Technology Assessment

Technology Assessment Program

Vision Rehabilitation for Elderly Individuals with Low Vision or Blindness

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Agency for Healthcare Research and Quality
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EXECUTIVE SUMMARY

Section 645 (a) of the Medicare Prescription Drug, Improvement and Modernization Act of 2003 requires that the Secretary of Health and Human Services conduct a study to determine the feasibility and advisability of providing payment for vision rehabilitation services furnished by vision rehabilitation professionals.(1) The Secretary has been instructed to report on this study and provide recommendations for such legislation or administrative action as the Secretary determines to be appropriate.

On February 10th 2004, AHRQ issued a Statement of Work (SOW) contracting ECRI to update a previous report published in October 2002 titled, "Vision Rehabilitation: Care and Benefit Plan Models."(2) The SOW specified that ECRI should update and extend the Lewin Group report by systematically reviewing new evidence on the potential of vision rehabilitation services to improve the quality of life and functioning of the elderly with low vision or blindness. In commissioning this report, AHRQ provided ECRI with four Specific Aims. These Specific Aims are as follows:

1. Estimate the number of elderly persons with vision loss that might benefit from vision rehabilitation services. Review published estimates if available. If not, use sources of data such as the National Health Interview Survey or other sources as appropriate. Discuss how available data on prevalence relate to studied indications on vision rehabilitation and estimate how many Medicare beneficiaries might benefit from vision rehabilitation.

2. Update the Lewin report by reviewing any additional information regarding the training of vision rehabilitation personnel in the United States, as well as any practice guidelines or other documentation regarding accepted practice. Provide a summary of organizations that provide training and credentialing of vision rehabilitation professionals. Provide a summary of different state statutory or regulatory requirements governing both the credentialing of providers and the provision of services.
3. Update the Lewin report by systematically reviewing new evidence on the effectiveness of vision rehabilitation services. Include information on:
    a. The types of providers and settings that were used in studies
    b. The components and frequency of vision rehabilitation services provided in the studies
    c. The patient population that was studied, including age, whether community dwelling or in nursing homes, and information about the extent and characteristics of vision loss
    d. Validity of the outcomes selected for measurement
    e. Methods of measurement of outcomes
    f. Outcomes of the vision rehabilitation services
    g. The possible role of the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision on the benefits of vision rehabilitation

4. Summarize the types of providers that provided the services in the clinical trials, whether the services were provided under physician supervision, and the outcomes achieved. Provide an analysis of how these results might be generalizable to the question of whether providers, specifically the three types of providers specified in the law (low-vision therapists, orientation and mobility specialists, and rehabilitation teachers), can provide quality services in the absence of physician supervision.

The findings of our assessment as they pertain to these four Specific Aims are presented below.

Specific Aim 1: The precise number of individuals in the U.S. Medicare population who might benefit from vision rehabilitation services is not known; only estimates are available. Despite a number of limitations, the best estimate currently available emanates from a model developed by Massof.(3) Massof's model was developed using data from five U.S. population-based prevalence studies that screened for visual impairment (the Beaver Dam Study,(4) the Baltimore Eye Survey,(5-7) the Framingham Eye Study,(8-10) the Mud Creek Valley Study,(11) and the Salisbury Eye Evaluation Study.(12))

Massof's model, when applied to census data collected for the year 2000, estimates that approximately 1.255 million individuals in the U.S. consisting of 1,120,000 whites and 135,000 blacks would meet the ICD-9-CM definition for low vision (ICD-9 codes beginning with

the prefix 369.xx[1]) and are thus potential candidates for vision rehabilitation services. This represents approximately 3.7% and 4.9% of the total white and black Medicare-aged population, respectively.

These prevalence estimates include individuals with visual impairment from potentially correctable cataracts. Vision loss due to cataracts can, in most cases, be surgically corrected. Consequently, the prevalence estimates need to be adjusted to account for these individuals. Although the precise number of individuals with correctable cataract cannot be determined, Massof estimated this figure to lie in the region of 15% to 20%.(13) Assuming that this estimate is reasonable, we calculated that the total number of individuals in the U.S. who might be considered as potential candidates for low-vision rehabilitation services falls within the range of 1,004,000 to 1,066,750. Thus, adjusting for the prevalence of cataracts, we estimate that approximately 3.3% to 3.5% of Medicare-aged whites (896,000 to 952,000 individuals) and 3.8% to 4.1% of Medicare-aged blacks (108,000 to 114,750 individuals) are potential candidates for low-vision rehabilitation services.

Although Massof's model provides the best currently available estimates of the prevalence of low vision among the elderly Medicare population, the generalizability of these estimates to the specific question, "How many Medicare beneficiaries might benefit from vision

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[1] ICD-9 codes for "low vision" are coded 369.XX, where the prefix 369 relates to the diagnosis of "low vision or blindness" and the suffix .XX relates to the severity of the low vision in both eyes.

rehabilitation services?" cannot be determined. There are several reasons for this:

- First, the prevalence estimates calculated using Massof's model were based on data from epidemiological studies that were not designed to determine the prevalence of individuals who meet Medicare's current eligibility criteria for vision rehabilitation services. Rather, these studies were designed to provide an estimate of the prevalence of visual impairment in selected U.S. populations where the definition of visual impairment was usually based solely on measures of visual acuity. Disability resulting from visual impairment is not entirely dependent upon visual acuity. Visual field loss and other impairments can also lead to disability. For the purposes of addressing Specific Aim 1 then, available data on the prevalence of visual impairment will likely underestimate the true prevalence of low vision in the U.S.

- Second, Medicare's current suggested medical necessity criteria for vision rehabilitation services extend beyond the World Health Organization (WHO) definitions of low vision (ICD-9-CM code: 369.xx) and include individuals with a number of uncorrectable and irreversible visual field defects that fall into the ICD-9 diagnostic category of a "visual disturbance" (ICD-9-CM code: 368.4x). Massof's prevalence estimates do not take into account this latter diagnostic category. The consequence of this is that, even if prevalence data from the population-based studies listed above were to provide an accurate estimate of the

prevalence of low vision, the estimates emanating from Massof's model will likely underestimate the true prevalence of low vision as defined by Medicare's eligibility criteria.

- Third, the studies used to develop Massof's model focused primarily on white populations. Although two of the studies did evaluate African Americans, none evaluated any other racial groups. Consequently, the generalizability of the estimates derived from the Massof model to the elderly Medicare population is unclear.

Specific Aim 2: Vision rehabilitation services are multidisciplinary. Although staffing models differ from program to program, guidelines from the American Academy of Ophthalmology (AAO)(14) and the American Optometric Association (AOA)(15) list both licensed medical personnel (ophthalmologists, optometrists, ophthalmic nurses, occupational therapists and physical therapists) and unlicensed low-vision professionals (low-vision therapists, vision rehabilitation teachers, and orientation and mobility specialists) as appropriate providers of vision rehabilitation services.

The Lewin Group report provided little information on the training and credentialing of personnel that provide vision rehabilitation services. In the present report, we provide descriptions of each service provider considered by the AAO and the AOA to be members of a multidisciplinary rehabilitation team. We also provide details of their training and credentialing. In particular, we provide extensive information on the training and credentialing that is available to

selected vision rehabilitation personnel who do not meet the current definition of a Medicare physician (occupational therapists, physical therapists, low-vision therapists, rehabilitation teachers, and orientation and mobility trainers).

Information on state statutory or regulatory requirements governing both the credentialing of providers and the provision of services is sparse. Ophthalmologists, optometrists, occupational therapists, physical therapists, and social workers are all required to be licensed by the states in which they practice. There are currently no state statutory or regulatory requirements governing the provision of vision rehabilitation services by unlicensed personnel (low-vision therapists, rehabilitation teachers, or orientation and mobility specialists). Efforts supported by a number of organizations are currently underway in the state of New York to obtain licensure for low-vision therapists, vision rehabilitation teachers, and orientation and mobility specialists as a new class of allied health professional.(16-18) To date, however, this and other similar efforts in the states of North Dakota and Tennessee, have not been successful.(16,17,19)

Low-vision therapists, rehabilitation teachers, and orientation and mobility specialists can, provided they meet certain eligibility criteria, apply for certification by the Academy for Certification of Vision Rehabilitation and Education Professionals (ACVREP). According to the National Vision Rehabilitation Cooperative, ACVREP certification of unlicensed vision rehabilitation personnel is recognized by many states as a "…strong barometer to ensure quality control among

providers."(20) For example, the state of Alabama strongly encourages that unlicensed vision rehabilitation personnel within its programs have ACVREP certification and the state of Georgia requires ACVREP certification for rehabilitation teachers and orientation and mobility specialists that work in state-run programs.(20)

Specific Aim 3: In order to address Specific Aim 3, we asked the following Key Question: *Is vision rehabilitation an effective intervention for patients with irreversible low vision or blindness?* In assessing effectiveness, we considered four outcomes related to disability and function; activities of daily living, mood, psychosocial status, and quality of life.

Since the publication of the Lewin Group report, the field of vision rehabilitation has been active, funding opportunities for research into low vision have improved, and a plethora of new studies are underway. This increase in activity, however, is not yet mirrored by the literature. Our literature searches, which were limited to the period January 2000 to February 2004,[2] identified a total of five systematic reviews(21-25) and 13 studies that met our *a priori* inclusion criteria.(26-38) These studies included four RCTs,(26-29) two nonrandomized controlled trials,(30,31) and seven before-after studies.(32-38)

[2] The Lewin Group report covered literature published before this time. As per the requirements of Task 3, this report focuses on new evidence that has been published since the publication of the Lewin Group report.

The quality of each included study was rated using standard criteria as proposed by the U.S. Preventive Services Task Force (USPSTF).(39) The quality of included studies was not high. No included studies, not even the RCTs, were completely protected from all potential confounders. Three RCTs were rated as USPSTF Level I-Low,(27-29) one RCT was rated as Level I-Fair,(26) one non-randomized controlled trial was rated as Level II-1-Fair,(30) one non-randomized controlled trial was rated as Level II-1-Low,(31) six before-after-studies were rated as Level II-3-Fair,(33-38) and one before-after-study was rated as Level II-3-Low.(32) This finding is in concordance with the findings of the Lewin Group report and five other systematic reviews that have been published since 2000.(21-25)

The generalizability of each included study to the elderly Medicare population was estimated from study enrollment criteria and the reported characteristics of the patients who were actually enrolled in the study. With the exception of one study,(38) which was excluded from our analysis for reasons of poor generalizability, the generalizability of the findings of the included studies to the elderly Medicare population were judged to be “Fair.”

The included studies evaluated the effectiveness of several different vision rehabilitation services. These included comprehensive rehabilitation services,(32,35,37) optical aids and low-vision devices,(28-30,33,38) orientation and mobility training,(31,34) training in the use of adaptive techniques (eccentric viewing),(36) and group intervention programs.(26,27)

Comprehensive Vision Rehabilitation Programs

One systematic review published since January 2000 assessed the effectiveness of comprehensive rehabilitation programs. Stelmack et al.(24) concluded that exposure to vision rehabilitation services leads to improvements in self-reported functional status and quality of life. This conclusion, however, was based on data from a small evidence base consisting of four studies.

Our searches identified three studies published since January 2000 that evaluated the effectiveness of three different comprehensive vision rehabilitation programs and met the *a priori* inclusion criteria for this assessment.(32,35,37) All three studies utilized a before-after design (one study: USPSTF Quality Rating: Level II-3-Low; two studies: USPSTF Quality Rating: II-3-Fair). The results of these studies, though methodologically weak, suggest that individuals with low vision do benefit from exposure to comprehensive vision rehabilitation services.

One cannot draw evidence-based conclusions pertaining to the relative effectiveness of the three comprehensive vision rehabilitation service models evaluated, or draw conclusions about the relative effectiveness of different staffing models. The available evidence does not allow one to determine the relative effectiveness of the different components of the programs assessed or determine the optimal frequency and intensity of service provision. Finally, evidence from included studies does not allow one to draw conclusions pertaining to the relationship between the pattern of vision loss, the

etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to comprehensive vision rehabilitation services.

Optical Devices and Visual Aids

Three relevant systematic reviews have been published since January 2000.(21-23) Of these, one evaluated evidence on the effectiveness of an array of optical devices and low-vision aids that are used in VA vision rehabilitation programs,(21) one evaluated the effectiveness of optical filters,(23) and the third evaluated evidence on the effectiveness of an implantable miniature telescope.(22) All three systematic reviews failed to reach any evidence-based conclusions because of a paucity of available data.

Our searches identified five studies published since January 2000 that evaluated the effectiveness of optical aids or low-vision devices and met the *a priori* inclusion criteria for this assessment.(28-30,33,38) One of these studies was excluded from further consideration because of poor generalizability to the Medicare population.(38) The remaining studies were small (N ranged from 22 to 90), fair-to-low quality (USPSTF Quality Ratings ranged from I-Low to II-3-Fair), laboratory-based studies.(28-30,33)

All four included studies showed that the prescription of optical devices and low-vision aids improved reading performance. One included study examined the question of the optimum number of training sessions required following prescription of low-vision aids.(28) This study found that five training sessions, followed by

practice, was optimal. Because all four studies were directly supervised and performed by optometrists, one is precluded from drawing conclusions about how different supervisory and staffing models may influence outcome.

Orientation and Mobility Training

One systematic review published since January 2000 attempted to evaluate the effectiveness of orientation and mobility training. Virgili and Rubin(25) searched the Cochrane Central Register of Controlled Trials Medline, Embase, and LILACS up to September 2002 for randomized and quasi-randomized controlled trials. No randomized or quasi-randomized controlled trials were identified by their searches so no conclusions about the effectiveness of orientation and mobility training were drawn.

Evidence on the effectiveness of orientation and mobility from two studies(31,34) that met the *a priori* inclusion criteria for this assessment is inconclusive. One non-randomized controlled study (USPSTF Quality Rating: II-1-Fair) did not provide evidence supporting the hypothesis that orientation and mobility training leads to improvements in mobility.(31) The other study, which utilized a before-after study design (USPSTF Quality Rating: II-3-Fair), found that exposure to an orientation and mobility-based program resulted in a number of improvements across a number of domains of psychosocial status.(34) Whether the differences in the findings of the two included studies are the result of differences in study quality,

differences in service protocol, differences in enrolled patients, or differences in the outcomes measured is not known.

