eligibility criteria for enrollment. Those who met the eligibility requirements were younger on average by 3 years ($P < .001$) but were similar to those who did not meet eligibility criteria with respect to race/ethnicity, sex, and length of stay in the nursing home.

Table 1 lists the demographic and medical characteristics of enrollees. The sample ranged in age as high

Table 2. Visual Function Characteristics of Study Sample^a

Characteristic	Binocular	Better Eye	Worse Eye
Distance visual acuity, No. (%)			
20/25 or better	17 (4.5)	43 (11.4)	6 (1.6)
Worse than 20/25 to 20/60	186 (49.3)	214 (56.8)	145 (38.5)
Worse than 20/60 but better than 20/200	143 (37.9)	97 (25.7)	136 (36.1)
20/200 or worse	31 (8.2)	23 (6.1)	90 (23.9)
Distance visual acuity, logMAR, mean (SD)	0.41 (0.29)	0.43 (0.29)	0.65 (0.33)
Near visual acuity, No. (%)			
20/25 or better	38 (10.1)	9 (2.4)	2 (0.5)
Worse than 20/25 to 20/60	231 (61.4)	173 (45.9)	90 (23.9)
Worse than 20/60 but better than 20/200	86 (22.9)	157 (41.6)	171 (45.4)
20/200 or worse	21 (5.6)	38 (10.1)	114 (30.2)
Near visual acuity, logMAR, mean (SD)	0.54 (0.33)	0.57 (0.32)	0.81 (0.37)
Contrast sensitivity, No. (%)			
≥1.80	2 (0.53)	0	0
≥1.50 but <1.80	87 (23.2)	35 (9.3)	7 (1.9)
≥1.20 but <1.50	166 (44.3)	188 (50.1)	115 (30.7)
≥0.90 but <1.20	66 (17.6)	86 (22.9)	104 (27.7)
≥0.60 but <0.90	31 (8.3)	38 (10.1)	51 (13.6)
≥0.30 but <0.60	10 (2.7)	15 (4)	26 (6.9)
<0.30	13 (3.5)	13 (3.5)	71 (19.2)
Contrast sensitivity, log sensitivity, mean (SD)	1.22 (0.38)	1.14 (0.35)	0.83 (0.52)

Abbreviation: logMAR, logarithm of the minimum angle of resolution.

^aOf the study sample (N = 380), we were unable to obtain data on 3 participants for distance acuity, 4 for near acuity, and 5 for contrast sensitivity because of refusal to cooperate with testing.

as 102 years of age, but the majority of residents (75%) were in their 70s or 80s. One-fourth of the sample was African American, with the rest being white of non-Hispanic origin for the most part. The vast majority was female (81%). Almost half (49%) had not completed high school. Most MMSE scores fell within 16 to 26. Residents averaged about 5 to 6 chronic medical conditions. The average length of stay in the nursing home was 2 years and ranged from recently admitted to 12 years. Most participants (82%) had Medicaid and/or Medicare, slightly more than half had both (54%), and 90% of the sample had some form of health insurance.

A relatively small portion of the sample had what would be considered to be good binocular visual acuity (20/25 or better), with 5% and 10% having distance and near acuity in that range, respectively (**Table 2**). Based on binocular estimates of distance acuity, about 46% of the sample had visual acuity worse than 20/60. When this vision impairment rate was computed based on only those with good mental status (MMSE score ≥ 24), about 34% of the sample had binocular distance visual acuity worse than 20/60. About 6% of the entire sample had a visual acuity of 20/200 or worse in the better eye using a distance acuity test and about 10% using a near acuity test. Estimates of near acuity were slightly poorer than for distance acuity (by about a line). Binocular acuity was slightly better than the acuity in the better eye, whether measured for distance or near. Twenty-

Table 3. Other Visual Characteristics of Study Sample: Variables Collected From Resident Interview^a

Characteristic	No. (%)
Have you ever worn glasses?	
Yes	364 (96.0)
No	15 (4.0)
Do you have glasses now?	
Yes	317 (87.1)
No	47 (12.9)
If yes, are they for	
Distance only	2 (0.6)
Near only	50 (15.6)
Both	248 (77.5)
Don't know	20 (6.3)
Do you wear these glasses?	
Yes	280 (87.5)
No	40 (12.5)
If no, why not?	
Don't need them/can't see with them/don't help	27 (67.5)
Lost or stolen	1 (2.5)
Broken	3 (7.5)
Did not bring them when I moved to nursing home	2 (5.0)
Problem with hands so difficulty putting them on/off	1 (2.5)
Can't get used to them	1 (2.5)
They don't fit	2 (5.0)
Don't know or refused to give reason	3 (7.5)
How often do you wear your glasses?	
All the time	140 (49.7)
Most of the time	31 (11.0)
About half the time	22 (7.8)
Some of the time	37 (13.1)
Only once in a while	52 (18.4)
When was your last eye examination?	
Within past year	105 (27.6)
Between 1 and 2 y ago	59 (15.5)
More than 2 y ago	51 (13.4)
Other ("very long time ago," "ages ago")	25 (6.6)
Don't know	140 (36.9)
Did your vision influence your decision to come to nursing home?	
Yes	34 (9.0)
No	345 (91.0)

