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# The History and Future of Low Vision Services in the United States

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***Abstract:*** This article discusses the history of low vision services in the United States. The field began to gain momentum as the term *low vision* was conceptualized and coined, and this momentum is rapidly increasing with changes in the demographics of visual impairment.

> There is no doubt that there are many individuals who, having visual acuity between 20/200 and 20/70, are not classified as "blind," and who could be benefited by optical aids. This group is in as great a need of service as those who are "blind." They are not the primary responsibility of an organization for the blind, but their needs merit consideration by some appropriate agency in the community. (Industrial Home for the Blind Survey, 1957, p. 13)

In the 1260s, explorer Marco Polo discovered elderly people in China reading with magnifying lenses, 400 years before Descartes "invented" them in France. But it was not until 300 years after Descartes, in the 1950s, that George Hellinger developed an optical aids program at the Industrial Home for the Blind (IHB) in

New York City, now Helen Keller Services for the Blind (Hellinger & Green, 1954). Gerald Fonda and Eleanor Faye did the same at the Lighthouse for the Blind across town, coining the term *low vision* (Goodrich & Bailey, 2000). Although the term *partially blind* was already used to denote a state distinct from "blindness," it was not until the conceptualization and use of the term *low vision* that the field of low vision rehabilitation started to gain momentum. In this article, we discuss the pioneering work in low vision rehabilitation, the circumstances that spurred its growth, and the spectrum of current services and providers that is inspiring and sometimes confusing.

## The rise of low vision services

Between Marco Polo's era and ours, *blindness* and *sight* were the dominant, if not the only, terms with which to talk about vision. In 1893, the British Parliament defined *blindness* as "too blind to read the ordinary school books used by children" (quoted in Goodrich & Bailey, 2000, p. 678). In the 1930s, the U. S. government defined *blindness* as vision "insufficient for the ordinary activities of life for which sight is required" and declared that level of vision to be 20/200 or a maximum visual field of 20 degrees, the parameters of "legal blindness" (Roberts, 1986, p. 10). This demarcation has caused controversy and prompted Lloyd Greenwood's comment in 1949, "More people are blinded by definition than by any

other cause" (quoted in Ritter, 1957, p. 10). The subsequent focus of public and private resources on people who are "blind" had the practical effect of overlooking many of those whose residual vision, while better than "blindness," was "insufficient for the ordinary activities of life" and who were in "as great a need of service as those who are blind." The very test used to define *legal blindness* in 1933 (Roberts, 1986) has inadvertently contributed to the problem. The Snellen acuity chart, developed in 1865 by Herman Snellen (National Research Council, 2002), was the only one that was inexpensive, widely available, easily administered, and had face validity. Its largest letter represented a visual acuity of 20/200; anyone seeing less than that was designated by the American Medical Association as "legally blind." The Snellen chart offered only the single letter "E" to measure acuity of 20/200 and only two letters to represent the next level of vision (20/100), so it is little wonder that contemporary research has found that it is not a good measure of functional vision. It contributed to the faulty presumption that vision much less than normal is useless (National Advisory Eye Council, 1993).

Low vision services in the United States were born of an awakening that there is a middle ground between sight and blindness. The origins of these services were educational institutions for the blind, like the Perkins School, which initiated its first class for "partially blind" children in 1913 (Hathaway, 1943, 1959; Merry, 1933). At that time, it was common to fit children with

high collars and blindfolds to save their residual vision. The president of the Association of Instructors of the Blind criticized this practice in 1916 (Burritt, 1916), and ophthalmologists debunked it in the 1930s (Goodrich & Arditi, 2000). Early in the 20th century, education for "partially sighted" children advocated the use of large print, but sight-saving classes continued, and it was not until the 1960s, as a result of the pioneering work of Barraga (1964a, 1964b), that more attention began to be paid to low vision devices and visual training (Goodrich & Bailey, 2000). Barraga's innovative work led to the recognition that many children with low vision, who were inaccurately labeled "blind," would be better served by educational practices that included low vision devices and teaching strategies that permitted them to learn to use their vision more effectively (Roberts, 1986). World War II brought home many veterans who were blind or had low vision, prompting the establishment in 1948 of the first Veterans Administration (VA) blind rehabilitation program at Hines Hospital in Chicago (Bledsoe, 1997). Although the VA, IHB, and Lighthouse programs were for people who were blind, they contained the seeds from which low vision services grew.