In summary, the effectiveness (or lack of effectiveness) of orientation and mobility training has yet to be demonstrated by a well-designed study that has utilized validated instruments to measure a patient-oriented outcome. In addition, the available data does not allow one to draw evidence-based conclusions regarding the relative effectiveness of different orientation and mobility training programs or the optimal frequency and intensity of administration of such services. Nor does the available evidence allow one to draw conclusions regarding the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to orientation and mobility training programs.

Adaptive Techniques Training

Our searches identified one before-after study (USPSTF Quality Rating: II-3-Fair) that evaluated the effectiveness of adaptive techniques training and met the *a priori* inclusion criteria for this assessment.(36) This Swedish study used a computer program in conjunction with a scanning laser ophthalmoscope (SLO) to teach individuals with age-related macular degeneration (AMD) to use eccentric retinal loci for reading. The study investigators found that 18 of 20 enrolled individuals learned to use eccentric viewing for the purposes of reading. Among these 18 individuals, reading speeds increased significantly from baseline ($p < 0.001$). Because no long-

term followup data are available, however, it is not clear whether these improvements in reading performance can be maintained over time.

Available data does not allow one to draw evidence-based conclusions regarding the relative effectiveness of different adaptive training techniques. Nor does the available evidence allow one to draw conclusions regarding either the optimal frequency and intensity of administration of eccentric viewing training, or the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to the program.

Group Intervention Programs

The Lewin Group report identified four studies that evaluated the effectiveness of group intervention programs. Based on the findings of these studies, the Lewin Group report stated that group intervention "…appears to be effective, based on attitudinal outcomes and perceptions of activity levels."(2)

Our searches identified two relevant articles describing two RCTs that were published since January 2000 and met the *a priori* inclusion criteria for this assessment.(26,27) One of these articles presented updated data emanating from a RCT that was cited in the Lewin Group report.(27) These updated data, along with data from the remaining RCT, lend support to the conclusions of the Lewin Group report. Both studies found that exposure to a group intervention program led to significant improvements in patient outcomes. Brody

et al. (USPSTF Quality Rating: I-Fair) found that quality of life and mood among individuals with low vision (all enrollees had AMD) who had been exposed to their self-management group intervention program were significantly improved when compared to controls.(26) Dahlin Ivanoff et al. (USPSTF Quality Rating: I-Low) found that exposure to their group health education program led to significant improvements across a number of activities of daily living.

Available data does not allow one to draw evidence-based conclusions regarding the relative effectiveness of the two group intervention programs, the optimal frequency and intensity of these programs, or the most effective staffing model. Nor does the evidence allow one to draw evidence-based conclusions regarding the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to group intervention programs.

Specific Aim 4: The personnel that provided services in the studies that are included in this report covered the entire gamut of vision rehabilitation personnel identified previously. Rehabilitation services described by the included studies were usually (11 out of 13 studies) directly supervised by a Medicare-defined physician.[3]

Because of limitations in the literature, it is not possible to provide an analysis of how the outcomes of the included studies might be

[3] Relevant Medicare-defined physicians who include doctors of medicine; doctors of osteopathy; and doctors of optometry; see Appendix A and CMS Medical Benefit Policy Manual..(189)

generalizable to the question of whether providers, specifically the three types of providers specified in the law (low-vision therapists, orientation and mobility specialists, and rehabilitation teachers), can provide quality services in the absence of direct physician supervision.

The only direct evidence, albeit weak, to demonstrate that quality services can be provided by low-vision therapists, orientation and mobility specialists, and rehabilitation teachers in the absence of direct physician supervision comes from two before-after-studies (USPSTF Quality Ratings: II-3-Fair and II-3-Low) both of which evaluated the effectiveness of the Veterans Affairs Blind Rehabilitation Centers program.(32,37) Although Medicare-defined physicians are involved in this rehabilitation program (they are responsible for the clinical management of enrolled individuals and are members of the rehabilitation team that develops an individualized care plan for new enrollees), they do not supervise the implementation of vision rehabilitation services directly. The implementation of the care plan is instead coordinated by a rehabilitation specialist (orientation and mobility specialists, vision rehabilitation teachers, and low-vision therapists). Both De l'Aune et al.(32) and Stelmack et al.(37) demonstrated that exposure to this service improves the ability of "blind" veterans to perform activities of daily living, which in turn enhances their quality of life.

SCOPE OF REPORT

Section 645 (a) of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 requires that the Secretary of Health and Human Services conduct a study to determine the feasibility and advisability of providing for payment for vision rehabilitation services furnished by vision rehabilitation professionals.(1) The Secretary has been instructed to report on this study and provide recommendations for such legislation or administrative action as the Secretary determines to be appropriate.

On February 10th 2004, AHRQ issued a Statement of Work (SOW)(40) contracting ECRI to update a previous report published in October 2002 titled, "Vision Rehabilitation: Care and Benefit Plan Models."(2)

The SOW specified that ECRI should update and extend the Lewin Group report by systematically reviewing new evidence on the potential of vision rehabilitation services to improve the quality of life and functioning of the elderly with low vision or blindness. As part of fulfilling this contract, ECRI was instructed to address the following Specific Aims:

1. Estimate the number of elderly persons with vision loss that might benefit from vision rehabilitation services. Review published estimates if available. If not, use sources of data such as the National Health Interview Survey or other sources as appropriate. Discuss how available data on prevalence relate to studied

indications on vision rehabilitation and estimate how many Medicare beneficiaries might benefit from vision rehabilitation.

2. Update the Lewin report by reviewing any additional information regarding the training of vision rehabilitation personnel in the United States, as well as any practice guidelines or other documentation regarding accepted practice. Provide a summary of organizations that provide training and credentialing of vision rehabilitation professionals. Provide a summary of different state statutory or regulatory requirements governing both the credentialing of providers and the provision of services.
3. Update the Lewin report by systematically reviewing new evidence on the effectiveness of vision rehabilitation services. Include information on:
    a. The types of providers and settings that were used in studies
    b. The components and frequency of vision rehabilitation services provided in the studies
    c. The patient population that was studied, including age, whether community dwelling or in nursing homes, and information about the extent and characteristics of vision loss
    d. Validity of the outcomes selected for measurement
    e. Methods of measurement of outcomes
    f. Outcomes of the vision rehabilitation services

g. The possible role of the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision on the benefits of vision rehabilitation

4. Summarize the types of providers that provided the services in the clinical trials, whether the services were provided under physician supervision, and the outcomes achieved. Provide an analysis of how these results might be generalizable to the question of whether providers, specifically the three types of providers specified in the law (low-vision therapists, orientation and mobility specialists, and rehabilitation teachers), can provide quality services in the absence of direct physician supervision.

BACKGROUND

In this section we provide background information on low vision, blindness, and vision rehabilitation services. The purpose of this section is two-fold: 1) to provide context for the research syntheses presented later in this report and, 2) to address Specific Aim 1 and Specific Aim 2 as laid out in the section headed, "*Scope of Report*."

Low Vision and Blindness

Definitions of Low Vision and Blindness

There is no universal consensus on the definitions for low vision and blindness.(2,3,21,41) In its broadest sense, low vision can be defined as any visual impairment that results in disability and that cannot be corrected medically, surgically, or with conventional eyeglasses. ICD-9-CM defines low vision and blindness using standard measures of visual acuity and visual field diameter (see Table 1).

Table 1. ICD-9-CM Definitions of Low Vision and Blindness

Definition	Visual Acuity[a]	Visual Field[a]
Moderate visual impairment	<20/60 to 20/160	Not considered
Severe visual impairment	≤20/200 to 20/400	Visual Field ≤20 degrees[b]
Profound visual impairment	<20/400 to 20/1000	Visual Field ≤10 degrees[b]
Near-total vision loss	≤20/1250	
Total Blindness	No perception of light	

[a] In better seeing eye
[b] Largest field diameter for Goldman isopter III4e, 3/100 white test object, or equivalent

The ICD-9-CM threshold criteria that define an individual as having low vision are an uncorrectable and irreversible visual acuity of less than 20/60[4] in the better seeing eye, or a visual field of 20 degrees or less in the better seeing eye. In the U.S., the threshold for a diagnosis of low vision is often considered to be a visual acuity of less than 20/40 in the better seeing eye. The use of this higher visual acuity in the definition of low vision is based on the fact that a visual acuity of 20/40 in the better seeing eye is the criterion used by many states for the provision of an unrestricted driver's license. Many experts contend that this latter threshold, without other limitations in visual functioning, is an inappropriate threshold with which to define low vision.(42) It is argued that aside from the limitation of being unable to drive, individuals with this visual acuity rarely suffer significant reductions in their ability to perform other functions and are, therefore, unlikely to be candidates for vision rehabilitation services. This opinion is mirrored by a recent Medicare Program Memorandum (Appendix A) that states that, in the absence of visual field disturbance, individuals will not meet Medicare's suggested medical necessity requirements unless their visual acuity is less than 20/60 in the better seeing eye.

Individuals who meet the ICD-9-CM criteria for *severe visual impairment* (a visual acuity of 20/200 or less or a visual field of 20 degrees or less in the better seeing eye) meet the minimum requirement for classification as legally blind in the U.S., and are,

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[4] A visual acuity 20/60 is the minimum acuity required to read standard newspaper print

therefore, entitled to disability benefits. The terms “severe visual impairment” and “profound visual impairment” are preferred by the American Academy of Ophthalmology (AAO) to the term “legal blindness” for the purposes of classifying individuals with low vision and blindness because the former terms more accurately reflect the fact that some residual vision remains in patients with these degrees of vision loss.(14) AAO suggests that, in the context of vision rehabilitation, the term “blindness” be reserved for those individuals with no residual vision at all in the better seeing eye (i.e. complete blindness).(14)

Recognizing that the ICD-9-CM definitions for low vision and blindness do not encompass all patients with uncorrectable and irreversible visual impairment severe enough to limit an individual’s daily activities and functioning, Medicare’s current suggested medical necessity criteria (Appendix A) expands eligibility for vision rehabilitations services beyond the ICD-9-CM definitions for low vision and blindness (ICD-9-CM codes beginning with the prefix 369[5]). Medicare has suggested that individuals with the following visual field “disturbances”[6] should also be considered eligible for vision rehabilitation services: a central scotoma in the better seeing eye (ICD-9-CM code: 368.41), generalized contraction or constriction

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[5] ICD-9 codes for “low vision” are coded 369.XX, where the prefix 369 relates to the diagnosis of ‘low vision or blindness” and the suffix XX relates to the severity of the low vision in both eyes.

[6] ICD-9-CM codes for ‘visual disturbances” are distinct from ICD-9 codes for ‘low vision.” ICD-9 codes for the diagnosis of a “visual disturbance” are allocated the prefix 368 and the suffix .4X identifies the type of visual disturbance as being a visual field disturbance.

of the visual field in the better seeing eye (ICD-9-CM code: 368.45), homonymous bilateral visual field defects (ICD-9-CM code: 368.46) or heteronymous bilateral visual field defects (ICD-9-CM code: 368.47). This extension of the eligibility for vision rehabilitation services beyond the ICD-9-CM definitions of low vision and blindness has important implications for the accuracy of current estimates of the number of individuals in the elderly Medicare population who might benefit from vision rehabilitation services. These implications are discussed below in the section headed, "*Estimate of Number of Individuals in Elderly Medicare Population who Might Benefit from Vision Rehabilitation Services.*"

Causes of Low Vision and Blindness

Low vision and blindness are not caused by a single disease. Rather, they can result from a plethora of different ophthalmologic and neurological disorders. These disorders include, but are not limited to, age-related macular degeneration (AMD), glaucoma, cataract, diabetic retinopathy, central retinal vein occlusion (CRVO), retinitis pigemtosa, corneal damage, stroke, atherosclerosis, temporal arteritis, trauma, and tumors. By far the most prominent pathologies underlying low vision and blindness among the elderly Medicare population are age-related macular degeneration (AMD)[7], glaucoma, and diabetic retinopathy.(4-12) The impact of each of these latter eye diseases on functional vision is summarized in Table 2.

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[7] AMD rarely causes total blindness but is a primary cause of low vision in the U.S.

Table 2. Primary Causes of Low Vision in the Elderly

Disease	Clinical Presentation	Associated Disabilities
AMD	Reduced visual acuity Loss of central vision (central scotoma)	Difficulty reading, inability to recognize faces, distortion or disappearance of central vision, reduced color vision, reduced contrast perception, mobility difficulties related to loss of depth and contrast cues.
Diabetic retinopathy	Reduced visual acuity Scattered central scotoma Peripheral and mid-peripheral scotoma Macula edema	Difficulty with tasks requiring fine-detail vision such as reading, distorted central vision, fluctuating vision, loss of color perception, mobility problems due to loss of depth and contrast cues. In severe cases, total blindness can occur.
Glaucoma	Degeneration of the optic disc Loss of peripheral vision (constricted visual field)	Mobility and reading problems due to restricted visual fields, people suddenly appearing in the visual field. In severe cases, total blindness can occur.
Cataract[a]	Reduced visual acuity Light scatter Sensitivity to glare Image distortion	Remedied by lens extraction in 90% of cases. If not, difficulty with detail vision, difficulty with bright and changing light levels, reduced color vision, decreased contrast perception, mobility difficulties related to loss of depth and contrast cues.

Adapted from Pazel(43)

[a] Vision loss experienced by most individuals with cataract can be reversed. Consequently, many elderly individuals with cataract will not be considered as candidates for vision rehabilitation.

Another common cause of visual impairment among the elderly is cataract. In most cases, however, vision impairment resulting from cataract can usually be successfully corrected through the surgical removal of the cataractous lens. As a consequence, many (but not all[8]) individuals with visual impairment resulting from cataract will not meet current definitions for low vision or blindness (*irreversible* and

[8] Approximately 10% of individuals with cataract may not be appropriate candidates for cataract surgery because of health issues or concerns related to the potential progression of diabetic retinopathy or glaucoma secondary to surgery.

uncorrectable visual impairment) and will not usually be considered candidates for vision rehabilitation services.