^aMissing data are because no response was given to the item.

four percent of the sample had distance acuity in the worse eye of 20/200 or worse; this value was 30% for near acuity. Using the vision impairment definition from a recent study of nursing homes in Maryland and Delaware (worse than 20/40 at distance in the better-seeing eye),² 57.3% of the sample would be considered to be visually impaired. Binocular contrast sensitivity was less than 1.50 in 76% of participants, with 14.5% of the sample having very severe impairment (score < 0.90).

The vast majority of enrollees (96%) indicated that they had worn spectacles at some stage during their lives, and about three-quarters had spectacles now for both distance and near tasks (78%) (**Table 3**). Most reported wearing these spectacles (88%); for those who wore them, 61% did so all or most of the time. For those who had spectacles but did not wear them, the cited reasons for nonwear were varied but most said that they do not need them, cannot see with them, and/or that

Table 4. Other Visual Characteristics of Study Sample: Variables Collected From Family Member/Guardian Interview^a

Characteristic	No. (%)
Has resident ever worn glasses?	
Yes	269 (96.0)
No	10 (3.6)
Don't know	1 (0.4)
Does resident have glasses now?	
Yes	242 (88.4)
No	23 (10.9)
Don't know	1 (0.7)
If yes, does resident wear these glasses?	
Yes	218 (90.5)
No	21 (8.7)
Don't know	2 (0.8)
If yes, how often does resident wear glasses?	
All the time	108 (48.9)
Most of the time	31 (14.0)
About half the time	18 (8.1)
Some of the time	23 (10.4)
Only once in a while	37 (16.7)
Don't know	4 (1.8)
If no, why doesn't resident wear them?	
Doesn't need them/can't see with them/don't help	13 (61.9)
Lost or stolen	1 (4.8)
Broken	1 (4.8)
Doesn't care if he or she has glasses	2 (19.1)
Don't know	4 (19.1)
Were vision-related concerns one reason why the resident moved to a nursing home?	
Yes	16 (5.7)
No	263 (93.9)
Don't know	1 (0.4)

^aMissing data are because of family members or guardians who could not be contacted by telephone for the interview.

they do not help. When enrollees were asked when their most recent eye examination was, 28% responded that they had an examination within the past year. Twenty percent indicated that the last examination was more than 2 years ago or used verbiage indicating that it was a very long time ago. About one-third of participants responded "don't know" to this question. Ninety-one percent replied that vision was unrelated to their decision to live in a nursing home. When the resident's sponsor was interviewed about some of these same issues, results were very similar to residents' responses (**Table 4**).

Review of the medical record indicated that 66% of resident records had no information about an eye examination (**Table 5**). The presence of visual acuity impairment worse than 20/40 was unrelated to the presence of an eye examination noted in the medical record. With respect to ophthalmic diagnoses listed in the medical record, 8.2% had a notation of a glaucoma diagnosis in one or both eyes; 3.1%, diabetic retinopathy; 32.5%, cataract; and 4.6%, age-related macular degeneration. Nearly all participants' nursing home records (93%) had documentation that their sponsor had granted permission to the nursing home to provide eye care for the resident.

Table 5. Other Visual Characteristics of Study Sample: Information From the Nursing Home Medical Record^a

Characteristic	No. (%)
Does resident have record of eye examination in medical record?	
Yes	127 (33.6)
No	251 (66.4)
If yes, time elapsed since this eye examination?	
Within past year	111 (86.7)
Between 1 and 2 y ago	12 (9.4)
More than 2 y ago	5 (3.9)
Diagnosis listed in medical record for	
Glaucoma	29 (8.2)
Diabetic retinopathy	11 (3.1)
Cataract	117 (32.5)
Age-related macular degeneration	16 (4.6)
Did resident's sponsor agree to have nursing home provide eye care for resident?	
Yes	342 (93.4)
No	2 (0.6)
Could not be determined from medical record	22 (6.1)

^aMissing data are because medical record could not be located.