Three critical developments helped low vision rehabilitation grow to its current state.

1. *Visual aid technologies:* Early in the 20th century, Von Rohr (1918) designed a telescopic lens for Zeiss Optical, and shortly thereafter, prisms for

hemianopsias were introduced (Baunschwig, 1922). In the 1930s, the optics of low vision devices was systematized (Feinbloom, 1935), and 20 years later, the microlens was introduced (Kestenbaum, 1953). The first exhibition of low vision aids was organized in 1954 for the International Congress of Ophthalmologists (Goodrich & Arditi, 2000), and a decade later, the first closed-circuit television was developed at the RAND Corporation (Genensky, Baran, Moshin, & Steingold, 1969). Technology in the field of low vision rehabilitation, including computers, has continued to develop at an impressive rate.

2. *Evaluation tools:* The first standardized visual acuity chart with M notation was introduced in the 1950s (Sloan, 1951, 1959), followed in the 1970s by the logMAR chart design (Bailey & Lovie, 1976) and by the publication of the first low-contrast letter chart in 1984 (Ginsburg, 1984). Manual and automated visual field devices improved on the tangent screen of the 1950s, and the development of the SLO in the 1980s made precise macular mapping possible (Timberlake et al., 1982). This technology enabled clinicians to learn much about the various patterns of vision loss and their important functional implications.

3. *Training methods for consumers:* Following Feinbloom's (1938) early report of 500 cases of low vision, publications on low vision assessment and training began to appear (Barraga, 1964a, 1964b; Faye & Hood, 1975; Fonda, 1960; Mehr &

Freid, 1975). Conferences on low vision were sponsored in the 1970s by the Rehabilitation Services Administration, the VA, and the National Eye Institute (NEI) (Goodrich & Arditi, 2000). Eccentric viewing techniques were developed in the 1970s (Holcomb & Goodrich, 1976), followed by further publications defining training methods (Inde & Bäckman, 1975; Jose, 1983; Quillman, 1980). The Pepper Test, used for both assessment and training, appeared in 1986 (Baldasare, Watson, Whittaker, & Miller-Shaffer, 1986); the 1990s gave rise to a major text (Freeman & Jose, 1991); and contributions to the field continue to appear at a rapid rate (see, for example, Silverstone, Lang, Rosenthal, & Faye, 2000a, 2000b).

These new tools and methods were paralleled by developments in the training of professionals in academic institutions, with Boston College's orientation and mobility (O&M) program (Wiener & Siffermann, 1997) and Western Michigan University's master's degree program in rehabilitation teaching, both launched in the early 1960s, and the master's degree program in low vision at the Pennsylvania College of Optometry in the 1980s (Smith, 1983). Twenty years later, a graduate certificate in vision rehabilitation is offered by the Occupational Therapy Department of the University of Alabama at Birmingham.

In addition to these programs, there was increasing

interest in residual vision among service and professional organizations (Hathaway, 1943). The American Optometric Association established its Committee to Aid the Partially Sighted in 1959. In the 1970s, the American Foundation for the Blind (AFB) formed an Ad Hoc Advisory Committee on Low Vision Services, the American Academy of Optometry began its Low Vision Diplomate program, the American Academy of Ophthalmology established its Low Vision Committee, and the American Association of Workers for the Blind expanded to include a Low Vision Division (Goodrich & Bailey, 2000).

During the same period, advocacy for use of large-print books by those with residual vision took firm hold. Clear Type Publishing introduced large-print books in 1916 (Hathaway, 1943), and the American Printing House for the Blind has continuously published them since 1947. In the 1950s, Lorraine Marchi, founder of the National Association of Visually Handicapped, began advocating for their broader availability and use in schools by children with residual vision.