Consequences of Low Vision or Blindness

Low vision and blindness have a significant impact on the physical and mental well-being of the affected individual. Individuals with impaired vision are less able to perform activities of daily living,(24,44-51) are less mobile,(24,48,50) are more isolated,(44,50) suffer higher rates of depression,(24,52-59) and consequently, have a reduced overall quality of life(24,51,52,60) when compared to their normal-sighted counterparts. In addition, patients with visual impairment have higher mortality rates,(61-63) and are more prone to accidents and falls.(62,64-71) As a consequence, elderly individuals with low vision are more prone to injuries than their normal-sighted counterparts.(62,68,72,73) For example, low vision is a well-documented risk factor for hip fractures in the elderly resulting from falls.(73-75)

Estimate of Number of Individuals in Elderly Medicare Population who Might Benefit from Vision Rehabilitation Services

This section addresses Specific Aim 1 of this report (see "*Scope of Report*") and aims to provide an estimate of the number of individuals in the elderly Medicare population who might benefit from vision rehabilitation services. At the present time, the precise number of individuals in the elderly Medicare population who meet Medicare's

suggested eligibility criteria for vision rehabilitation services is not known; only rough estimates are available.

Our searches identified eleven potential sources of relevant published data. These sources are:

- The National Health Interview Survey (NHIS).(76,77)
- The Lighthouse Survey.(78)
- The 1988 to 1994 National Health and Nutritional Examination Survey (NHANES III).(79)
- The Prevent Blindness America/National Eye Institute survey.(80)
- The Medical Expenditure Panel Survey (MEPS).(81)
- The Framingham Eye Study.(8-10)
- The Mud Creek Valley Eye Survey.(11)
- The Beaver Dam Eye Study.(4)
- The Salisbury Eye Evaluation.(12)
- The Baltimore Eye Survey.(5-7)
- Proyecto VER (Vision Evaluation and Research).(82)

The Lewin Group report cited estimates of the prevalence of low vision and blindness from two sources; the National Health Interview Survey and Lighthouse International.(2) These sources, however, along with prevalence estimates emanating from the NHANES III, the Prevent Blindness America/National Eye Institute survey and the MEPS, do not provide accurate estimates of the number of elderly

individuals who will meet Medicare's current suggested medical necessity criteria for vision rehabilitation services because they were self-assessment surveys. The problem with estimating the prevalence of visual impairment from self-assessment surveys is that the cause of the survey respondent's poor vision is unknown. As a consequence, prevalence estimates from these studies include an unknown number of individuals with reversible visual impairments such as uncorrected refractive error or cataract, leading to overestimates of low vision in the elderly population.

The remaining six studies (the Baltimore Eye Survey, the Beaver Dam Eye Study, the Framingham Eye Study, the Mud Creek Valley Eye Survey, the Salisbury Eye Evaluation, and Proyecto VER) avoided the primary problem associated with self-assessment surveys by screening subjects for visual impairment. A thorough ophthalmic examination of all individuals who were found to have a visual impairment was performed, and those individuals with impairments that could be corrected through refraction were accounted for.

Although, these latter six studies are currently the most reliable primary sources of data on the prevalence of visual impairment in the U.S., as individual studies they are of limited value in addressing Specific Aim 1. This is because the prevalence estimates that emanate from them differ considerably across studies. These disagreements appear to be the consequence of differences in methodology and differences in the definitions of low vision that were used.

Robert Massof of the Lions Vision Research and Rehabilitation Center (Johns Hopkins University School of Medicine) recently developed a model based on prevalence data extracted from five of the six population-based studies listed above that screened for visual impairment (the Baltimore Eye Survey, the Beaver Dam Eye Study, the Framingham Eye Study, the Mud Creek Valley Eye Survey, and the Salisbury Eye Evaluation). The purpose of developing this model was to understand the sources of disagreement between studies and to attempt to obtain a consensus estimate of the prevalence rates of Medicare-aged Americans who might benefit from low-vision services.(3)

Exploration of the heterogeneity in prevalence estimates reported by the five population-based studies that were considered by Massof found that the two major reasons for these between-studies differences in prevalence estimates were: 1) different criteria were used to measure best-corrected visual acuity in different studies and, 2) different studies utilized different age ranges in the oldest age category. When Massof corrected for these differences, the results of all but one of the prevalence rate studies (the Mudd Creek Valley Study), fell on the same line on a plot of prevalence versus age. Massof argued that the prevalence data from the Mudd Creek Valley study could not be reconciled with that obtained from the remaining four studies because the prevalence of cataracts in this impoverished population was exceedingly high.

In order to estimate the prevalence of low vision among U.S. elders, Massof applied his model to census data collected for the year 2000.

His analysis estimated that approximately 1,275,000 whites and 230,000 blacks over the age of 45 years will have a best-corrected visual acuity of less than 20/60 (the ICD-9-CM threshold for low vision). When looking at the Medicare-aged population, Massof estimated that approximately 1,120,000 whites and 135,000 blacks would meet the ICD-9-CM definitions for low vision and blindness. This represents approximately 3.7% and 4.9% of the total white and black Medicare-aged population, respectively.

The prevalence estimates presented above include an unknown number of individuals with visual impairment that results from potentially correctable cataract. Massof estimated that approximately 15% to 20% of cases included in the prevalence estimates presented above may have cataract. Because vision loss due to cataract can, in most cases, be corrected surgically, not all individuals with cataract should be counted in estimates of the prevalence of patients who would be considered to be potential candidates for vision rehabilitation. Assuming that Massof's estimates of the number of cases of cataract are reasonable, we estimate that the total number of individuals in the U.S. who might be considered as potential candidates for low-vision rehabilitation services falls within the range of 1,004,000 to 1,066,750. Thus, adjusting for the prevalence of cataract, we estimate that approximately 3.3% to 3.5% of Medicare-aged whites (896,000 to 952,000 individuals) and 3.8% to 4.1% of Medicare-aged blacks (108,000 to 114,750 individuals) are potential candidates for low-vision rehabilitation services.

Using age and race data for each state obtained from the 2000 U.S. Census, we estimated the number (and prevalence) of Medicare-aged individuals who are potential candidates for vision rehabilitation services. These state-by-state prevalence data, which have been adjusted for cases of correctable cataract[9], are presented in Table 3.

Table 3. State-by-State Low Vision and Blindness Prevalence Estimates

State	Estimated number of white candidates[a]	Estimated number of black candidates[a]	Total number of potential candidates[a]	Prevalence rate (%)[a]
Alabama	16,245	4,482	20,727	3.61
Alaska	924	29	953	3.52
Arizona	21,526	399	21,925	3.51
Arkansas	11,602	1,516	13,118	3.56
California	97,667	7,463	105,130	3.54
Colorado	13,461	412	13,873	3.52
Connecticut	15,272	894	16,166	3.53
Delaware	3,103	459	3,562	3.57
District of Columbia	669	1,971	2,640	3.93
Florida	90,081	7,060	97,141	3.54
Georgia	21,609	6,272	27,881	3.62
Hawaii	1,281	23	1,304	3.51
Idaho	4,963	7	4,970	3.50
Illinois	45,016	6,435	51,451	3.57
Indiana	24,526	1,763	26,289	3.53
Iowa	15,015	150	15,165	3.51

[9] We assumed that 15% of individuals included in the prevalanece estimates have correctable cataract.

State	Estimated number of white candidates[a]	Estimated number of black candidates[a]	Total number of potential candidates[a]	Prevalence rate (%)[a]
Kansas	11,771	489	12,260	3.52
Kentucky	16,577	1,065	17,642	3.53
Louisiana	13,654	4,808	18,462	3.64
Maine	6,355	11	6,366	3.50
Maryland	16,401	4,468	20,869	3.61
Massachusetts	28,274	955	29,229	3.52
Michigan	37,649	4,931	42,580	3.56
Minnesota	20,229	228	20,457	3.51
Mississippi	8,903	3514	12,417	3.65
Missouri	24,179	2199	26,378	3.54
Montana	4,086	5	4,091	3.50
Nebraska	7,861	181	8,042	3.51
Nevada	6,780	387	7,167	3.53
New Hampshire	5,107	15	5,122	3.50
New Jersey	33,772	3,896	37,668	3.55
New Mexico	6,232	116	6,348	3.51
New York	70,574	10,723	81,297	3.57
North Carolina	27,964	6,285	34,249	3.60
North Dakota	3,240	3	3,243	3.50
Ohio	47,810	5,042	52,852	3.55
Oklahoma	14,068	807	14,875	3.53
Oregon	14,640	148	14,788	3.51
Pennsylvania	61,977	5,030	67,007	3.54
Rhode Island	5,056	119	5,175	3.51
South Carolina	13,174	4,263	17,437	3.63
South Dakota	3,660	5	3,665	3.50

State	Estimated number of white candidates[a]	Estimated number of black candidates[a]	Total number of potential candidates[a]	Prevalence rate (%)[a]
Tennessee	21,731	3,054	24,785	3.56
Texas	61,478	7,220	68,698	3.55
Utah	6,385	28	6,413	3.50
Vermont	2,681	5	2,686	3.50
Virginia	22,628	5,022	27,650	3.60
Washington	21,336	428	21,764	3.51
West Virginia	9,356	293	9,649	3.52
Wisconsin	23,697	653	24,350	3.51
Wyoming	1,951	10	1,961	3.50
Puerto Rico	12,536	1278	13,814	3.55

[a] Estimates calculated by ECRI using overall U.S. prevalence estimates for blacks and whites emanating from Massof's model and age, race and state population data extracted from the 2000 U.S. census database available online at http://factfinder.census.gov/home/saff/main.html?_lang=en

Although Massof's model provides the best available estimates of the prevalence of low vision and blindness among the current Medicare population, the generalizability of these estimates to the specific question, "How many Medicare beneficiaries might benefit from vision rehabilitation services?" cannot be determined. There are several reasons for this:

- First, the prevalence estimates calculated using Massof's model were based on data from epidemiological studies that were not designed to determine the prevalence of individuals who meet Medicare's current eligibility criteria for vision rehabilitation services. Instead, these studies were designed to provide an estimate of the prevalence of visual impairment in

selected U.S. populations where the definition of visual impairment was usually based solely on measures of visual acuity. Disability resulting from visual impairment is not entirely dependent upon visual acuity. Visual field loss and other impairments can also lead to disability. For the purposes of addressing Specific Aim 1 then, available data on the prevalence of visual impairment will likely underestimate the true prevalence of low vision in the U.S.

- Second, Medicare's current suggested medical necessity criteria for vision rehabilitation services extend beyond the ICD-9-CM definitions of low vision and blindness (ICD-9-CM code: 369.xx). These criteria also include individuals with a number of uncorrectable and irreversible visual field defects that fall under the ICD-9 diagnostic category of a "visual disturbance" (ICD-9-CM code: 368.4x). Massof's estimates did not take into account this latter diagnostic category. The consequence of this, is that, even if prevalence data from the population-based studies listed above were to provide an accurate estimate of the prevalence of low vision in the U.S. (as defined by ICD-9-CM definitions), the estimates emanating from Massof's model will likely underestimate the true prevalence of low vision and blindness as defined by Medicare's current suggested eligibility criteria.

- Third, the studies used to develop Massof's model focused on white populations. Although two of the studies did evaluate African Americans, none evaluated any other racial groups.

Consequently, the generalizability of the estimates derived from the Massof model to the elderly Medicare population is unclear.

In April 2004, the Eye Diseases Prevalence Research Group (EDPRG)(83) published their estimates for low vision and blindness in the U.S. These estimates emanated from a logistic regression model derived from pooled prevalence data collected in seven U.S. and non-U.S. population-based studies. Like Massoff, EDPRG applied their model to demographic data from the 2000 U.S. Census and estimated that approximately 2.9 million individuals over the age of 65 met their definition for low vision or blindness in the U.S. This prevalence estimate is approximately twice that estimated by Massoff.

Of the two models mentioned above, we believe that it is the Massoff model that provides the best estimates of the number of individuals in the elderly U.S. Medicare population who might benefit from vision rehabilitation services. There are three reasons for this:

- First, the EDPRG defined low vision as being a best corrected visual acuity of 20/40 or less in the better seeing eye. In the absence of any other visual disturbance, individuals are not normally considered to be appropriate candidates for vision rehabilitation unless their visual acuity falls below 20/60 in the better seeing eye. Of particular importance to Specific Aim 1 is the fact that individuals with visual acuities of 20/40 or less and who do not have any other visual field disturbances will not meet Medicare's suggested medical necessity criteria as laid

out in the 2002 PM presented in Appendix A. Consequently, the prevalence figures presented by the EDPRG will grossly overestimate the number of individuals in the U.S. Medicare population who would be considered as appropriate candidates for vision rehabilitation services.

- Second, only four of the seven population-based studies that were used to develop the EDPRG model were U.S. based (the Baltimore Eye Survey, the Beaver Dam Eye Study, the Salisbury Eye Evaluation, and Proyecto VER). The remaining three studies were performed in Australia (the Blue Mountains Eye Study(60,84-87) and the Melbourne Vision Impairment Project(60,88)) and in Holland (the Rotterdam Study(89)). Clinical and surgical practices and access to care differ significantly from the U.S. in these countries. These differences may in turn influence the prevalence (and cause specific distribution of visual impairment).

- Third, the prevalence estimates derived by the EDPRG include individuals who have cataract. For example, the study authors reported that 47% of the individuals with low vision in the Proyecto VER study had cataract. Because vision loss due to cataract can, in most cases, be corrected surgically, not all individuals with cataract should be counted in estimates of the prevalence of patients who would be considered to be potential candidates for vision rehabilitation.

Vision Rehabilitation Services

Vision rehabilitation services aim to maximize the use of any residual vision that an individual might have and provide practical adaptations that reduce the disabilities associated with low vision or blindness. Ideally, vision rehabilitation services provide a continuum of care beginning with medical and surgical intervention to control the progression of the underlying disease that has caused vision loss. This may be followed by the prescription of appropriate low-vision devices and access to appropriate low-vision services. Low-vision services for the elderly include:

- Training in the use of low-vision devices
- Rehabilitation teaching
- Rehabilitation counseling
- Orientation and mobility training
- Independent living support

The desired outcome for those who enter a vision rehabilitation program is that they will attain the maximum function of any residual vision that they may have, increase their level of functional ability, increase their degree of independence, and, as a consequence, experience an improvement in their quality of life.

Despite the existence of a number of vision rehabilitation services in the U.S., access to these services has been limited. The reasons for this include inadequate referral rates from optometrists and ophthalmologists,(90,91) a general unawareness among the visually

impaired concerning the availably of services,(92) and financial and physical barriers.(93) Consequently, access to, and the adoption of, vision rehabilitation services has, to date, been suboptimal.

Training and Credentialing of Vision Rehabilitation Personnel

This section addresses Specific Aim 2 of this report (see "*Scope of Report*") wherein we provide the reader with information regarding the types of personnel that typically provide vision rehabilitation services in the United States along with details of their training and credentialing.