COMMENT

More than half of the residents in the sample (57%) were visually impaired using a common definition of vision impairment in that habitual visual acuity in the better eye was worse than 20/40. Unfortunately, there are no epidemiological studies on vision impairment in community-dwelling older adults in Alabama or the southeastern United States using similar measurement methods in which to place this prevalence rate in context. Using studies of community-based samples of individuals 60 years or older in other US regions and the same definition of vision impairment as a reference, vision impairment rates from these studies range from approximately 10% to 20%.²³⁻²⁷ Thus, the prevalence of vision impairment in our sample is higher relative to older-adult community-based populations in the United States, consistent with previous studies on the visual status of residents in US nursing homes.^{1,2,4}

The vision impairment rate for this Birmingham nursing home sample (57%) is higher than the 38% reported in a previous study on nursing homes in Maryland and Delaware.² It is unknown to what extent the higher prevalence in Alabama represents a truly exacerbated public health problem or whether methodological factors are largely responsible for the difference in the estimates. The age, sex, and race/ethnicity distributions of the 2 samples are very similar; however, other differences exist between the studies. Sixteen of 17 nursing home sites in the present study were for-profit, whereas in the West et al study,² 61% were for-profit. There was a mental status minimum requirement in the present study (MMSE score ≥ 13) but not in the West et al study.² Regardless of these differences, the present study contributes to the growing body of evidence that visual impairment continues to exist at a very high level within nursing home populations in the United States.

In addition to distance acuity, this study assessed near visual acuity and contrast sensitivity, which were not reported in previous studies on nursing home residents in the United States.^{2,4,9,12,14} The distribution of near visual acuity values reflected those for distance acuity except the near acuity distribution was shifted about one line poorer on the acuity chart. For older persons prone to presbyopia who spend a great deal of time in bed or in a small room carrying out close activities or who have limited mobility (as do many nursing home residents), the integrity of near visual acuity has high relevance. About 1 in 4 residents (28.5%) had binocular near visual acuity that was worse than 20/60, a common definition for low vision. This relatively high rate of near visual acuity impairment may be due to a lack of correction or undercorrection of presbyopia. Binocular contrast sensitivity, known to be critical for both mobility and reading,²⁸⁻³¹ was abnormal (Pelli-Robson scores worse than 1.5) in 3 of 4 residents.

The vast majority of residents had some type of spectacle correction and reportedly used this correction most of the time. This observation is encouraging because it suggests that if refractive error in nursing home residents is corrected with new spectacles, they would actually wear the correction and thus visually benefit from it. The reasons cited for nonuse of spectacles, although mentioned by a minority of the sample, are also instructive in that they suggest ways to optimize the use of spectacles in this population, such as ensuring the prescription and fit are appropriate and encouraging nursing care staff to facilitate care and proper storage of spectacles.

Although it is widely recognized that visual impairment negatively impacts health-related quality of life and causes activity difficulties in older adults,^{32,33} for the vast majority of residents visual impairment did not consciously influence the decision to move to the nursing home where focused supervision and assistance with the activities of daily living would be readily available. This was also verified by the sponsors interviewed. There remains the possibility that visual impairment had an indirect or a secondary influence on the decision to reside in a nursing home, not consciously acknowledged by resident or sponsor, since a recent Australian study found that the presence of visual impairment was an independent contributor to subsequent nursing home placement.³⁴

It appears that routine eye care may not be taking place for a substantial segment of the nursing home residents in our sample, as implied by our data in several ways. First, 20% indicated that their most recent eye examination was more than 2 years ago or indicated it was a very long time ago, with another 30% indicating that they had no recollection of an eye examination. This was the case even though the vast majority of the sample (90%) had health insurance. Because cognitive impairment is common among persons residing in nursing homes, these self-reported data on the most recent eye examination might be viewed as unreliable. However, the medical record itself contained no record of or reference to an eye examination for 66% of the enrollees. Finally, the visual impairment rates for this sample are very high (57%), as discussed earlier. Information about the extent to which this visual impairment is remediable was unavailable to the study, so whether high visual impairment rates can

be interpreted as underutilization of routine eye care may be questionable. Yet some credence is lent to this possibility based on a previous study estimating that 37% of the visual impairment and 20% of the blindness among nursing home residents is remediable by refractive error correction.¹

Strengths of this study include the use of several types of data sources to understand the visual status of nursing home residents, including interviews with resident and sponsor, medical record abstraction, and the assessment of the resident's central visual function using state-of-the-art measurement tools. Not only was distance acuity assessed, but also near acuity and contrast sensitivity, which were not examined in prior nursing home studies. To our knowledge, this is the first study on the visual status of nursing home residents in the southeastern United States. A large number of homes served as sites in the study. Study limitations must also be acknowledged. This study's protocol did not provide information on the causes of visual impairment identified or whether it was correctable. It was also beyond this study's scope to probe the possible mechanisms underlying apparently low eye care utilization in the nursing homes studied (eg, poor staff communication, inadequate understanding on the part of family sponsors on the importance of routine eye care). These issues are worthy of further study. To what extent these findings generalize outside Alabama or to government-operated nursing homes is unknown. The exclusion of persons with MMSE scores less than 13 may have biased prevalence estimates.