Although the early programs were limited to the "blind," they planted the seeds for low vision rehabilitation. The 1957 survey by IHB still reads like a virtual blueprint for modern low vision services. It emphasized

- the importance of a team approach to services and treatment;

- the need for ongoing therapy with multiple visits;
- the recognition that performance with devices in the clinic setting may not reflect the applicability of those devices in the home environment; and
- the need to integrate optical aids and rehabilitation so that the client may be considered a "total individual, with a variety of interrelated needs, not merely as a problem in low vision" (p. 14)

These concepts set the stage for the rise of low vision rehabilitation, whose geometric expansion in just the past two decades reflects three factors: (1) changes in demographics, pathology, and lifestyle, as well as in perceptions of aging, all serving to increase the need for comprehensive low vision rehabilitation services, particularly for older Americans; (2) increased rehabilitation capability in terms of providers and devices; and (3) changes in public policy and funding, with the promise of imminent further change.

The history of the progression from blindness as the exclusive and definitive condition of visual impairment to partial blindness and then to low vision is reflected in the name of this journal, which was founded in 1907 as *Outlook for the Blind*; became *New Outlook for the Blind*; and finally took its present title, which reflects the inclusion of those with low vision. The focus of consumers has changed as well, with the founding, in 1979, of the Council of Citizens with Low Vision, as

differentiated from the older National Federation of the Blind and the American Council of the Blind. Other organizations, like the Association for Macular Diseases and the Macular Degeneration Partnership, reflect the rise of low vision and the need for information and support among those with low vision. Our field continues to grow rapidly, gathering greater steam each year, as evidenced by the quantity and distribution figures of other publications in low vision. *Low Vision: The Reference* (Goodrich & Arditi, 2004) documented over 10,000 citations in the low vision literature, over 80% of which were published in the past 20 years.

## Demographic, social, and medical changes

Two developments of the past 50 years have changed the face of blindness and low vision dramatically. They have been (1) a decrease in blindness, particularly among children and young adults, because of medical advances, improved protective eyewear, and changes in the weapons of war and (2) an increase in low vision among older adults because of an increase in the age and longevity of the population and medical advances that have prolonged life and delayed or prevented the onset of full blindness.

Changes in medical practice have greatly reduced the incidence of retinopathy of prematurity, a major cause of blindness in the 1950s, and many interventions are

helping to preserve sight that is threatened by a variety of other causes. Pharmaceutical and surgical treatments have significantly decreased the development of blindness from such conditions as glaucoma and diabetic retinopathy. Improvements in protective eyewear and consciousness of the importance of such protection have made sports injuries less likely, and sophisticated, remote weapons of war have resulted in fewer injuries that are specific to soldiers' eyes.

Antibiotics have decreased deaths from infections, and drugs are controlling hypertension and decreasing deaths from strokes and heart attacks, thereby increasing longevity. In 1900, the life expectancy of Caucasians was 46.3 years for men and 48.3 for women; in 1950, it was 65.6 years for men and 71.1 for women; and by 2000, it had risen to 74.3 for men and 79.7 for women (National Center for Health Statistics, 2004). This dramatic increase in the life span has given rise to a high prevalence of chronic diseases of aging, including age-related macular degeneration (AMD). In 1957, the IHB reported that 60% of its low vision clients were aged 20–60, 14% were aged 70 or older, and only 3.6% had macular degeneration of any kind. Today, well over 60% of low vision consumers are elderly, and AMD is the biggest cause of vision loss among adults in the developed world and is becoming more common in many less developed countries (Eye Diseases Prevalence Research Group, 2004; VanNewkirk et al., 2000).

Socially, the concept of aging is changing rapidly, greatly influencing how low vision is viewed and treated, since the majority of those with low vision are in the latter third of their lives. In past generations, people were expected to retire from their jobs and most activities at age 65. Today, many people continue both to work and to engage in many other activities well beyond age 65—to the point that age 60 has been termed "the new 30" (Sherrill, 2003). Elderly people with vision loss are therefore in desperate need of visual rehabilitation, precisely because they are not necessarily sitting quietly in their rocking chairs. Furthermore, the visual demands for performing activities of daily living are greater in our complex mechanical, digital, and screen-oriented society, with basic services often distant from home and inaccessible by public transportation.

The impact of these changes is further amplified by the changing patterns of family geography. We have become a mobile society, with adult children often living far from their parents; thus, the survival of elderly people requires greater independence than in previous generations. Short of a medical miracle, the baby boomers will develop AMD in numbers at least equivalent to the current generation of elderly people (D. Lee, Gómez-Marin, Lam, Zheng, & Jané, 2004). Their expectations for continued independence and a good-quality lifestyle will likely be much higher than those of their parents and hence will challenge the parameters of rehabilitation services.