Comprehensive vision rehabilitation services are interdisciplinary. Most vision rehabilitation programs provide access to a number of different vision rehabilitation personnel. These personnel include both licensed (ophthalmologists, optometrists, occupational therapists, psychologists and counselors, and social workers) and unlicensed personnel (low-vision therapists, vision rehabilitation teachers, and orientation and mobility specialists). Below, we provide a summary of the training and credentialing of personnel who typically provide vision rehabilitation services.

Licensed Vision Rehabilitation Personnel

Ophthalmologists

An ophthalmologist is a licensed medical doctor with a specialization in vision and ocular health. As qualified physicians, ophthalmologists

meet the requirements of a Medicare-defined physician.[10] Consequently, vision rehabilitation planning and coordination activities performed by these professionals may qualify for reimbursement from Medicare.

There are approximately 132 ophthalmology residency programs in the U.S.(94) These residency programs are accredited by the Accreditation Council for Graduate Medical Education (ACGME), which ensures that the resident's clinical experience includes exposure to the entire spectrum of ophthalmic diseases. Low vision is one of the clinics specifically mentioned on the program information forms that the Residency Review Committee for ophthalmology uses in its evaluation of the nation's residency programs in ophthalmology.

Optometrists

A doctor of optometry is a licensed, independent primary health care provider. Doctors of optometry meet the requirements of a Medicare-defined physician. Seventeen universities in the U.S. offer programs in optometry that are accredited by the Accreditation Council on Optometric Education (ACOE). At the present time, there is no requirement that an optometric program provide a specific curriculum in rehabilitation optometry. However, vision rehabilitation is a track that is included in the programs of all accredited optometry schools and questions on vision rehabilitation are included in the National Board of Examinations that are taken by all optometry students.(94)

[10] Relevant Medicare-defined physicians who include doctors of medicine; doctors of osteopathy; and doctors of optometry; see Appendix A and CMS Medical Benefit Policy Manual.(189)

The content outline for the National Board examinations can be found at the National Board of Examiners in Optometry Web site (www.optometry.org).

Accredited residencies are available for optometrists who are interested in vision rehabilitation.(95) Many of these residencies are located within Department of Veterans Affairs Blind Rehabilitation Centers and Visual Impairment Centers to Optimize Remaining Sight programs. In addition, many optometry residents in ocular disease, geriatrics, primary care, and pediatric residency programs will often receive direct experience in patient care during low-vision rotations.

Occupational Therapists

Occupational therapists are licensed professionals with expertise in the cognitive, sensory, physical, and psychological aspects of disability and aging. Under current Medicare law, services provided by these personnel may qualify for reimbursement through Medicare provided these services are rendered under the supervision of an ophthalmologist or optometrist.

Occupational therapists have a bachelor's degree or higher degree in occupational therapy. Beginning in 2007, however, a master's degree or higher will be the minimum educational requirement.(96) To obtain a license, applicants must graduate from an accredited educational program and pass a national certification examination administered by the National Board for Certification in Occupational Therapy

(NBCOT)[11].(97,98) Those who pass the exam are awarded the title "Occupational Therapist Registered (OTR)."

In 2003, entry-level education was offered in 38 bachelor's degree programs, 3 post-baccalaureate certificate programs for students with a degree other than occupational therapy, and 86 entry-level master's degree programs. There were 48 programs that offered a combined bachelor's and master's degree and 5 offered an entry-level doctoral degree. Most schools have full-time programs, although a growing number also offer weekend or part-time programs.(96)

Occupational therapy coursework typically includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills (See Table B-1 of Appendix B for an example). Completion of six months of supervised fieldwork is also required before graduation.

At the present time, formal training in the rehabilitation of individuals with low vision or blindness is not part of any occupational therapy degree. However, post-graduate certification programs specifically designed to prepare occupational therapists for a role in vision rehabilitation are now being established. For example, the Department of Occupational Therapy of the University of Alabama will begin teaching a post-graduate certification and a post-professional master's degree in vision rehabilitation in January 2005.(99)

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[11] NBCOT was formerly known as the American Occupational Therapy Certification Board (AOTCB).

There are currently 65,000 licensed occupational therapists in the U.S. Occupational therapists are regulated in all 50 states and three U.S. territories. Of these 53 jurisdictions, 46 states, the District of Columbia, Guam and Puerto Rico license occupational therapists; two states-Hawaii and Michigan-have registration laws; and one state, Colorado, has a trademark law.(100)

Physical Therapists

According to the American Physical Therapy Association, there were 213 accredited physical therapist programs in 2002.(101) Of these accredited programs, 146 offered master's degrees, and 67 offered doctoral degrees. All physical therapist programs seeking accreditation are required to offer degrees at the master's degree level and above, in accordance with the Commission on Accreditation in Physical Therapy Education (CAPTE).(102)

Typical physical therapy programs begin with basic science courses such as biology, chemistry, and physics and then introduce specialized courses, including biomechanics, neuroanatomy, human growth and development, manifestations of disease, examination techniques, and therapeutic procedures (See Table B-2 of Appendix B for more detail). Besides getting classroom and laboratory instruction, students receive supervised clinical experience. Among the courses that are useful when one applies to a physical therapist educational program are anatomy, biology, chemistry, social science, mathematics, and physics. Before granting

admission, many professional education programs require experience as a volunteer in a physical therapy department of a hospital or clinic.

All States require physical therapists to pass a licensure exam before they can practice, after graduating from an accredited physical therapist educational program.(103)

Social Workers

Social workers evaluate the patient's overall living situation, identify vocational and educational barriers, provide family and social support, and, where needed, evaluate the patient's coping abilities and psychological state, identify and provide access to local resources, and act as patient advocates.(104) In some rehabilitation programs, social workers serve as case managers, facilitating discharge planning, providing help with financial arrangements, etc.

Most social workers have a Master of Social Work degree; after one or two years of supervised practice, social workers are eligible for licensure. The licensed clinical social worker can function as an independent service provider whose services may be eligible for reimbursement from Medicare.(105)

Unlicensed Vision Rehabilitation Personnel

Low-vision Therapists

Low-vision therapists develop and conduct functional assessment tests of visual abilities for everyday tasks that are important to the

individual with low vision. Everyday visual tasks might include reading, writing, moving through space, grooming, watching television, cooking, cleaning, household repair, finding lost objects, or other educational, vocational or recreational pursuits. The nature and extent of a number of specific rehabilitation services is guided by the results of this functional assessment. Once the extent and type of services have been determined, the role of the low-vision therapist is to implement aspects of the rehabilitation plan such as: the provision of instruction in the use of residual visual function for performing daily tasks, instruction in the use of low-vision devices prescribed by the eye care specialist, instruction in the use of visual environmental cues, modification of the visual environment to enhance the use of vision, the use of appropriate psychosocial information to devise motivational strategies to assist consumers in performing desired tasks, and family/caregiver training and counseling.

At the time of writing, one accredited U.S. university provides a specialized degree program in low-vision therapy.(106) The Pennsylvania College of Optometry offers a Master's level degree in low-vision therapy.[12] Despite the fact that only one U.S. university provides a degree program specifically designed to train individuals to become low-vision therapists, a number of other university programs in the vision education/rehabilitation arena include courses that would allow one to meet the requirements of the core curriculum for low-

[12] Details of the curriculum for the certificate and Master's degree programs offered by the Pennsylvania College of Optometry are presented in Table B-3 of Appendix B.

vision therapy as specified by the Academy for Certification of Vision Rehabilitation and Education Professionals (ACVREP).(18)

ACVREP offers four categories of certification for low-vision therapists.(107) These four categories are differentiated by the qualifications possessed by certification candidates. Eligibility and training requirements for these four certification categories are presented in Appendix B.

Vision Rehabilitation Teachers

Like low-vision therapists, vision rehabilitation teachers are responsible for evaluating the patient's functional capabilities, teaching the patient to use assistive devices, making behavioral and environmental adaptations to improve function, teaching neuromuscular adaptations to improve performance (e.g., eccentric viewing), and teaching alternative ways to overcome vision disabilities.(94,104,108) Vision rehabilitation teachers may be required to make home visits to give followup training and recommend changes to the patient's home environment.

Vision rehabilitation teachers typically have a degree in rehabilitation teaching obtained from an accredited U.S. university.[13] An example of the curriculum of a "typical" rehabilitation teaching degree program is presented in Table B-5 of Appendix B.

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[13] A list of U.S. universities that provide courses in rehabilitation teaching can be found at the following Web site: http://www.aerbvi.org.

The ACVREP offers three categories of certification for vision rehabilitation teachers.(108) Eligibility and training requirements for these three certification categories are presented in Appendix B.

Orientation and Mobility Specialists

Orientation and mobility specialists are responsible for evaluating the patient's mobility capacities and teaching the patient to get oriented, navigate, walk through the environment, cross streets, and use public transportation. They also provide training to others in how to help the patient travel safely and provide recommendations regarding behavioral and environmental modifications that will improve safety and facilitate mobility.(94,104,109)

Orientation and mobility specialists typically have a Master's level degree in orientation and mobility obtained from an accredited U.S. university.[14] An example of the curriculum of a "typical" orientation and mobility degree program is presented in Table B-4 of Appendix B.

The ACVREP offers three categories of professional certification for orientation and mobility specialists.(109) Eligibility and training requirements for each of these three certification categories are presented in Appendix B.

[14] A list of AER approved U.S. universities that provide courses in orientation and mobility are listed by the AER at the following worldwide Web site: http://www.aerbvi.org.

State Statutory and Regulatory Requirements for Unlicensed Vision Rehabilitation Personnel

There are currently no state statutory or regulatory requirements governing the provision of vision rehabilitation services by unlicensed personnel (low-vision therapists, rehabilitation teachers, or orientation and mobility specialists). Efforts supported by a number of organizations are currently underway in the state of New York to obtain licensure for low-vision therapists, vision rehabilitation teachers, and orientation and mobility specialists as a new class of allied health professional.(16-18) To date, however, this and other similar efforts in the states of North Dakota and Tennessee, have not been successful.(16,17,19)

According to the National Vision Rehabilitation Cooperative, ACVREP certification is recognized by many states as a "…strong barometer to ensure quality control among providers."(20) For example, the state of Alabama strongly encourages that unlicensed vision rehabilitation personnel employed within its programs have ACVREP certification and the state of Georgia requires ACVREP certification for rehabilitation teachers and orientation and mobility specialists that work in state-run programs.(20)

Clinical Practice Guidelines

Specific Aim 2 of the SOW requires that we review information from clinical practice guidelines regarding accepted practice. Our searches (Appendix E), which included (but were not restricted to) a search of

the National Guideline Clearinghouse (NGC), identified 13 relevant guidelines. These guidelines originate from the American Academy of Ophthalmology,(14,110-117) the American Optometric Association,(15,118) the American Occupational Therapy Association,(119) and the American Geriatrics Society.(120)

Of the 13 guidelines identified by our searches, only three were directly relevant to the current topic. They are:

- American Academy of Ophthalmology (AAO).
  Vision rehabilitation for adults. San Francisco (CA): American Academy of Ophthalmology (AAO); 2001 Feb. 32 p.(14)

- American Optometric Association. Care of the patient with low vision. St. Louis (MO): American Optometric Association; 1997. 72 p. (Optometric clinical practice guideline; no. 14).(15)

- American Occupational Therapy Association (AOTA).
  Adults with low vision. Bethesda, (MD): American Occupational Therapy Association, Inc.; 2001. 25 p.(119)

The first two guidelines are represented in the National Guideline Clearinghouse (NGC) and therefore meet the criteria of an evidenced-based guideline. The third guideline, though not included in the NGC database, was assessed against the NGC inclusion criteria(121) and was determined to be appropriate for inclusion in this report.

Below, we provide a direct comparison of the AAO, AOA and AOTA guideline recommendations for the management of patients with low

vision or blindness including the overall objective and scope of the guidelines, the target population, and interventions and practices considered. We also examine the guidelines with respect to the specific management recommendations offered in the guidelines, identifying their similarities and differences.

The primary objective of all of the guidelines is similar in that their aim is to provide recommendations for evaluation and rehabilitation services that will ultimately reduce the functional impact of vision loss, thereby improving overall quality of life in patients with low vision or blindness. Outcome measures common to all of the guidelines include patient-oriented measures such as ability of patient to independently complete activities of daily living, and the overall quality of life of the patient. The primary target population of the included guidelines is any adult individual with low vision or blindness who might benefit from vision rehabilitation services. None of the guidelines specifically speak to vision rehabilitation as it pertains to the elderly Medicare population. The AAO and AOTA recommendations pertain to adults over the age of 18 years, while AOA recommendations pertain to all age groups.

In terms of the interventions and practices that are considered, each of the included guidelines addresses the following areas:

- Patient evaluation, including visual examination, ocular history and functional history to identify the impact of the visual loss

- Management and rehabilitation interventions, such as optical devices and visual aids to enhance visual abilities, and training in the use of residual vision and/or use of optical devices
- Referral and multidisciplinary care
- Follow up care

Patient Evaluation

All three included guidelines recommend that a thorough patient evaluation be performed. Common to all three guidelines are recommendations for a functional history. For example, AOTA recommends that a thorough evaluation be performed looking specifically at functional level in activities of daily living, work and other productive activities; functional activities that the patient can and cannot perform; their needs, plans and goals; the underlying components causing the functional deficit; and other factors (e.g., environmental, age and general health) that affect the patient's functional performance. AOTA also recommends that a thorough evaluation of the patient's living and working environments is essential in the evaluation process.

AAO similarly recommends that a thorough functional history (that includes gaining an understanding of the patient's living environment) is key to rehabilitating patients with low vision or blindness and will facilitate appropriate referral. They recommend that the history interview process be performed in the presence of a family member, friend or caregiver, in order to confirm information. The history should

include questions directed to problem areas the patient experiences and their significance, as well as the patient's experience with home-based near vision tasks (e.g., reading abilities), distance vision skills (e.g., distinguishing/recognizing faces; ability to drive and see traffic signals, etc.), and mobility and community skills (e.g., ability to go shopping, perform job, etc.).

AOA recommends that a thorough history be performed, with input from family members or other care providers as appropriate or permitted by the patient. The history should include nature and duration of presenting problem, visual functioning (e.g., ability to read, write, independent travel ability, etc.), general health and medical history, social history, and vocational, educational and vocational vision requirements and goals (i.e., a needs assessment).

