

Rehabilitation of Hospital Inpatients With Visual Impairments and Disabilities From Systemic Illness

William L. Park, OD, R. Samuel Mayer, MD, Chris Moghimi, OTR, Joanne M. Park, COA, James T. Deremeik, MA

ABSTRACT. Park WL, Mayer RS, Moghimi C, Park JM, Deremeik JT. Rehabilitation of hospital inpatients with visual impairments and disabilities from systemic illness. *Arch Phys Med Rehabil* 2005;86:79-81.

Objectives: To describe the comorbidity of visual impairment and disability among patients hospitalized for systemic illness and to discuss rehabilitation.

Design: Retrospective study.

Setting: Hospital-based, academic tertiary medical center with referring neurology, ophthalmology, and rehabilitation units.

Participants: Ninety-three hospitalized patients referred to the low vision rehabilitation clinic primarily by the physical medicine and rehabilitation and neurology units.

Interventions: Measurements of best-corrected visual acuity and other visual function testing. Referrals were made for prescriptive glasses, assistive devices, rehabilitation, resources, and ophthalmologic evaluation.

Main Outcome Measures: Specialized services, presence of comorbidities, and visual function measurements.

Results: The mean admitting visual acuity revealed a moderate visual impairment. The primary diagnosis for admission (51%) was cerebrovascular accidents. There was a mean of 3.5 other comorbidities.

Conclusions: The majority of patients admitted to the hospital for systemic diseases also had visual impairments. In many patients, this visual disability (either from the systemic and/or ocular disease) interfered with their activities of daily living.

Key Words: Activities of daily living; Brain injuries; Cerebrovascular accident; Rehabilitation; Vision, low; Vision disorders.

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AQUIRED BRAIN INJURY is the leading cause of neurologic dysfunction in the United States; the National Stroke Association estimates that 730,000 persons experience a cerebrovascular accident (CVA) each year. Of the approximately 570,000 who survive, many have some type of visual disturbance and the majority of people recovering from a traumatic brain injury (TBI) will have difficulties in binocular function, oculomotor skills, convergence and divergence of the eyes, accommodation, and visual fields.¹⁻⁴

From the Lions Vision Research and Rehabilitation Center, Wilmer Eye Institute, School of Medicine (Park, Deremeik), and Physical Medicine and Rehabilitation Department (Mayer, Moghimi), Johns Hopkins Hospital, Baltimore, MD; and Greater Baltimore Medical Center, Baltimore, MD (Park).

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Reprint requests to William L. Park, OD, Lions Vision Research and Rehabilitation Center, Wilmer Eye Institute, 550 N Broadway, 6th Fl, Baltimore, MD 21205. e-mail: wlpark@jhm.edu.

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These visual disorders often affect a person's ability to perform routine activities of daily living (ADLs), such as reading, writing, driving, watching television, cooking, and shopping, with the brain having difficulty receiving accurate visual information. This can lead to balance disturbances, disorientation, and generalized confusion.⁴ For the elderly population, sensory impairments increase susceptibility to injury and limit quality of life. Decreasing vision and failing hearing can reduce physical, functional, and emotional capabilities and social well-being. Vision and hearing impairments decrease independence in performing ADLs and in one's orientation, mobility, and communication with others. Isolation, depression, and poorer social relationships often accompany vision and hearing loss.⁵⁻¹¹

Falling is a serious problem for the elderly population, who are also more likely to be hospitalized after a fall. Thirty percent of community-dwelling people over age 65 years fall each year. The ability to walk independently is among the most fundamental ADLs. With loss of independent walking, community living is jeopardized and the risk of being placed in a nursing home is increased.^{9,10}

All of these situations may be further complicated by a visual impairment. Morse et al¹¹ found that the average hospital length of stay (LOS) was 13.4 days for patients with a visual impairment, 11.9 days for patients with either a visual impairment or eye pathology, and 8.2 days for patients with no visual impairment. They concluded that a better understanding of the functional care needs of patients with a visual impairment in acute care settings and at the time of discharge from the hospital could contribute to reducing excess LOS and its related costs and improve the quality of care.