## Low vision services in the past decade

As the IHB survey predicted, a key component of any program's success is the combining of optical devices with rehabilitation training. As early as the mid-1970s, research indicated that almost 90% of the persons who received optical devices and low vision training continued to use their devices for many years (Goodrich et al., 1976), and more-recent studies have shown an even higher continued rate of use (Watson, De l'Aune, Long, Maino, & Stelmack, 1997). The combination of low vision evaluation and rehabilitation training have had legal mandates for children and employment-age adults for decades through government-funded school and vocational programs, although in reality they have been chronically under funded. For the large number of seniors with low vision, no similar system has been broadly accessible and funding has been even more limited. At least six barriers served to limit access to rehabilitation services for those with low vision:

1. Many state and private programs required people to be legally blind to receive services, and most individuals with visual impairments do not meet the legal criteria.

2. Many programs or providers offered only one of the services (either low vision evaluation and

prescription of devices or rehabilitation), and few optometrists and ophthalmologists provided even low vision evaluations.

3. Governmental and private funding was earmarked largely for younger clients because they were the visually impaired population of the mid-20th century, and their advocates in the educational system provided visibility and funding for programs.

4. Elderly people with visual impairments, regardless of their visual acuity, did not perceive themselves as blind and did not look to organizations for the blind for help.

5. Trained rehabilitation providers (certified low vision therapists, O&M instructors, occupational therapists, and rehabilitation teachers) were and continue to be in short supply, so services were and are not available in many areas, and extensive waiting lists exist in many areas where their services are offered.

6. Optometrists and especially ophthalmologists, who had not been gatekeepers to rehabilitation programs for children, were often unfamiliar with existing services. They were therefore unlikely to refer elderly persons for these services.

The result of all these factors was that relatively few elderly people with low vision were given the combination of devices and rehabilitation training that

is crucial to their independence and well-being.

## Changes in public policy and funding

In 1975, the VA proposed to the U.S. House of Representatives that low vision services should be provided through Medicare or some other national health insurance program. That effort was unsuccessful. In the 1990s, however, the great need of elderly persons for low vision rehabilitation prompted physicians to advocate for Medicare reimbursement for these services. A structure was already in place for at least minimal Medicare reimbursement to physicians for performing low vision evaluations, so the pressing need was to gain Medicare coverage for rehabilitation. To do so required gaining Medicare's recognition that low vision rehabilitation is rehabilitation, not the provision of eyeglasses, which it does not cover.

The first successes in this effort were achieved by Donald C. Fletcher, M.D., on a handshake with Medicare in Kansas and Florida in the mid-1990s, and the first formal, written policy appeared in Michigan in 1997. Over the ensuing five years, 25 more states gained coverage, and in May 2002, Medicare published a Program Memorandum (Center for Medicare and Medicaid Services, 2002) that defined visual rehabilitation services that cannot automatically be denied by local carriers and provided strong support for an appeal should a denial occur. Practically

speaking, the Program Memorandum has resulted in national coverage for visual rehabilitation within the medical system. The services of all vision rehabilitation professionals may currently be billed to Medicare when services are provided at the site where the physician is present. The purpose of the proposed legislation, discussed later in this article, is to add the 2,717 certified rehabilitation teachers, O&M instructors, and certified low vision therapists nationwide to the 80,000 occupational therapists who may provide reimbursable rehabilitation services in persons' homes and to guarantee permanent coverage.

The Program Memorandum (Center for Medicare and Medicaid Services, 2002) provides for reimbursement for rehabilitation for visual impairments on the same basis and with the same rules as apply to medical rehabilitation services for any physical impairment:

- A physician's order—an initial evaluation in which clear and attainable goals are set forth.
- Documentation of activities undertaken in each 15-minute time unit of therapy, which may include activities of daily living; community integration; sensory integration, as in eccentric viewing training and scotoma (blind spot); and training in preferred retinal locus (PRL). Progress must be documented at each visit.
- A monthly progress report signed by the referring physician and a discharge summary indicating the

degree to which each goal was met.