AAO and AOA also provide recommendations for a thorough visual examination including detailed recommendations for the measurement of near and distance visual acuity, refraction, ocular motility and binocular visual assessment, visual field range and central scotomas, and contrast sensitivity. AOTA also indicates that a visual examination of a patient with visual impairment needs to be performed and can include measures of far and near acuity, contrast sensitivity, color perception, the visual field, and oculomotor/pupillary function. AOTA notes that ophthalmologists and optometrists can complete the above mentioned evaluations to diagnose and determine the degree of visual impairment; occupational therapists can perform the above mentioned assessments to determine how performance areas of the patient will be affected.

Management and Rehabilitation

All three guidelines provide recommendations for the management and/or rehabilitation of patients with low vision or blindness. All three guidelines emphasize both the use of optical and non-optical corrective interventions such as appropriate spectacle prescription, near and far magnification devices (e.g., hand-held magnifiers, spectacle-mounted reading lenses, telemicroscopes, stand magnifiers, and electronic devices), lighting, glare control and contrast enhancement. Each group also provides management recommendations for central field defects such as scotoma identification and eccentric fixation training. AOTA, however, provides a much larger focus on restorative and compensatory strategies that will help the patient improve their performance in everyday functions of self-care (activities of daily living), work and leisure. Consistent with this, AOTA argues that because environmental conditions greatly affect performance, rehabilitation therapy sessions and training should be performed within the environment (e.g., home, workplace, other community setting) in which the patient will perform the tasks, to better account for contextual issues.

AAO also provides recommendations for training in adaptations for activities of daily living, noting that this care is usually provided by occupational therapists, rehabilitation teachers, orientation and mobility specialist and certified low-vision therapists. AAO further notes that because older patients may have more difficulties applying skills learned in the laboratory to their home environment, home visits by rehabilitation personnel are usually beneficial.

Referral and Multidisciplinary Care

All three groups emphasize the importance of multidisciplinary care in the management of patients with low vision or blindness. For example, AAO states that rehabilitation therapy is most often performed by a team of multidisciplinary personnel, stating that a team approach is recommended because it is the most effective in addressing various functional and psychological problems caused by the visual loss. They further note that the disciplines required in patient management depend on the complexity of the functional problems faced by the patient. When vision and contrast sensitivity are more compromised and functional problems are severe, a more advanced level of care provided by a full multidisciplinary team may be required. This team usually will consist of ophthalmologists and optometrists, in conjunction with ophthalmic technicians trained in low vision, occupational therapists, psychologists, social workers, certified low-vision therapists, rehabilitation teachers, and orientation and mobility specialists.

AOA also supports use of a interdisciplinary approach to vision rehabilitation, noting that referral may be necessary for additional services outside of the expertise of the low-vision clinician. Referral services include state and/or local rehabilitation services, orientation and mobility specialists, occupational therapists, counseling services, nutrition counseling, genetic counseling, etc.

AOTA state that collaboration with other vision rehabilitation specialists is often needed to ensure a comprehensive program,

including orientation and mobility specialists and rehabilitation teachers. Referral sources for occupational therapists are listed as physicians (including ophthalmologists), non-physician practitioners (including optometrists), family members and patients themselves.

Follow-up Care

Although none of the guidelines provide specific guidance on follow-up care, all three identified its importance. All three guidelines emphasized the need for periodic reassessment to tailor therapy for individuals whose vision continues to decline and/or whose functional status, living situation, etc., change.

Ongoing Trials

Our searches (Appendix D) identified over 20 relevant studies that are presently ongoing. Data from many of these trials will help to meet the objectives of the National Eye Institute Rehabilitation Panel's 5-year agenda for improving the body of knowledge in the area of visual impairment and rehabilitation.(122) Details of these ongoing studies are summarized in Table C-1 of Appendix C.

METHODS

Key Question, Analytic Framework, and Outcomes

In this section, we address a single Key Question. In answering this Key Question, we meet the objectives of Specific Aims 3 and 4 as laid out in the section headed, "*Scope of Report*." That is,

we evaluate and synthesize evidence on the effectiveness of different vision rehabilitation services. In addition, we provide details of the types of service providers and attempt to determine how the outcomes obtained by the included studies might be generalizable to the question of whether providers, specifically the three types of unlicensed providers (low-vision therapists, orientation and mobility specialists, and rehabilitation teachers), can provide quality services.

Key Question Addressed

In order to meet the objectives of Specific Aim 3 and 4 of this report, we address the following Key Question: *Is vision rehabilitation an effective intervention for patients with irreversible low vision?*

In assessing effectiveness, we consider the following outcomes:

a) Activities of daily living

b) Mood

c) Psychosocial status

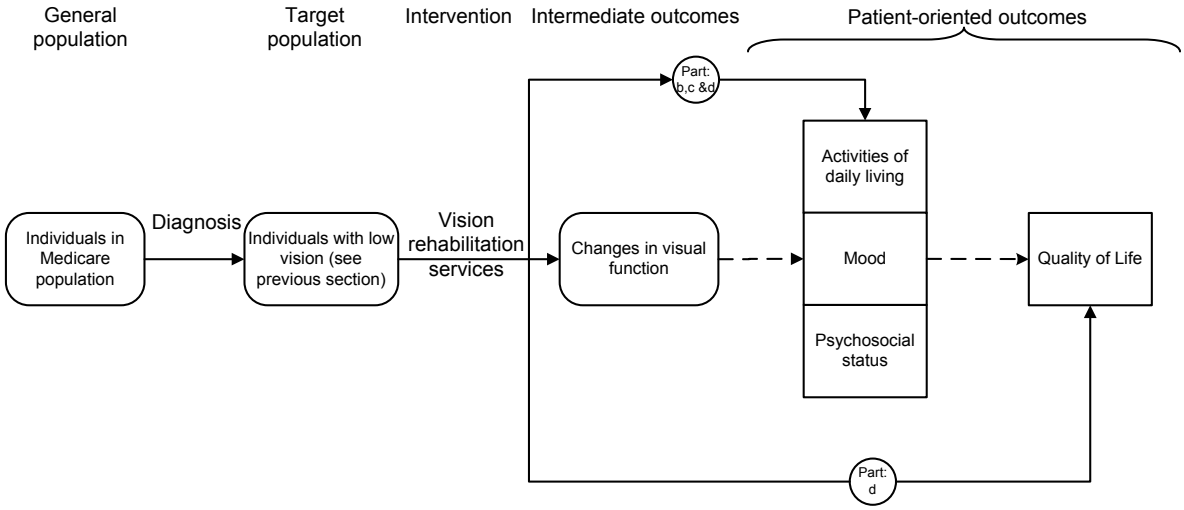
d) Quality of life

Analytic Framework for Addressing Effectiveness of Vision Rehabilitation

The relationships between the target population, the intervention and each of the outcomes listed above are made explicit by the analytic framework shown in Figure 1. In this figure, solid lines represent linkages that are addressed by our Key Question and dashed lines represent associations between outcomes. For example, changes in

mood and/or psychosocial status might reasonably be expected to lead to changes in quality of life. The letters within circles relate to the key question addressed in this report as follows: (a) does the vision rehabilitation service of interest lead to an improvement in activities of daily living in individuals with low vision? (b) Does the vision rehabilitation service of interest lead to an improvement in mood in individuals with low vision? (c) Does the vision rehabilitation service of interest lead to an improvement in psychosocial function in individuals with low vision? (d) Does the vision rehabilitation service of interest lead to an improvement in quality of life in individuals with low vision?

Figure 1. Analytic Framework for Addressing Effectiveness of Vision Rehabilitation



Outcomes Assessed

The analytical framework highlights the fact that we consider several types of outcomes in this report. As one moves from the left (changes in visual function) to the right (quality of life) of Figure 1, outcome

measures become more focused on the patient's perceptions of how low vision is affecting their lives. Although some may consider the outcomes to the right of the framework as being more subjective than the more objective measures of visual function, the value of these latter measures is limited. This is because different people are affected by reductions in visual function in different ways. Therefore, some individuals with high levels of visual impairment may not be as disabled by their visual deficit than other individuals with seemingly less severe forms of visual impairment. A number of studies have shown that the relationships between visual performance measures and patient-oriented outcomes tend to be weak.(28,123) It is for this reason that we have only included studies that assessed the effectiveness of vision rehabilitation services using patient-oriented outcomes in this report (see section headed, "Inclusion/Exclusion Criteria" below).

Some investigators have argued that some outcome measures that are typically considered to be patient oriented also have limited value when one is trying to measure the effectiveness of a low-vision intervention. For example, some have suggested that measures of reading performance (reading is an "activity of daily living" and is therefore a patient-oriented outcome) such as reading speed and reading duration may not be satisfactory measures of the overall impact of a low-vision intervention.(28,123) These investigators hold that the ability of an individual to perform a specific range of tasks in a laboratory may not be important to the individual, may not address the particular needs of the individual, and consequently, may not

improve the physical and mental well being of the individual. Furthermore, they suggest that laboratory findings may not be generalizable to the home setting. We have nevertheless, included these types of studies in this report because they were included in the Lewin Group report.

Activities of Daily Living

Activities of daily life encompass any activity that an individual would normally perform as part of their normal daily activities. These activities include reading, writing, personal hygiene, cooking, orientation and mobility, etc. Measures and instruments used to assess activities of daily living in the studies that met the inclusion criteria for this report, along with details of a number of measures and instruments that are currently being used in ongoing studies (Table C-1 of Appendix C), are presented in Table D-1 of Appendix D.

Mood

Low vision is commonly associated with depression. Instruments used to assess depression among patients enrolled in the studies that met the inclusion criteria for this report, along with details of instruments currently being used in ongoing studies (Table C-1 of Appendix C), are presented in Table D-2 of Appendix D.

Psychosocial Status

Psychosocial status refers to the interaction between social and psychological factors. For example, an individual with low vision may feel that he or she can no longer interact socially with relatives and friends as often as he or she would like, perhaps because of reduced mobility. This may lead to feelings of isolation and depression. Alternatively, feelings of depression resulting from the loss in visual function may lead to a reduction in the individual's willingness to socialize.

Instruments used to assess psychosocial status in studies that met the inclusion criteria for this report, along with details of instruments currently being used in ongoing studies (Table C-1 of Appendix C), are presented in Table D-3 of Appendix D.

Quality of Life

This outcome measure may be the most meaningful of all measures. This is because any changes in an individual's ability to perform activities of daily living, mood, psychological status, and any adverse events associated with the intervention should--if these changes are meaningful--be reflected by changes in the individual's quality of life.

Instruments used to measure changes in quality of life among the individuals enrolled in the studies that met the inclusion criteria for this report, along with details of instruments that are currently being used in ongoing studies (Table C-1 of Appendix C), are presented in Table D-4 of Appendix D.

Literature Searches

Details of our literature searches, which included searches of 11 electronic databases, hand searches of the bibliographies of all retrieved articles, and searches of the gray literature, are presented in Appendix E. In addition, we contacted experts in the field of vision rehabilitation via email or telephone in order to aid us in identifying any unpublished literature.

Inclusion/Exclusion Criteria

We used the following criteria to determine which studies would be included in our analysis:

1. Study must not have been included in the Lewin Group report.

   This criterion was adopted to avoid redundancy. Note that the Lewin Group report will serve as the foundation for our update. Thus, all conclusions drawn by the Lewin Group that are relevant to this report (as defined by the section headed, "Scope of Report," will be reiterated in our report and built upon whenever new evidence is available.

2. Studies of any type of vision rehabilitation service were included.

   Included studies were not confined to those of comprehensive vision rehabilitation services. We also included studies that evaluated the effectiveness of one facet of vision rehabilitation (e.g., orientation and mobility training, visual aids, etc.).

3. We excluded studies that evaluated the effectiveness of a rehabilitation service designed specifically for patients with dual sensory loss (i.e., individuals with low vision *and* poor hearing).

   Individuals with dual sensory loss are a special subgroup of individuals with low vision who require extra services that extend beyond those generally considered to be part of a typical vision rehabilitation service. For example, such individuals need access to personnel other than ophthalmologists, optometrists, and occupational therapists; they also need access to audiologists, etc. Studies designed to measure the effectiveness of a service identified as a vision rehabilitation service that enrolled some patients with dual sensory loss were <u>not</u> excluded.

4. Study must evaluate the effectiveness of a vision rehabilitation program in older adults.

   The findings of a study must be as generalizable as possible to the U.S. Medicare population. Although the vision rehabilitation literature can be loosely divided into studies of vision rehabilitation for younger and older individuals, we recognize that studies of these older adults may not be perfectly generalizable to the U.S. Medicare population.

Older individuals are typically defined in the vision rehabilitation literature as being those aged 45 or older.[15]

We included studies that enrolled individuals over the age of 45 because excluding them would likely eliminate nearly all vision rehabilitation studies. We could not determine whether the Lewin Group's report used an age criterion to include/exclude studies.

5. Study must report on at least one of the outcomes that are the focus of this report.

6. With the exception of case reports, study can be of any design.

   Because only a few relevant studies were published since the Lewin Group report, we have maximized the size of the evidence base by not limiting inclusion of this report to controlled trials.[16] *The Lewin Group report also included studies of many designs.*

7. The study must have assessed the effectiveness of a vision rehabilitation service on 10 or more individuals with low vision.

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[15] The reason for this age threshold is that the primary causes of irreversible low vision in the elderly (age-related macular degeneration and glaucoma) do not tend to be manifest in those younger than 45.

[16] Please note that issues related to the quality of the included studies will be addressed in a section of the report entitled "Quality of Evidence Base"

The results of small studies are typically more variable and less generalizable than those of larger studies.

8. Study must be published in English.

9. Study must be published as a full article. Meeting abstracts were not included.

   Published meeting abstracts do not include sufficient details about experimental methods to permit one to verify that the study was well designed.(124,125) *In addition, it is not uncommon for abstracts that are published as part of conference proceedings to describe studies that are never published as full articles.(126-129)*

10. The study must be designed to assess the effectiveness of a rehabilitation service in improving outcomes of individuals with low vision.

    Studies designed to develop and validate a new psychometric instrument were not included.

11. Study must not enroll individuals with reversible visual deficits.

    Not all individuals with low vision have irreversible vision loss. For example, most patients with cataracts can have vision restored surgically. Thus, these patients do not meet the working definition of low vision used in this report (individuals with irreversible visual impairment).

12. When several sequential reports from the same study center are available, only outcome data from the largest and most recent report were included. However, we used relevant data from earlier and smaller reports if the report presented pertinent data not presented in the larger, more recent report.