METHODS

Ninety-three inpatients, hospitalized for systemic diseases, underwent low vision consultations from January 15, 2002, through December 20, 2002. They were referred from 2 sources. The first was a comprehensive 14-bed inpatient rehabilitation unit that offers an interdisciplinary approach with a team comprised of professionals from occupational therapy (OT), physical therapy, speech therapy, recreational therapy, and neuropsychology. Patients with different diagnoses were seen for intensive rehabilitation (3h/d) to increase their overall function and independence before discharge, with continued therapy as an outpatient or at home. The second source of referral was a 60-bed acute care neurology unit. Common diagnoses included CVA, brain tumors, aneurysms, spinal surgeries, and various other neurologic disorders.

Ninety-seven percent of the inpatients seen (90/93) were brought to the low vision clinic by the escort service for the initial evaluation; the other 3 were seen in their room because they were nonambulatory. Consultation had been requested by the attending physician (primarily psychiatrists or neurologists); low vision rehabilitation was provided, along with further direction on future vision rehabilitation as indicated, based on the initial consultation. No patient referred was excluded.

Table 1: Primary Admitting Diagnosis of Inpatient Population (N=93)

CVA	47
Brain tumor	12
TBI	3
Multiple sclerosis	3
Spinal stenosis	3
Cancer (lung and kidney)	2
Leg amputation	2
Ocular trauma	2
AIDS	2
Organ transplant	2
Anoxic brain injury	1
Parkinson's disease	1
Progressive supranuclear palsy	1
Temporal lobe resection	1
Ventriculo-peritoneal shunt	1
Laminectomy	1
Optic neuropathy	1
Myasthenia gravis	1
Giant cell arteritis	1
Myocardial infarction	1
Coronary artery disease	1
Coronary artery bypass	1
Diabetes mellitus complications	1
Lupus erythematosus	1
Drug/alcohol abuse	1

Abbreviation: AIDS, acquired immune deficiency syndrome.

Tests Conducted

Best-corrected visual acuity was established by manifest refraction. Stereopsis, color perception, binocularity, accommodation, contrast sensitivity, divergence and convergence testing, and Goldmann visual fields were performed as indicated.

RESULTS

The primary diagnosis on admission (51%) was CVA (table 1). Seventy patients (75%) had a primary diagnosis of central nervous system etiology. There were 27 different primary diagnoses, with a mean of 3.5 other comorbidities along with the primary diagnosis (table 2). There were 54 different comorbidities associated with the primary diagnosis. Hypertension (40%), hemiparesis as a result of a stroke (28%), hypercholesterolemia (27%), diabetes mellitus (22%), obesity (20%), coronary artery disease (17%), and depression (16%) were the most commonly seen systemic comorbidities. Glaucoma (10%) and optic neuropathy (6%) were the 2 most common ocular comorbidities.

The mean age at hospital admission into the hospital was 60 years (range, 16–85y), and 40 patients (43%) were under age 60 years. Fifty-five of the patients were women, 68% were white, and 31% were African American.

Twenty-nine patients (31%) had best-corrected visual acuity of 20/40 or worse. The mean entrance visual acuity of all patients was 20/83 in the right eye and 20/233 in the left eye (moderate visual impairment). The mean best-corrected visual acuity after evaluation was 20/64 and 20/192, respectively (excluding 19 patients with a visual acuity of <20/14,000 to light perception in 1 eye excluded). The mean entrance visual acuity of patients hospitalized for nonneurologic implications was 20/128 and 20/399 prior to examination and 20/93 and 20/278, respectively, after examination and refraction. Stereoa-

cuity was severely impaired to 273 seconds of arc (indicating poor binocularity) using the polaroid Titmus test. The mean contrast sensitivity using the Pelli-Robson chart (detection of low contrast objects) was moderately impaired at 1.29 log units, as compared with 1.65 log units for normal binocular contrast sensitivity in older individuals without eye disease.¹⁰⁻¹² This implies an increased risk for impaired orientation and mobility (curbs and steps), difficulty with reading, driving, and all other ADLs.

Goldmann visual fields were performed on 52 patients; 4 could not be tested because of their decreased cognition or attention, and 37 were not tested because they could not be scheduled before discharge from the hospital. Fourteen (27%) of those tested had a right or left hemianopsia, 5 (10%) had a quadrantanopsia, 17 (33%) had some form of field defect, and only 16 (30%) had visual fields greater than 110°.

A low vision practitioner (WLP) made the initial evaluation of all inpatients. Thirty-nine patients (42%) were referred to and evaluated by a rehabilitation teacher with a master's degree in education providing rehabilitation for the visually impaired, 24 (26%) by an occupational therapist (other than the hospital staff occupational therapist), and 7 (8%) by both the rehabilitation teacher and the occupational therapist in the low vision service, at the initial consultation.