In summary, this study implies that more than half of persons residing in nursing homes in Birmingham have distance visual acuity in the better eye that is worse than 20/40; 10% have visual acuity of 20/200 or worse. Near visual acuity is slightly worse on average, by about a line, than distance acuity, implying that adequate correction of presbyopia may be lacking in this population. Approximately three-quarters of residents had abnormal binocular contrast sensitivity. The medical record had no record of or reference to an eye examination for more than half the residents enrolled despite the fact that the vast majority had health insurance that would cover eye care services. These findings underscore the need to better understand the causes of high visual impairment rates in nursing home residents and to evaluate interventions to improve the visual status of this population.

Submitted for Publication: February 8, 2006; final revision received October 31, 2006; accepted November 19, 2006.

Correspondence: Cynthia Owsley, PhD, MSPH, Department of Ophthalmology, School of Medicine, University of Alabama at Birmingham, 700 S 18th St, Suite 609, Birmingham, AL 35294-0009 (owsley@uab.edu).

Financial Disclosure: None reported.

Funding/Support: This research was supported by the Retirement Research Foundation, the EyeSight Foundation of Alabama, the Pearle Vision Foundation, National Institutes of Health grant R21-EY14071, and Research to Prevent Blindness, Inc.

Additional Information: Dr Owsley is a Research to Prevent Blindness Senior Scientific Investigator.