- Completion of therapy within a maximum of three consecutive months in any calendar year.

In its definition of beneficiaries who qualify for services, the Medicare Program Memorandum includes those with acuities of less than 20/70, central scotomas, and visual field deficits, fulfilling, 45 years later, IHB's admonition that "some appropriate agency in the community provide rehabilitation services to those with low vision" (IHB survey, 1957, p. 13; see also Hellinger & Green, 1958).

## What do we mean by low vision rehabilitation?

Professionals are often unaware that when we talk about low vision rehabilitation, different people may be referring to different services. Low vision rehabilitation or visual rehabilitation for those with low vision starts with two clearly different parts: (1) the low vision evaluation and (2) rehabilitation training. What we refer to as low vision rehabilitation may include a wide assortment of one or more of the following elements:

*A low vision evaluation*, performed by optometrists and ophthalmologists, may vary in its inclusion of any or all of the following or more:

- Evaluation of disease

- Evaluation of the chief functional deficit
- Evaluation of comprehensive functional deficits
- The prescription of optical devices
- Recommendations for nonoptical devices
- The application of devices to activities of daily living
- Discussion of the emotional and psychological impact of vision loss
- Discussion of minimizing the risks of the progression of the disease or condition
- Discussion of the risks for family members

*Rehabilitation training for adults* may include any or all of the following, only some of which are recognized and reimbursed by Medicare. Education of children with low vision has its own spectrum of activities, which overlaps with but is not identical to the following:

- Training in the specific use and care of prescribed devices
- Training in reading and writing techniques
- Training in the performance of activities of daily

living with or without optical devices

- Training in the identification of scotomas and the efficient use of the PRL, a more precise form of eccentric viewing
- Training in visual motor skills, including scanning, tracing, tracking, and the localization of specific targets
- Training in visual perceptual skills, including part-to-whole relationships, visual closure, visual perspective, and motion parallax
- Training in adapting the environment with lighting, contrast, organization, labeling, glare control, hazard removal, and other safety measures
- Training in the use of nonoptical devices
- Training in adaptive computer use, including enlargement and speech output
- Training in safe mobility in the home and community, including the use of support canes and long canes, as well as sunglasses for glare and monoculars for orientation and spotting
- Training in recreational activities
- Introduction to local and national resources and services

- Driver evaluation and training
- Counseling and support groups
- Training and support for caregivers
- Classes in crafts and hobbies

There is an equivalent variety of formats for the delivery of low vision services and vision rehabilitation services. Some services are conducted in a person's home, while others are conducted in a clinic setting in a nonprofit agency, a physician's office, a school, or a hospital rehabilitation department. Some are itinerant, with comprehensive services transported to consumers, a model that is familiar in services for children who are in general education classrooms, while others are residential, with consumers transported to the services for various amounts of time. Some are classes and group sessions, others are individual therapy, and still others are a combination of group and individual formats. In short, low vision services in educational settings are as varied as are those in rehabilitation settings and are affected by many of the same factors, including these:

- The need to identify accurately who may be eligible for and benefit from services
- Limited availability of qualified personnel
- Limited availability of local services and

resources

- The challenges created by diverse cultural populations
- The challenges of serving a diverse population with visual impairments, ranging from near-typical vision to total blindness, as well as children with multiple disabilities
- Funding restrictions

As with rehabilitation services for older individuals, the challenge of providing high-quality education to children with low vision has driven the development of new assessment procedures (Goodman & Wittenstein, 2003; Haegerstrom-Portnoy, 2004; Hyvärinen, 2000) and innovative teaching strategies (see, for example, Corn et al., 2003; Corn & Koenig, 2002; D'Allura, 2002; Wilkinson, Stewart, & Trantham, 2000). Educational programs are also provided to visually impaired children with additional disabilities (Haegerstrom-Portnoy, 2004; Lueck & Heinze, 2004; Zambone, Ciner, Appel, & Graboyes, 2000). Computer technology has both challenged and enhanced educational offerings for children with visual impairments, requiring teachers to learn computer and access technology and the skills to teach it and to assess its impact (Abner & Lahm, 2002; Kapperman, Sticken, & Heinze, 2002). The variety of delivery models is testimony to the fact that one best model has not been identified, either in rehabilitation or in

education. If a single model or several models evolved as the best for any age group, it would likely be the result of outcome studies that proved its or their effectiveness.