Forty-three (46%) of the patients received a new prescription for glasses after a significant improvement in their visual acuity as determined during examination. Thirty patients (32%) also received assistive devices such as high plus reading lenses, hand and stand magnifiers, and/or video magnification as indicated. Speech output technology was evaluated for patients with vision so impaired that the patient could not read with video magnification at 45 times magnification and on a black background with white letter text. Telescopic magnification for central visual acuity loss and reverse telescopic spectacle-mounted devices for field expansion from peripheral visual field loss were also evaluated when functionally indicated. Nonoptical aids (eg, talking watches, alarm clocks, glucometers, large number clocks and telephones, illumination sources, large print checks, books, daily planners, white canes) were also evaluated for improvements in ADLs or mobility.

Nine patients (10%) were referred to OT for follow-up home ADLs because of functional issues and overall modification of their environment (ie, improvement of lighting; creating contrast in the kitchen, bedroom, and bathroom; marking of stairs, appliances, food products, and clothes). Seventeen patients (18%) were referred to the OT outpatient clinic, usually for further assessment of the efficacy of assistive devices, navigation and mobility, scanning, patient use of prism, and visuo-perceptual therapy. Sixteen (17%) of the 93 inpatients were simultaneously referred to state agencies for personal safety issues, mobility instruction, and comprehensive rehabilitation and for financial, educational, and vocational resources after discharge from the hospital. Simultaneous referral to the Division of Rehabilitation Services (DORS) and OT was made in

Table 2: Comorbidities of the Inpatient Population

Neurologic complications	131
Cardiovascular complications	116
Diabetic complications	25
Orthopedic complications	24
Other major diseases	20
Ocular disease	19
Respiratory disease	9

many cases because of acute personal safety issues (usually relating to mobility and safe travel), necessitating an emergent assessment of the home environment. The reason for dual referral was that OT could more frequently provide an emergent assessment (in our area), with the DORS following up with the patients on a long-term basis. All cases were opened, and collaboration among the rehabilitation teacher, the Johns Hopkins Hospital occupational therapists, and the DORS counselor was coordinated on behalf of the patient.

Thirty-nine (42%) patients were seen for follow-up (WLP) 1 or more times, along with the rehabilitation teacher and/or occupational therapist. Five of those patients were prescribed prism; 2 patients wore the prism for a short term (<3mo) and 3 were long-term wearers. Of the long-term patients, 1 was prescribed 30 prism diopters base down because of a lack of down gaze—secondary to progressive supranuclear palsy—simply to see her food. The second patient was prescribed prism for vertical diplopia and the third was prescribed 21 prism diopters for a right homonymous hemianopsia mounted base right to relocate the blind field. Three patients were temporarily occluded using a clip-on plastic black patch or Bangert occlusion foil.

Seven (8%) patients received outpatient visuoperceptual training for posttrauma vision syndrome characteristics, primarily involving accommodation difficulties, convergence insufficiency, diplopia, poor extraocular motility skills, scanning, and compensation for visual field loss.

Seven (8%) patients were referred to ophthalmology: 3 for diabetic retinopathy, 1 for high intraocular pressure, 2 for a cataract extraction consultation, and 1 with papilloedema.

Five patients, all with neurologic diagnoses, were referred for road evaluations to a certified driving instructor. Two patients had a guarded prognosis (TBI and CVA along with Parkinson's disease). An author (WLP) participated in the evaluation and observation of the driving skills of the 2 patients who had a guarded prognosis for demonstrating safe driving skills. The patient with TBI was given a positive recommendation (demonstrated safe driving skills) after the road evaluation. The second patient, who had Parkinson's and had had a CVA, was given a negative recommendation (because of multiple steering wheel and braking interventions during the road test) caused by decreased cognition and visual processing and a lack of awareness of his driving environment.

DISCUSSION

Visual impairments are common in patients on a rehabilitation unit. This study describes visual impairments in neurologically impaired patients and in patients with other common rehabilitation diagnoses such as amputation, hip fracture, joint replacement, acquired immune deficiency syndrome, and cardiac disorders.