Data Extraction

Information extracted from the included studies is presented in Evidence Tables in Appendix G. These tables describe study results, design details (randomization status, blinding status, etc.), information on enrolled patients (demographics, underlying etiology, etc.), information on the type of provider and the setting of the study (inpatient or outpatient service, nursing home or community based, etc.), and details of the intervention protocol used (components of intervention, frequency of sessions, etc.).

We have only extracted relevant outcome data. Outcome data that fell outside of the purview of the present report were not extracted. If relevant data were reported in figures but not in text, we estimated them from the figures. When study authors did not report dichotomous data as percentages, we computed percentages. Any author errors and reporting discrepancies are noted in the Evidence Tables.

Evaluation of the Quality of Evidence Base

We rated evidence strength and internal validity using standard criteria as proposed by the U.S. Preventive Services Task Force (USPSTF).(39) We estimated the generalizability of each study to the U.S. Medicare population using study enrollment criteria and the reported characteristics of the patients who were actually enrolled in the study.

Statistical Methods

No quantitative analyses were performed in this report. This was primarily the consequence of the fact that no two included studies evaluated the same rehabilitation service or component.

EVIDENCE BASE

Our searches identified 86 articles that potentially met our *a priori* inclusion criteria and were therefore retrieved. On retrieval, 68 of the 86 articles were found not to meet our inclusion criteria. The primary reason for exclusion (39 articles) was that the article was a meeting abstract (a violation of inclusion criterion nine). The remaining 29 articles were excluded for a variety of other reasons. These latter articles (not the abstracts), and the reason for their exclusion are listed in Table F-1 of Appendix F.

Having excluded the 68 articles above, 18 articles remained. These 18 articles, which are listed in Table 4, consist of five systematic reviews, four randomized controlled trials (RCTs),

two non-randomized controlled trials, and seven “before-after” studies.

Table 4. Evidence Base

Study Design	References
Systematic Reviews	Adams et al.(21) CCOHTA(22) Eperjesi et al.(23) Stelmack et al.(24) Virgili and Rubin(25)
Randomized Controlled Trials	Brody et al.(26) Dahlin Ivanoff et al.(27) Goodrich et al.(28) Peterson et al.(29)
Non-randomized controlled studies	Goodrich and Kirby(30) Soong et al.(31)
“Before-after” studies	De l’Aune et al.(32) Eperjesi et al.(33) Engel et al.(34) Hinds et al.(35) Nilsson et al.(36) Stelmack et al.(37) Tejaria et al.(38)

EVIDENCE SYNTHESIS

The included studies can be grouped by the primary type of vision rehabilitation service that they assessed (Table 5).

Table 5. Types of Vision Rehabilitation Services Evaluated

Reference	Year	Comprehensive services	Optical Devices and visual aids[a]	Orientation and mobility training	Adaptive training techniques	Group Interventions
Systematic reviews						
Adams et al.(21)	2003		✓			
CCOHTA(22)	2004		✓			
Eperjesi et al.(23)	2002		✓			
Stelmack et al.(24)	2001	✓				
Virgili and Rubin(25)	2004			✓		
Included studies						
De l'Aune et al.(32)	2004	✓				
Eperjesi et al.(33)	2004		✓			
Peterson et al.(29)	2003		✓			
Nilsson et al.(36)	2003				✓	
Brody et al.(26)	2002					✓
Dahlin Ivanoff et al.(27)	2002					✓
Hinds et al.(35)	2002	✓				
Stelmack et al.(37)	2002	✓				
Tejaria et al.(38)	2002		✓			
Goodrich and Kirby(30)	2001		✓			
Soong et al.(31)	2001			✓		
Goodrich et al.(28)	2000		✓			
Engel et al.(34)	2000			✓		

[a] Studies of the prescription and training in use of optical devices and low-vision aids

Below we present the findings of our evidence syntheses organized by the types of rehabilitation services identified in Table 5.

Comprehensive Services

Our searches identified one systematic review(24) and three studies(32,35,37) that met the inclusion criteria for this report and evaluated the effectiveness of a comprehensive vision rehabilitation program. Details of the systematic review and the three included studies are presented in the evidence tables of Appendix G (Table G-1 through Table G-9).

Quality of Included Studies

The three included studies, which enrolled a total of 5,266 individuals with low vision or blindness, evaluated the effectiveness of three different comprehensive vision rehabilitation programs. The results of our analysis of the quality of these studies are summarized in Table 6. Quality ratings for each study are based on an evaluation of the data presented in Table G-3 of Appendix G.

Table 6. Quality of Studies of Comprehensive Vision Rehabilitation Services

Reference	Year	Study Design	USPSTF Quality Rating[a]
De l'Aune et al.(32)	2004	BAS	Level II-3-Low
Hinds et al.(35)	2002	BAS	Level II-3-Fair
Stelmack et al.(37)	2002	BAS	Level II-3-Fair

BAS Prospective "before-after" study

[a] See criteria proposed by the U.S. Preventive Services Task Force.(39)

Details of Study Enrollees and Study Generalizability

Details of the patients enrolled in the studies of De l'Aune et al.,(32) Stelmack et al.,(37) and Hinds et al.(35) are presented in Table G-5, Table G-6, and Table G-7 of Appendix G. None of the study populations were found to be highly generalizable to the Medicare population (the generalizability of the studies to this population was deemed to be "Fair" [17]).

De l'Aune et al. evaluated the effectiveness of a U.S.-based comprehensive vision rehabilitation service; the Department of Veterans Affairs (VA) Blind Rehabilitation Centers (BRC) program. Though the characteristics of all patients enrolled in this very large (N = 5067), multicenter study were incompletely reported (see Table G-5, Table G-6, and Table G-7 of Appendix G), available patient information on the distribution of ocular diseases responsible for low vision, the distribution of comorbidities, and the age range of those enrolled in the program suggests that the findings of this study are generalizable to the elderly Medicare population. However, 95% of those enrolled in the VA BRC program were male, which limits the generalizability of the findings of the study.

Stelmack et al. evaluated the effectiveness of a single VA BRC center as well as a VA program designed for veterans who are not legally blind but who have low vision; the VA Visual Impairment Centers to

[17] High = Characteristics of all enrolled patients typical of Medicare population; Fair = Characteristics of some enrolled patients typical of Medicare population; Poor = Characteristics of only a few enrolled patients typical of Medicare population or enrolled patients represent a subgroup of Medicare population.

Optimize Remaining Sight (VICTORS) program. The distribution of ocular diseases responsible for low vision and blindness in the individuals included in these programs was similar to that of the elderly population of individuals with low vision in the U.S. However, the programs enrolled patients over a wide age range (BRC program: 38 to 88 years; VICTORS program: 44 to 87 years) which limits the generalizability of the study's findings to the elderly Medicare population. Also, the distribution of males to females who received services in the Stelmack study was dissimilar to the sex distribution in the Medicare population (BRC program: 93.5% male; VICTORS program: 78.4% male).

The distribution of eye diseases underlying low vision, the age distribution (97% aged >55 years), and the sex distribution (69% were female) of the individuals enrolled in the study of Hinds et al. were reasonably similar to those of the U.S. Medicare population. Because this study was performed in the U.K., however, the findings of this study may not be strongly generalizable to the elderly Medicare population.

Details of Programs Evaluated

De l'Aune et al and Stelmack et al.(37) both evaluated the effectiveness of the U.S.-based VA BRC vision rehabilitation program. In addition, Stelmack et al.(37) evaluated the effectiveness of another VA program; VA VICTORS. Hinds et al. evaluated the effectiveness U.K.-based vision rehabilitation service, the Interdisciplinary Low Vision Service (ILVS).

The VA BRC program provides rehabilitation services to veterans who are legally blind (visual acuity ≤20/200 or a visual field ≤20 degrees)[18].(130) The VA VICTORS program differs from the VA BRC program in that it provides rehabilitation services to veterans who are not legally blind but who have a disabling visual impairment (defined by the VA as an uncorrectable visual acuity of ≤20/50, near VA ≤20/50, or significant loss of visual field).(130)

Both the BRC and the VICTORS programs are staffed by a multi-disciplinary team of vision rehabilitation professionals consisting of ophthalmologists, optometrists, psychologists, social workers, occupational therapists, physical therapists, and low-vision therapists. Orientation and mobility trainers and rehabilitation teachers are employed within the VA BRC program but they are not included in the multidisciplinary team that staff the VA VICTORS program. This difference in staffing is indicative of the differences in the needs of the individuals that are enrolled in these two services.

The VA BRC system is an intensive, highly structured, rehabilitation service. Enrolled veterans are admitted as inpatients. Length of stay in the center depends on individual circumstances but can be several months. During their stay at the center, each patient participates in rehabilitation activities consisting of seven 50 minute sessions, five days per week. Rehabilitation services include: orientation and

[18] Note that many of the individuals who were enrolled in the studies of Stelmack et al. and De l'Aune et al. and who received rehabilitation services through the VA BRC program were not legally blind (see Table G-5 of Appendix G)

mobility instruction, communication skills instruction, activities of daily living training, manual skills training, vision skills training, computer access training, physical conditioning and recreation, and counseling.

All rehabilitation departments and clinical providers within the VA BRC program contribute to an individualized interdisciplinary plan of care that is cosigned by the team coordinator (usually an orientation and mobility specialist, a rehabilitation teacher or a low-vision therapist), an optometrist, a psychologist, a geriatric physician/nurse practitioner, and a social worker. The interdisciplinary plan of care is updated throughout each veteran's program. Orientation and mobility specialists, vision rehabiltation teachers, and low-vision therapists are not directly supervised by a Medicare-defined physician in this program. However, clinical direction is provided by an optometrist (a Medicare-defined physician) through the rehabilitation plan that prescribes any low-vision devices that are to be integrated in the veteran's rehabilitation program and the general approach to training that should be provided by low-vision therapists.

VA VICTORS services, though comprehensive in that they are staffed by a multidisciplinary team, differ from the services provided by the VA BRC program in that they are geared toward individuals with low vision who are not legally blind. As such, they are less intensive than VA BRC services. Also, orientation and mobility services and rehabilitation teaching are not provided by the VA VICTORS program.

Patients with low vision are typically admitted to a VICTORS unit for a period of three to five days. Services available to the veteran enrolled

in the VICTORS program are similar to those offered to those enrolled in the BRC program. However, an emphasis is placed on learning how to use assistive devices in order to maximize residual vision. Consequently, in this program, clinical management is closely supervised by on optometrist who prescribes low-vision aids and instructs low-vision trainers on the types of training that the veteran with low vision requires.

The ILVS program provides low-vision services to community dwelling individuals in Fife, Scotland. Patients referred to this program attend outpatient clinics, where they receive clinical assessment; referral for appropriate treatment; blind and partially sighted registration; refraction and prescription of low-vision aids together with information, counseling, and support. Individualized rehabilitation services are planned and overseen by ophthalmologists. Rehabilitation workers[19] or social workers share the consultation with the ophthalmology staff at the low-vision clinics and provide domiciliary visits whenever they are necessary. In addition, the ILVS program maintains close links with the low-vision programs provided by local community optometrists who see patients in their own locality. Hinds et al. did not provide details of the intensity of the program.

[19] It is unclear to what extent U.K.-based "rehabilitation workers" correspond to U.S.-based unlicensed low-vision personnel (low-vision therapists, rehabilitation teachers, and orientation and mobility trainers).

Outcomes Assessed

Outcomes addressed by the two included studies that evaluated the effectiveness of comprehensive vision rehabilitation services are identified in Table 7.

Table 7. Outcomes Assessed

Reference	Year	Program evaluated	Quality of Life	Psycho-social status	Mood	Activities of Daily Living
De l'Aune et al.(32)	2004	VA BRC				✓
Hinds et al.(35)	2002	ILVS	✓			✓
Stelmack et al.(37)	2002	VA BRC and VICTORS	✓			

ILVS Interdisciplinary Low Vision Services
VA BRC Department of Veterans Affairs Blind Rehabilitation Centers program
VA VICTORS Department of Veterans Affairs Visual Impairment Centers to Optimize Remaining Sight program

All three studies used validated instruments to measure outcomes. Hinds et al. and Stelmack et al. measured quality of life using the Vision-Related Quality of Life "core questionnaire" (VCM 1) and the 25 item version of the National Eye Institute Visual Function Questionnaire (NEI VFQ-25), respectively. Activities of daily living were evaluated in the study of Hinds et al. using the Manchester Low Vision Questionnaire (MLVQ) and in the study of De l'Aune et al. using the Veterans Affairs 13-item ADL checklist (VA-13). Descriptions of four instruments can be found in Table D-1 and Table D-4 of Appendix D.

Findings of Included studies

Effect of Comprehensive Vision Rehabilitation Services on Quality of Life

Both Stelmack et al.(37) and Hinds et al.(35) found that individuals with low vision experience significant improvements in quality of life following exposure to three different comprehensive vision rehabilitation programs.

Stelmack et al., using the NEI VFQ-25 plus its supplement, found significant improvements in quality of life at discharge when compared to baseline for seven of the 39 items examined among individuals with low vision following rehabilitation in the VA BRC program ($p < 0.01$[20] for each item) and for four of the 39 items examined among individuals with low vision following rehabilitation in the VA VICTORS program ($p < 0.01$[21] for each item). The seven items that showed significant improvements from baseline among individuals who received VA BRC services and the four items that showed significant improvement among individuals who received VA VICTORS services all pertained to items related to activities of daily living (VA BRC: difficulty with reading ordinary print in the newspaper [item-5]; difficulty doing work or hobbies that require you to see close up [item-6]; difficulty reading street signs or names of store [item-8];

[20] After Bonferroni correction for multiple outcomes.

[21] After Bonferroni correction for multiple outcomes.

difficulty going out to see movies, plays or sports event [item-14]; difficulty reading small print in a telephone book, on a medicine bottle, or on a legal form [item-A3]; difficulty figuring out whether bills you receive are accurate [item-A4]; and difficulty seeing and enjoying programs on television [item-A8] -- VA VICTORS: difficulty reading street signs and names of stores [item-8]; difficulty figuring out whether bills receieved are accurate [item-5]; difficulty going to see movies, plays or sports events [item-14]; difficulty reading small print in a telephone book, on a medicine bottle, or on a legal form [item-A3]).