Outcomes studies are increasingly required for all medical services. In the past few years, outcome studies using quality-of-life measures have found a beneficial impact of low vision services (see, for example, Haymes, Johnston, & Heyes, 2002; Moore, 2003; Stelmack, Stelmack, & Massof, 2002), but few have addressed comparative outcomes of different service models, partly because vision rehabilitation is new in medicine and partly because it is complicated to measure the outcomes of low vision rehabilitation. First, the majority of adults who receive services have progressive diseases, so both vision and function continue to decrease; second, those who are already elderly acquire additional functional problems with further aging that may be unrelated to low vision but exacerbate it; and third, outcomes studies ideally include a control group that receives no service. Even without outcomes to prove it, however, few would argue that people with low vision do better with no help. Therefore, withholding services to prove the point is unethical. As communication among the variety of providers continues to grow, the hope is that reliable comparative outcomes studies will be possible across the spectrum of visual rehabilitation that will provide some guidance for the optimal structuring of low vision rehabilitation services.

Funders of vision rehabilitation services also use different definitions of low vision services for the programs they fund. For example, Medicare-reimbursed services define low vision as beginning at 20/70, but many government-funded nonmedical rehabilitation programs are mandated to exclude adults with acuities better than 20/200. Hence, the inclusion of all these programs in a discussion of low vision services calls into question again what we mean when we say “low vision” and “low vision services.” This situation may be changing, since a growing number of VA medical centers are recognizing the need for low vision services for veterans whose acuities are not yet 20/200, and some state vocational rehabilitation agencies provide services to visually impaired individuals who are not yet legally blind if their visual impairments are compromising their employment.

Even the terminology for age is confusing; Medicare recognizes elderly persons as such at age 65, but some governmental programs designate 55 year olds as elderly and thus no longer eligible for vocational programs. Privately funded nonprofit agencies vary in their inclusion policies, so, ironically, the only programs that predictably include all those with low vision are those that bill health insurance companies. Formats for these programs vary, too, from outpatient clinics that may also provide home visits to home care agencies to comprehensive outpatient rehabilitation facilities.

The diversity of providers of low vision rehabilitation services is one of the most confusing aspects of the field, a confusion that has been highlighted by the introduction of Medicare reimbursement. The 2002 Medicare policy brought visual rehabilitation into medicine, but it did not, and did not have the authority to, redefine practicing vision rehabilitation professionals as medical providers. Therefore, under the current policy, vision rehabilitation professionals can be reimbursed for services they provide only under the auspices of a physician who is at the location where and when the services are performed. To gain Medicare's recognition of visual rehabilitation professionals (rehabilitation teachers, O&M instructors, and low vision therapists), legislation has been proposed in House and Senate bills in the past several years. Passage of this legislation would remove the geographic limits currently in place and enable traditionally nonmedical vision rehabilitation professionals to provide services under the auspices of a physician but not necessarily in the same location as the physician. To do so would require the creation of a new category of supervision and supervisory responsibility in medicine. Congress has requested a study of the issue.

The current, hard-won Medicare policy and the proposed legislation will facilitate the provision of visual rehabilitation services to elderly persons with low vision, but they will also complicate the field.

Some are concerned about defining low vision as a medical problem, a necessity for medical insurance, while others are concerned about increasing the pool of providers. Since there is more interaction among those with medical and nonmedical training, however, mutual recognition and respect for the considerable skills of both groups is destined to develop.

A bridging of the nonmedical and medical worlds of visual rehabilitation was actually already in process before national Medicare reimbursement was gained, in the establishment of the Academy for the Certification of Visual Rehabilitation and Education Professionals (ACVREP) and the development of the newest certification, the certified low vision therapist (CLVT). The CLVT certification was established under the Association for Education and Rehabilitation of the Blind and Visually Impaired in 1997 and transferred to ACVREP in 1999 (ACVREP, 2004; Watson, Quillman, Flax, & Gerritsen, 1999). Certified low vision therapists work in association with a physician, and eligibility for certification is also extended to those with medical backgrounds. Many of the occupational therapists who currently provide visual rehabilitation services have obtained CLVT certification. The merger of the two worlds requires us all to negotiate some rocky terrain, but it also sets the stage for a richer array of services for elderly persons with low vision and a broader spectrum of opportunities for visual rehabilitation professionals and occupational therapists alike. Above all, dialogue;

cross-training; and the sharing of knowledge, skills, and experience by providers will enrich the field of low vision rehabilitation and will ultimately benefit those we serve: the many children, working-age adults, and elderly persons with low vision who are striving to maintain the quality of their lives.