Study results demonstrate that evaluation by a low vision rehabilitation team consisting of an optometrist, a rehabilitation teacher, and a specially trained occupational therapist (in visual impairments) can dramatically improve visual acuity and provide useful advice about therapeutic interventions and environmental adaptations. Massof et al^{13,14} and Wainapel¹⁵ have described similar interdisciplinary teams. Interventions included new optical prescriptions, visual assistive devices, visuospatial retraining, home evaluations, vocational training, and driver evaluations.

Routine screening of patients in rehabilitation for visual impairments is essential for several reasons. Patients with visual impairments are often mislabeled as uncooperative, unmotivated, demented, or clumsy. Elderly people rely progressively on visual information to maintain balance because

strength, vestibular function, and proprioception decline with age. Poor visual acuity is associated with falling and hip fractures, which have high rates of morbidity and mortality in the elderly population.⁶⁻¹¹ Patients with visual field cuts often have difficulty scanning their environments, which can slow progress in ADLs and ambulation.

In the current health care environment, with managed care and its limits on rehabilitation time, all patients must get the most out of each therapy session. This goal is achieved when vision problems are identified and treated early in the process. Prompt treatment makes it possible for other rehabilitation professionals to be more effective in achieving short- and long-term treatment goals.

CONCLUSIONS

The majority of patients who were admitted to the hospital for systemic diseases also possessed a visual impairment. In many patients, this resulted in a visual disability (either from systemic and/or ocular disease) that affected their ADLs and, in many cases, their personal safety relative to orientation, mobility, and safe navigation. This study demonstrated the importance of referring inpatients for visual rehabilitation, thus improving their ability to function during their hospital rehabilitation and subsequent discharge from the hospital.

References

1. Nelms AC. New visions—collaboration between OTs and optometrists can make a difference in treating brain injury. *OT Pract* 2000;31:15-8.
2. Obisesan TO, Vargas CM, Gillium RF. Geographic variation in stroke risk in the United States: region, urbanization, and hypertension in the Third National Health and Nutrition Examination Survey. *Stroke* 2000;31:19-25.
3. Wade TW. Epidemiology of disabling neurological disease: how and why does disability occur. *J Neurol Neurosurg Psychiatry* 1997;63:11-8.
4. Scheiman M. The eyes have it. *Adv Occup Therapists* 2000;9:61-3.
5. Keller BK, Morton JL, Thomas VS, Potter JF. The effect of visual and hearing impairments on functional status. *J Am Geriatr Soc* 1999;47:1319-25.
6. Tinetti ME, Inouye SK, Gill TM, Doucette JT. Shared risk factors for falls, incontinence and functional dependence: unifying the approach to geriatric syndromes. *JAMA* 1995;273:1348-53.
7. Rovner BW, Ganguli M. Depression and disability associated with impaired vision: the MoVIES Project. *J Am Geriatr Soc* 1998;46:617-9.
8. Wang JJ, Mitchell P, Cumming RG, Blue Mountains Eye Study. Visual impairment and nursing home placement in older Australians: the Blue Mountain Study. *Ophthalmic Epidemiol* 2003;10:3-13.
9. Mahoney JE, Sager MA, Jalaluddin M. New walking dependence associated with hospitalization for acute medical illness: incidence and significance. *J Gerontol A Biol Sci Med Sci* 1998;53:M307-12.
10. Mahoney JE, Sager MA, Dunham NC, Johnson J. Risk of falls after hospital discharge. *J Am Geriatr Soc* 1994;42:269-74.
11. Morse AR, Yatzkan E, Berberich B, Arons RR. Acute care hospital utilization by patients with visual impairment. *Arch Ophthalmol* 1999;117:943-49.
12. Rubin GS, Bandeen Roche K, Prasada-Rao P, Fried LP. Visual impairment and disability in older adults. *Optom Vis Sci* 1994;71:750-60.
13. Massof RW, Dagnelie G, Deremeik JT, DeRose JL, Suleiman SA, Glasner NM. Low vision rehabilitation in the U.S. health care system. *J Vis Rehabil* 1995;9:3-31.
14. Massof RW, Aibbhai SS, Deremeik JT, et al. Low vision rehabilitation: documentation of patient evaluation and management. *J Vis Rehabil* 1996;10:3-31.
15. Wainapel SF. Low vision rehabilitation and rehabilitation medicine: a parable of parallels. In: Massof RW, Lidoff L, editors. *Issues in low vision rehabilitation: service delivery policy and funding*. New York: AFB Pr; 2001. p 55-70.