Hinds et al. used the VCM-1 instrument to evaluate changes from baseline six months after discharge from the ILVS program and found significant improvements in vision-related quality of life from baseline levels (VCM 1; $p < 0.0061$). Specifically, significant reductions in patient's fear of deterioration in vision ($p = 0.0004$), coping with daily life ($p = 0.0095$), and safety at home ($p < 0.0005$) were observed.

Effect of Comprehensive Vision Rehabilitation Services on Activities of Daily Living

De l'Aune et al.(32) and Hinds et al.(35) measured the ability of individuals with low vision or blindness to perform activities of daily living prior to and then following exposure to a comprehensive vision rehabilitation program. Both studies found that activities of daily living were improved following exposure to these programs

De l'Aune et al. found that mean overall VA-13 scores improved significantly from baseline measures ($p < 0.001$). In addition, these investigators found that significant improvements from baseline were also seen across four subscales (low vision, living skills, manual skills, and orientation and mobility skills; all $p < 0.001$).

Hinds et al.(35) found that reading activity was improved from baseline levels when measured six months following exposure to the ILVS program. In this study, reading activity was measured by determining the proportion of individuals with low vision who used a prescribed low-vision aid and the proportion of patients who found the prescribed device helpful in reading materials important to them in their everyday lives. The study investigators found that 95% of patients enrolled in their service were prescribed a low-vision aid (the authors did not describe which low-vision aids were prescribed). Of these, 75% attempted to use the prescribed aid in their daily lives, and approximately 50% of users reported that the prescribed device was helpful. Significant increases from baseline in the number of patients who had read or attempted to read ordinary print (newspapers, magazines, etc.), large print books, and shop prices (labels, tickets, etc.) were observed. However, no significant increases from baseline were seen for a number of other reading activities (reading bank statements, reading own writing, reading instructions on packets, reading markings on dials, reading the telephone directory, reading the time on a watch, completing forms, signing name, writing letters, identification of money).

Relative Effectiveness of Different Programs

Evidence from included studies is not sufficient to allow one to determine the relative effectiveness of one comprehensive treatment program when compared to another. None of the included studies directly compared the effectiveness of one comprehensive treatment program against another. Although two studies measured the effects of comprehensive services on quality of life and activities of daily living, respectively, indirect comparisons were precluded by the fact that different instruments were used to measure these outcomes.

Influence of Program Components and Frequency of Services on Outcome

Evidence from included studies is not sufficient to allow one to explore the influence of program components and frequency of services on outcome. As was the case above, none of the included studies were designed to explore this relationship directly. Given this, one can only explore this relationship using indirect methods. Because individuals enrolled in the included studies received rehabilitation services that were individualized, however, it would only be possible to evaluate the relationship between program components and the frequency of administration indirectly, if the authors of the included studies provided details of the actual program components that were used and the frequency of their application for each enrollee. Such data were not presented.

Relationship between Staffing Model and Outcome

Evidence from the three included studies is not sufficient to allow one to determine the relative effectiveness of different comprehensive vision rehabilitation service staffing models. More specifically, the available evidence does not allow one to determine whether outcomes obtained following exposure to a comprehensive vision rehabilitation service are influenced by whether the training program was directly supervised by a Medicare-defined physician.

Although the coordination of care for individuals included in the VA BRC program is typically not directly supervised by a Medicare-defined physician and is usually coordinated by either a low-vision therapist, a rehabilitation teacher, or a mobility and orientation specialist, one is precluded from comparing outcomes obtained following exposure to this service to outcomes following exposure to VA VICTORS or the ILVS programs. This is because individuals enrolled in the VA BRC program have more severe visual impairment than those enrolled in either of the other two programs and are therefore not comparable.

Relationship between pattern of vision loss, the etiology of vision loss, and the prognosis following exposure to comprehensive vision rehabilitation services

A paucity of evidence from suitable studies precludes one from drawing conclusions about the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an

individual patient's future vision following exposure to comprehensive vision rehabilitation services.

Findings of other Systematic Reviews

Stelmack et al.(24) performed a systematic review of the literature pertaining to comprehensive rehabilitation services and concluded that exposure to vision rehabilitation services led to improvements in self-reported functional status and quality of life. Details of the methodology employed in this systematic review are summarized in Table G-1 of Appendix G. It is important to note that the primary aim of this systematic review was to evaluate the effects of low vision on quality of life and not the evaluation of the effectiveness of vision rehabilitation services on quality of life (only four of the 18 articles included in the review assessed changes in quality of life following exposure to rehabilitation services). As a consequence, studies were not critically appraised beyond the primary study focus, the population studied, and the validity of the instruments that were used to assess quality of life.

Subsection Summary

One systematic review published since January 2000 assessed the effectiveness of comprehensive rehabilitation programs. Stelmack et al.(24) concluded that exposure to vision rehabilitation services leads to improvements in self-reported functional status and quality of life. This conclusion, however, was based on data from a small evidence base consisting of four studies.

Our searches identified three studies that evaluated the effectiveness of three different comprehensive vision rehabilitation programs.(32,35,37) All three of these studies utilized a before-after study design (two studies, USPSTF Quality Rating: II-3-Fair; one study, USPSTF Quality Rating: II-3-Low). The findings of all three studies, though methodologically weak, suggest that individuals with low vision or blindness do benefit from exposure to comprehensive vision rehabilitation services.

The studies of De l'Aune et al.(32) and Stelmack et al.(37) provide some evidence that quality services can be provided in the absence of direct physician supervision. Their evaluation of the VA BRC program, in which services are typically coordinated by a rehabilitation specialist (orientation and mobility specialists, vision rehabilitation teachers, and low-vision therapists), demonstrated that exposure to this service improves quality of life among "blind" veterans (where *blindness* is defined as a visual acuity $\leq$20/200 or a visual field $\leq$20 degrees).

One cannot draw evidence-based conclusions pertaining to the relative effectiveness of the three comprehensive vision rehabilitation service models evaluated or draw conclusions about the relative effectiveness of different staffing models used to provide services. The available evidence does not allow one to determine the relative effectiveness of the different components of the programs assessed or to determine the optimal frequency and intensity of service provision. Finally, evidence from the three included studies does not allow one to draw conclusions pertaining to the relationship between

the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to comprehensive vision rehabilitation services.

Optical Aids and Low-Vision Devices

Our searches identified three systematic reviews(21) and five studies(33) that met the inclusion criteria for this report and evaluated the effectiveness of an optical aid or low-vision device. Details of these three systematic reviews and of the five included studies are presented in Appendix G (Table G-1 through Table G-9).(28-30,38)

Quality of Included Studies

Five studies that enrolled a total of 236 individuals with low vision presented data pertaining to the effectiveness of a variety of different low-vision devices and optical aids.(33) The results of our analysis of the quality of these five are summarized in Table 8. The quality ratings for each study were based on an evaluation of the data presented in Table G-3 of Appendix G.

Table 8. Quality of Studies of Low-Vision Devices and Optical Aids

Reference	Year	Study Design	USPSTF Quality Rating[a]
Eperjesi et al.(33)	2004	BAS	Level II-3-Fair
Peterson et al.(29)	2003	RCT	Level I-Low
Tejaria et al.(38)	2002	BAS	Level II-3-Fair
Goodrich and Kirby(30)	2001	CT	Level II-1-Fair
Goodrich et al.(28)	2000	RCT	Level I-Low

RCT Randomized controlled trial
CT Prospective non-randomized controlled trial
BAS Prospective "before-after" study

[a] See criteria proposed by the U.S. Preventive Services Task Force.(39)

Details of Study Enrollees and Study Generalizability

Details of the patients enrolled in the studies of Eperjesi et al., Peterson et al., Tejeria et al., Goodrich and Kirby, and Goodrich et al.(28) are presented in Table G-5 of Appendix G.

None of the studies included in this section were found to be highly generalizable to the elderly Medicare population. While the generalizability of four of the five included studies was considered to

be “Fair[22],” the generalizability of one study was found to be “Poor.” Tejeria et al.(38) evaluated face recognition performance following the prescription of a low-vision optical aid in white citizens of the U.K. only. Non-white individuals were specifically excluded from the study. The justification for this was that a cross race recognition deficit (people are better at recognizing faces within their own race) has been well documented.(38) While in this case, the deliberate exclusion of non-whites may make sense from a methodological standpoint, it eliminates a large proportion of individuals who comprise the U.S. Medicare population. Consequently, we have excluded this study from further consideration in this assessment. Because this study met the *a priori* inclusion criteria for this report[23], however, we have, for the sake of completeness, presented the results of this study in Table G-9 of Appendix G.

[22] High = Characteristics of all enrolled patients typical of Medicare population; Fair = Characteristics of some enrolled patients typical of Medicare population; Poor = Characteristics of only a few enrolled patients typical of Medicare population or enrolled patients represent a subgroup of Medicare population.

[23] We did not anticipate that a study would exclude non-whites.

Outcomes Assessed

The outcomes assessed by the four included studies that evaluated the effectiveness of various optical devices and low-vision aids are identified in Table 9.

Table 9. Outcomes Assessed

Reference	Year	Program evaluated	Quality of Life	Psycho-social status	Mood	Activities of Daily Living
Eperjesi et al.(33)	2004	Light filters				✓
Peterson et al.(29)	2003	Magnifying devices				✓
Goodrich and Kirby(30)	2001	Various optical devices and a CCTV system				✓
Goodrich et al.(28)	2000	Various low-vision devices				✓

CCTV Closed-circuit television

All four studies reported on the effects of optical aids and low-vision devices on a specific activity of daily living; reading performance. None of the included studies evaluated the effects of these devices on measures of mood, psychosocial status, or quality of life.

Findings of Included Studies

Three included studies compared the effectiveness of different optical aids and low-vision devices in patients with low vision. Using measures of reading performance and patient preference, Goodrich and Kirby(30) compared the effectiveness of a patient's prescribed optical device (details of prescribed optical devices were not

reported) with two types of closed-circuit television (CCTV) systems on reading performance (reading speed and duration) and to compare patient preference. These investigators found that after five training sessions, patients read significantly faster when using either the stand-mounted or the handheld CCTV device than when using their prescribed optical aid (stand-mounted vs. optical device: $p = 0.040$; handheld vs. optical device: $p = 0.010$). In addition, patients were able to read for significantly longer when using either CCTV device than when using their prescribed optical aid (stand-mounted vs. optical: $p < 0.001$; handheld vs. optical device: $p < 0.001$). No significant differences in reading speed or duration were observed between the handheld and stand-mounted CCTV devices. When asked which of the two CCTV devices they preferred, most patients (73%) stated that they preferred the stand-mounted CCTV device.

Peterson et al.(29) compared the effectiveness of a number of magnifying devices (a magnification and field-of-view matched electronic visual enhancement system (EVES) with a monitor; a magnification and field-of-view matched EVES with a head mounted display (HMD); a stand mounted EVES with monitor viewing) with the patient's usual optical magnifier. Reading performance was measured before and then again immediately after demonstration of each device and a two minute training session. Reading speed was found to be significantly higher with the mouse or stand mounted EVES with monitor viewing than with the individual's normal optical magnifier at smaller print sizes ($p < 0.05$). The mouse EVES with HMD viewing caused lower reading speeds than stand

EVES with monitor viewing ($p < 0.001$). Although these data suggest that an EVES system may provide benefits over standard optical magnifiers, the value of these findings are limited. For example, the study was performed in a clinical laboratory and training sessions were very brief. Whether patients would actually use an EVES system in their normal environment more often than they use their normal optical magnifiers remains to be determined, as does the optimal amount of training that is necessary for optimal use of each of the devices examined.

Eperjesi et al.(33) evaluated the relative effectiveness of four different light filters on reading performance in 12 individuals with low vision resulting from AMD. The four filters assessed were a yellow Corning Photochromic Filter (CPF-450), a neutral density filter, an individual filter obtained using the Intuitive Colorimeter®, and a clear filter. The authors found that reading speed was statistically significantly increased with the CPF-450 filter when compared to all of the other filters.

Influence of Program Components and Frequency of Services on Outcome

Goodrich et al.(28) randomized 90 individuals with low vision to one of two groups with the aim of determining the optimum number of training sessions necessary to maximize reading performance following prescription of a low-vision device (USPSTF Quality Rating: I-Low). Patients were provided with optical devices and received full training (FTG) as defined by standard VA protocol (10 hour one hour

training sessions with an optical device) or half that amount of training plus five one hour sessions of practice (HTG). Reading speed was measured at baseline and again after 10 weeks of training. Both treatment groups demonstrated a significant increase in reading speed from baseline over ten sessions (FTG group: $p < 0.017$; HTG group: $p < 0.001$). Although reading speeds were similar in both groups during the first five sessions, FTG group showed little improvement beyond this point. Individuals allocated to the HTG showed continued improvement beyond the 5th week. These investigators concluded that their findings suggest that five training sessions are as effective as ten training sessions.

Relationship between Staffing Model and Outcome

The prescription of optical devices and low-vision aids is always performed by a Medicare-defined physician (an ophthalmologist or an optometrist). Subsequent training in the use of these devices was always supervised by Medicare-defined physicians in the studies that were included in this report. Consequently, one cannot determine whether it is possible to provide effective training in the use of low-vision devices and optical aids outside of the supervision of a Medicare-defined physician.

Findings of Systematic Reviews

Three relevant systematic reviews have been published since the publication of the Lewin Group report.(21) The types of devices

assessed, the methods used, and the findings of these systematic reviews are summarized in Table 10.

Table 10. Systematic Reviews of Optical Aids and Low-Vision Devices

Reference	Year	Devices evaluated	Methods	Conclusions
Adams et al.(21)	2003	Various: All devices used in VA VR programs	Medline, Embase, and Current Contents searched from 1970 to July 2002 Hand searches Only prospective controlled trials >10 pts included Peer-reviewed articles only 7 studies included Quality of included studies assessed	Review identified a paucity of high quality evidence in the peer-reviewed literature to inform choices about provision of optical low-vision devices. Review concluded that further research is required to determine appropriate candidacy for low-vision devices, suitable prescription for these devices, and outcome measures that define quality of life.
Eperjesi et al.(23)	2002	Filters	Medline searched for previous 30 years Hand searches Study design critically appraised Use of tinted lenses on progressive diseases excluded No study size limit Children and adults	Not possible to draw conclusions because of a paucity of high quality literature on the use of tinted lens
CCOHTA(22)	2004	Implantable miniature telescope	NR	CCOHTA concluded that there is limited published evidence on effectiveness of implantable miniature telescopes' safety and effectiveness. Its cost is still not established.