## The future

Low vision among seniors is looming as one of the biggest public health problems in the developed world (Pizzarello et al., 2004). The barriers that existed in the past have not disappeared, but they are becoming fewer:

1. The requirement of legal blindness by many state and private programs may change in compliance with Medicare and may become a less significant barrier as more services develop outside these programs.

2. The provision of only one part of the service, with sufficient education of providers and the public, may result in coordination, cooperation, and cross-referrals, so that consumers will receive the full spectrum of available services no matter where they enter the loop. Public education is flourishing, with efforts ranging from NEI's traveling exhibit on low vision rehabilitation to pamphlets from the NEI, AFB, Lighthouse International, and other groups, as well as self-help books (see, for example, Mogk & Mogk,

2004; Price & Comac, 2000; Solomon, 2000).

3. Existing funding sources, whether governmental or private, are unlikely to expand, but the entry of Medicare as a funder of visual rehabilitation services represents a path around this barrier.

4. Elderly persons with adult-onset low vision will continue to think of themselves as not being blind because the sighted world believes that blindness means no vision. Indeed, it would come as a surprise to many elderly persons with AMD and a best visual acuity of 20/400 that they have less vision than their younger neighbors with Stargardt's syndrome who are considered blind. This situation harkens back to the demarcation of legal blindness and the semantic dilemma it presents. The terminology does not reflect the reality that vision exists on a seamless continuum from full vision to no vision. The hope and expectation is that the blending of visual rehabilitation and medicine, along with public education, will help alleviate barriers to services.

5. A major effort is under way within ophthalmology to ensure that in the future, all persons with visual impairments are informed of the services that are available to them.

The considerable public health concern associated with aging and low vision has been emphasized in recent studies of the health implications of low vision for elderly persons. Although low vision does not, in itself,

lead to mortality, those who are elderly and have low vision are at a greater risk of a variety of diseases that increase the risk of mortality, depression, suicide, and other social and psychological problems (Borger et al., 2003; De Leo, Hickey, Meneghel, & Cantor, 1999; Horowitz, 2003; Horowitz, Reinhardt, Boerner, & Travis, 2003; A. G. Lee, Beaver, Jogerst, & Daly, 2003; P. P. Lee, Feldman, Ostermann, Brown, & Sloan, 2003; Waern et al., 2002; Warnecke, 2003). Vision rehabilitation services have already benefited from a greater understanding of the effects of low vision, and while evidence that low vision services reduce the risk of disease is not yet strong, it is growing, and these concerns about health and mortality risks will serve to increase the visibility of low vision in the public health community (Altangerel, Spaeth, & Rhee, 2003; Appollonio, Carabellese, Frattola, & Trabucchi, 1996; Ferris & Tielsch, 2004; Margolis et al., 2002; Weih, Hassell, & Keeffe, 2002).

If Marco Polo could travel through centuries as he did through continents, he might well be amazed by the variety and complexity of the overlapping systems for low vision rehabilitation, and he might spot the gaps in services. But if he borrowed a magnifier and looked closely, he would see that the hope for the future of low vision services rests exactly in the richness of this diversity: the hope and conviction that optometrists, ophthalmologists, rehabilitation teachers, certified low vision therapists, occupational therapists, and O&M instructors, who are all committed to the common goal

of alleviating the burden of those men, women, and children with low vision, will communicate across their specialties; that state governments, private nonprofit organizations, academic programs, medical institutions, and individual practitioners will develop working relationships and coordinate services; and that everyone in this field is willing to listen to and learn from each other. This diversity of effort and growth of communication above all will ensure a bright future for crucial low vision rehabilitation services and do justice to the inspiration and vision of the pioneers who began our field.

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