REFERENCES

1. Tielsch JM, Javitt JC, Coleman A, Katz J, Sommer A. The prevalence of blindness and visual impairment among nursing home residents in Baltimore. *N Engl J Med*. 1995;332(18):1205-1209.
2. West SK, Friedman D, Munoz B, et al. A randomized trial of visual impairment interventions for nursing home residents: study design, baseline, characteristics, and visual loss. *Ophthalmic Epidemiol*. 2003;10(3):193-209.
3. Mitchell P, Hayes P, Wang JJ. Visual impairment in nursing home residents: the Blue Mountains Eye Study. *Med J Aust*. 1997;166(2):73-76.
4. Horowitz A. Vision impairment and functional disability among nursing home residents. *Gerontologist*. 1994;34(3):316-323.
5. van der Pols JC, Bates CJ, McGraw PV, et al. Visual acuity measurements in a national sample of British elderly people. *Br J Ophthalmol*. 2000;84(2):165-170.
6. VanNewkirk MR, Weih L, McCarty CA, Stanislavsky YL, Keefe JE, Taylor HR. Visual impairment and eye diseases in elderly institutionalized Australians. *Ophthalmology*. 2000;107(12):2203-2208.
7. Tsiel-Sartral M, Nounou P, Rea C, et al. Visual acuity and ocular disease in geriatric nursing homes: study in 219 elderly people in France. *J Fr Ophtalmol*. 1999;22(4):431-437.
8. de Winter LJ, Hoyng CB, Froeling PG, Meulendijks CF, van der Wilt GJ. Prevalence of remediable disability due to low vision among institutionalised elderly people. *Gerontology*. 2004;50(2):96-101.
9. Whitmore WG. Eye disease in a geriatric nursing home population. *Ophthalmology*. 1989;96(3):393-398.
10. Klein R, Klein BEK, Linton KLP, De Mets DL. The Beaver Dam Eye Study: visual acuity. *Ophthalmology*. 1991;98(8):1310-1315.
11. Sturgess I, Rudd AG, Shilling J. Unrecognized problems amongst residents of part III homes. *Age Ageing*. 1994;23(1):54-56.
12. Friedman DS, West SK, Munoz B, et al. Racial variations in causes of vision loss in nursing homes. *Arch Ophthalmol*. 2004;122(7):1019-1024.
13. Wang JJ, Mitchell P, Smith W, Cumming RG, Leader SR. Incidence of nursing home placement in a defined community. *Med J Aust*. 2001;174(6):271-275.
14. Friedman DS, Munoz B, Roche KB, Massof R, Broman A, West SK. Poor uptake of cataract surgery in nursing home residents: the Salisbury Eye Evaluation in Nursing Home Groups Study. *Arch Ophthalmol*. 2005;123(11):1581-1587.
15. Koch JM, Datta G, Makhdoom S, Grossberg GT. Unmet visual needs of Alzheimer's disease patients in long-term care facilities. *J Am Med Dir Assoc*. 2005;6(4):233-237.
16. Folstein MF, Folstein SW, McHugh PR. "Mini-Mental State" a practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12(3):189-198.
17. Brod M, Stewart AL, Sands L, Walton P. Conceptualization and measurement of quality of life in dementia: the dementia quality of life instrument (DQOL). *Gerontologist*. 1999;39(1):25-35.
18. Simmons SF, Schnelle JF. Strategies to measure nursing home residents' satisfaction and preferences related to incontinence and mobility care: implications for evaluating intervention effects. *Gerontologist*. 1999;39(3):345-355.
19. Logsdon RG, Gibbons LE, McCurry SM, Teri L. Quality of life in Alzheimer's disease: patient and caregiver reports. *J Ment Health Aging*. 1999;5:21-32.
20. Ferris FL, Kassoff A, Bresnick GH, Bailey I. New visual acuity charts for clinical research. *Am J Ophthalmol*. 1982;94(1):91-96.
21. Pelli DG, Robson JG, Wilkins AJ. The design of a new letter chart for measuring contrast sensitivity. *Clin Vis Sci*. 1988;2(3):187-199.
22. Elliott DB, Bullimore MA, Bailey IL. Improving the reliability of the Pelli-Robson contrast sensitivity test. *Clin Vis Sci*. 1991;6(6):471-475.
23. West SK, Munoz B, Rubin GS, et al. Function and visual impairment in a population-based study of older adults: the SEE Project. *Invest Ophthalmol Vis Sci*. 1997;38(1):72-82.
24. Muñoz B, West SK, Rubin GS, et al. Causes of blindness and visual impairment in a population of older Americans: the Salisbury Eye Evaluation Study. *Arch Ophthalmol*. 2000;118(6):819-825.
25. Muñoz B, West SK, Rodriguez J, et al. Blindness, visual impairment and the problem of uncorrected refractive error in a Mexican-American population: Proyecto VER. *Invest Ophthalmol Vis Sci*. 2002;43(3):608-614.
26. Tielsch JM, Sommer A, Will J, Katz J, Royall RM. Blindness and visual impairment in an American urban population: the Baltimore eye survey. *Arch Ophthalmol*. 1990;108(2):286-290.
27. Azen SP, Varma R, Preston-Marti S, et al. Binocular visual acuity summation and inhibition in an ocular epidemiological study: the Los Angeles Latino Eye Study. *Invest Ophthalmol Vis Sci*. 2002;43(6):1742-1748.
28. Marron JA, Bailey IL. Visual factors and orientation-mobility performance. *Am J Optom Physiol Opt*. 1982;59(5):413-426.
29. West SK, Rubin GS, Broman AT, Munoz B, Bandeen-Roche K, Turano K. How does visual impairment affect performance on tasks of everyday life? the SEE Project. *Arch Ophthalmol*. 2002;120(6):774-780.
30. Legge GE, Rubin GS, Luebker A. Psychophysics of reading, V: the role of contrast in normal vision. *Vision Res*. 1987;27(7):1165-1177.
31. Rubin GS, Legge GE. Psychophysics of reading, VI: the role of contrast in low vision. *Vision Res*. 1989;29(1):79-91.
32. Scott IU, Smiddy WE, Schiffman J, Feuer WJ, Pappas CJ. Quality of life of low-vision patients and the impact of low-vision services. *Am J Ophthalmol*. 1999;128(1):54-62.
33. Verbrugge LM, Patrick DL. Seven chronic conditions: their impact on US adults' activity levels and use of medical services. *Am J Public Health*. 1995;85(2):173-182.
34. Wang JJ, Mitchell P, Cumming RG, Smith W. Visual impairment and nursing home placement in older Australians: the Blue Mountains Eye Study. *Ophthalmic Epidemiol*. 2003;10(1):3-13.

From the Archives of the Archives

Three types of implants have been designed, all in "vitalium," each of them to be integrated with the same type of artificial eye so that the motion of the implant is imparted to the eye and the eye is held up to support the upper lid in a normal manner.

All the implants have the same type of face, which is left exposed in the socket, with an oval depression anteriorly. The eye is designed with an oval peg on its posterior (concave) surface to fit into this depression.

Reference: Hughes WL. An integrated artificial eye and "vitalium" implant for use in enucleation and evisceration. *Arch Ophthalmol*. 1948;39(3):449.