Subsection Summary

Three relevant systematic reviews have been published since January 2000.(21-23) Of these, one evaluated evidence on the effectiveness of an array of optical devices and low-vision aids that are used in VA vision rehabilitation programs,(21) one evaluated the effectiveness of optical filters,(23) and the third evaluated evidence on the effectiveness of an implantable miniature telescope.(22) All three reviews failed to reach any evidence-based conclusions because of a paucity of available data.

Our searches identified five studies that evaluated the effectiveness of optical aids or low-vision devices.(28-30,33,38) One of these studies was excluded from further consideration because of poor generalizability to the Medicare population.(38) All of the remaining studies(28-30,33) were small (N ranged from 22 to 90), low quality (USPSTF Quality Ratings ranged from II-3-Fair to I-Low), laboratory based studies in which patients were not followed up.

All four included studies measured effectiveness using a single activity of daily living; reading performance. Some commentators have argued that this measure of effectiveness is of limited value.(28,123) They hold the opinion that the ability of an individual to perform a specific range of tasks in a laboratory may not be important to the individual, may not address the particular needs of the individual, and consequently, changes in this outcome may not be reflected by meaningful reductions in disability.

All four included studies showed that the prescription of optical aids and low-vision devices improved reading performance. One of these studies examined the question of the number of training sessions required following prescription of low-vision aids required to optimize outcome. This study found that five training sessions followed by practice was optimal. Because all four studies were supervised and performed by optometrists, one is precluded from drawing conclusions about how different staffing models may influence outcome.

Orientation and Mobility Training

Our searches identified one systematic review(25) and two studies(31,34) that met the inclusion criteria for this report and evaluated the effectiveness of orientation and mobility training in elderly individuals with low vision. Details of the systematic review and the two included studies are presented in Appendix G (Table G-1 through Table G-9).

Quality of Included Studies

The two included studies, which enrolled a total of 136 individuals with low vision or blindness, evaluated the effectiveness of two different orientation and mobility strategies.The results of our analysis of the quality of the two included studies that evaluated the effectiveness of orientation and mobility training are presented in Table 11. Quality ratings for each study were based on an evaluation of the data presented in Table G-3 of Appendix G.

Table 11. Quality of Studies of Orientation and Mobility Training

Reference	Year	Study Design	USPSTF Quality Rating[a]
Soong et al.(31)	2001	CT	Level II-1-Fair
Engel et al.(34)	2000	BAS	Level II-3-Low

CT Prospective non-randomized controlled trial
BAS Prospective "before-after" study

[a] See criteria proposed by the U.S. Preventive Services Task Force.(39)

Details of Study Enrollees and Study Generalizability

Details of the patients enrolled in the studies of Soong et al.(31) and Engel et al.(34) are presented in Table G-5 of Appendix G. The generalizability of the patients included in these two studies was found to be "Fair."[24]

Details of Programs Evaluated

Engel et al. did not provide any details of the orientation and mobility training methods evaluated in their study. The only information provided by these authors was that individuals received rehabilitation services from one of three agencies, all of which provided orientation and mobility training. The authors did not provide information on the personnel who provided rehabilitation services.

Sixteen of the 19 individuals enrolled in the study of Soong et al. who received mobility and orientation training were prescribed with

[24] High = Characteristics of all enrolled patients typical of Medicare population; Fair = Characteristics of some enrolled patients typical of Medicare population; Poor = Characteristics of only a few enrolled patients typical of Medicare population or enrolled patients represent a subgroup of Medicare population.

mobility devices; 10 with long canes and 6 with identity canes or support canes. Subjects who were prescribed a long cane underwent a “standard” program of training at the Guide Dogs for the Blind Association of Queensland (GDBAQ) that required them to live at the mobility rehabilitation center. No details of the personnel who provided orientation and mobility services at the GDBAQ were reported.

The long cane training program commenced with the basic techniques of upper and lower body protection and trailing, then the touch technique was taught. Training progressed from indoor work to slow outdoor travel, then to road crossings in quiet residential areas. The programs for the other subjects were individualized for routes they normally traveled. A few mobility and orientation skills were taught to all individuals. These included orientation and scanning skills, distance judgment, judgment of steps and curves, sighted guide technique, and self-protection skills. Subjects prescribed with identity canes learned diagonal positioning of the cane and probing techniques. Subjects prescribed with a support cane learned positioning of the cane for support while walking and depth judgment. All subjects were required to practice the techniques they were taught.

The duration and intensity of mobility and orientation training that each individual enrolled in the study of Soong et al. experienced varied. Some enrollees had only a single session of training ranging from 1 to 3 hours duration, whereas the subjects who were prescribed long canes received training over four consecutive days.

Outcomes Assessed

Outcomes addressed by the two included studies that assessed the effectiveness of orientation and mobility training are presented in Table 12.

Table 12. Outcomes Assessed

Reference	Year	Quality of life	Psycho-social status	Mood	Activities of daily living
Soong et al.(31)	2001				✓
Engel et al.(34)	2000		✓	✓	✓

Soong et al. measured a single outcome; mobility performance (the ability to navigate through an obstacle course). Engel et al. measured psychosocial status, mood, and activities of daily living using non-validated instruments that were developed at the beginning of the study. Further details of the methods and instruments used to measure outcomes in the two studies included in this section are presented in Table D-1, Table D-2, and Table D-3 of Appendix D.

Findings of Included Studies

Effectiveness of Orientation and Mobility Training

Soong et al. found that mobility performance assessed four weeks after exposure to orientation and mobility training was not significantly different from that seen among individuals that received no orientation and mobility training at all, suggesting that orientation and mobility training does not significantly enhance mobility performance. Because the investigators did not present details of any patient characteristics beyond the underlying cause of low vision and visual acuity, however, the comparability of the two patient groups in this non-randomized study cannot be determined.

Engel et al. observed significant short-term improvements in five of the nine domains of psychosocial status examined after exposure to a mobility and orientation training-based rehabilitation programs (sees relatives: $p = 0.016$; sees friends: $p = 0.007$; attends club-related activities: $p = 0.013$; engages in hobbies; $p = 0.007$; moderates physical activity: $p = 0.009$). No significant changes from baseline in the remaining four areas (visits on the telephone, attendance rates at senior activity centers, feelings of isolation, and satisfaction with activities) were observed. These investigators did not find that exposure to rehabilitation services had a major impact on activities of daily living or mood. Because of the poor quality of this study, and the fact that these investigators used non-validated custom instruments to measure changes in psychosocial status,

mood, and activities of daily living, following exposure to rehabilitation services, the validity of the findings of this study are uncertain.

Relative Effectiveness of Different Programs

Evidence from included studies is not sufficient to allow one to determine the relative effectiveness of one orientation and mobility training program over another.

Influence of Program Components and Frequency of Services on Outcome

Evidence from included studies is not sufficient to allow one to explore the influence of different components of orientation and mobility training programs and the frequency of their application on outcome.

Relationship between Staffing Model and Outcome

Evidence from included studies is not sufficient to allow one to determine the relative effectiveness of different staffing models that might be used by orientation and mobility training programs. More specifically, the available evidence does not allow one to determine whether outcomes obtained following mobility and orientation training are influenced by whether the training program was directly supervised by a Medicare-defined physician.

Findings of Systematic Reviews

One systematic review from the Cochrane collaboration attempted to evaluate the effectiveness of orientation and mobility training (Table G-1 of Appendix G). Virgili and Rubin(25) searched the Cochrane Central Register of Controlled Trials Medline, Embase, and LILACS up to September 2002 for randomized and quasi-randomized controlled trials. No randomized or quasi-randomized controlled trials were identified by their searches, so no conclusions about the effectiveness of orientation and mobility training were drawn.

Subsection Summary

Evidence demonstrating the effectiveness of orientation and mobility training in reducing disability among individuals with low vision is sparse. The 2001 Lewin Group report did not cite any articles that described studies of orientation and mobility training. The Cochrane collaboration recently published the findings of a systematic review that focused on the effectiveness of orientation and mobility training.(25) Their searches, which were limited to randomized or quasi-randomized controlled trials, did not identify any studies that evaluated the effectiveness of orientation and mobility training.

Our searches, which were not confined to randomized or quasi-randomized controlled trials, identified two orientation and mobility training effectiveness studies that met the *a priori* inclusion criteria for this report.(31,34) Both of these studies were small (N = 37 and 88, respectively), of low-to-moderate quality, and followed patients for a short period of time following exposure to rehabilitation services

(approximately 4 to 8 weeks). Evidence on the effectiveness of orientation and mobility from these two studies is inconclusive. One non-randomized controlled study (USPSTF Quality Rating: II-1-Fair) did not find that orientation and mobility training led to improvements in mobility.(31) The other study, which utilized a weaker before-after study design (USPSTF Quality Rating: II-3-Fair), found that exposure to an orientation and mobility based program resulted in a number of improvements in a number of psychosocial status domains.(34) Whether the differences in the findings of the two included studies are the result of differences in study quality, differences in service protocol, differences in enrolled patients, or some other difference cannot be determined.

In summary, the effectiveness (or lack of effectiveness) of orientation and mobility training has yet to be demonstrated by a well-designed study that has utilized validated instruments to measure outcome. In addition, the available data does not allow one to draw evidence-based conclusions regarding the relative effectiveness of different orientation and mobility training programs or the optimal frequency and intensity of administration of such services. Nor does the available evidence allow one to draw conclusions regarding the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient’s future vision following exposure to orientation and mobility training programs.

Adaptive Techniques Training

Our searches identified one study that met the *a priori* inclusion criteria for this report and evaluated the effectiveness of an adaptive technique training program.(36) Details of this study are presented in Appendix G (Table G-2 through Table G-9) Nilsson et al.(36) utilized a before-after study design to evaluate the effectiveness of training individuals with AMD to use eccentric viewing for reading.

Quality of Included Study

The finding of our assessment of the quality of the study of Nilsson et al., which was based on information presented in Table G-3 of Appendix G, is presented in Table 13.

Table 13. Quality of Studies of Adaptive Techniques Training

Reference	Year	Study Design	USPSTF Quality Rating[a]
Nilsson et al.(36)	2003	BAS	Level II-3-Fair

BAS Prospective "before-after" study

[a] See criteria proposed by the U.S. Preventive Services Task Force.(39)

Details of Study Enrollees and Study Generalizability

Details of the patients enrolled in the study of Nilsson et al.(36) are summarized in Table G-5 of Appendix G. The generalizability of the enrollees of this study to the elderly Medicare population was found to be "Fair."

Details of Program Evaluated

Nilsson et al.(36) used a computer program in conjunction with a scanning laser ophthalmoscope (SLO) to teach individuals with AMD to use eccentric retinal loci for reading. Training consisted of a one-hour session with a low-vision therapist separated by one week of practice. The number of sessions required depended on the individual.

Outcomes Assessed

Nilsson et al.(36) evaluated the effectiveness of eccentric viewing using a single outcome; reading performance.

Findings of Included Studies

Nilsson et al.(36) found that 18 of the 20 individuals enrolled in their study learned to use eccentric viewing for the purposes of reading. Reading speed increased significantly in these individuals from an average of 9.0 words per minute to 68.3 words per minute ($p < 0.001$). Because no long-term followup data are available, it is not clear whether the improvements in reading performance seen in the 18 patients who successfully learned to use eccentric viewing can be maintained over time.

Relative Effectiveness of Different Adaptive Training Programs

The only study(36) included in this section of the report did not compare the effectiveness of different adaptive training programs.

Influence of the Frequency and Intensity of Service Provision on Outcome

The only study(36) included in this section of the report did not evaluate the relationship between outcome and frequency and intensity of service provision.

Relationship between Staffing Model and Outcome

The only study(36) included in this section of the report did not evaluate the relationship between different staffing models and outcome.

Relationship between pattern of vision loss, the etiology of vision loss, and the prognosis following exposure to adaptive training techniques

The only study(36) included in this section of the report did not evaluate the relationship between pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to adaptive training techniques.

Findings of Systematic Reviews

No systematic reviews that evaluated the literature on adaptive techniques training were identified by our searches.

Subsection Summary

Our searches identified one before-after study (USPSTF Quality Rating: II-3-Fair) that evaluated the effectiveness of adaptive techniques training.(36) This Swedish study used a computer program in conjunction with a scanning laser ophthalmoscope (SLO) to teach individuals with AMD to use eccentric retinal loci for reading. The study investigators found that 18 of 20 enrolled individuals learned to use eccentric viewing for the purposes of reading. Among these 18 individuals, reading speeds increased significantly from an average of 9.0 words per minute to 68.3 words per minute ($p < 0.001$). Because no long-term followup data are available, however, it is not clear whether these improvements in reading performance can be maintained over time.

Available data does not allow one to draw evidence-based conclusions regarding the relative effectiveness of different adaptive training techniques. Nor does the available evidence allow one to draw conclusions regarding either the optimal frequency and intensity of administration of eccentric viewing training, or the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to the program.

Group Intervention Programs

Two studies (both RCTs) met the *a priori* inclusion criteria for this report and evaluated the effectiveness of a "self-management group

intervention" program. Brody et al.(26) compared the effectiveness of a 12-hour self-management group intervention program with either 12 hours of health education lectures, or no intervention at all (wait list). Dahlin Ivanoff et al.(27) compared the effectiveness of a group "health education" program with an individual intervention program that was the standard intervention used at the clinics at which the study was performed.

Quality of Included Studies

The findings of our assessment of the quality of the studies of Brody et al., and Dahlin Ivanoff et al., which were based on information presented in Table G-3 of Appendix G, are presented in Table 14.

Table 14. Quality of Studies of Group Intervention Programs

Reference	Year	Study Design	USPSTF Quality Rating[a]
Brody et al.(26)	**2002**	**RCT**	**Level I-Fair**
Dahlin Ivanoff et al.(27)	**2002**	**RCT**	**Level I-Low**

RCT Randomized controlled trial

[a] See criteria proposed by the U.S. Preventive Services Task Force.(39)

Details of Study Enrollees and Study Generalizability

Details of the patients enrolled in the study of Brody et al. are summarized in Table G-5 of Appendix G. The generalizability of the enrollees of both studies to the elderly U.S. Medicare population was judged to be "Fair."[25] The age range and sex distribution of the enrollees of both studies were similar to those seen among the Medicare population. However, both studies included only patients with AMD and the race distribution within these studies is unknown. Whether the fact that the study of Ivanoff et al. was performed in Sweden, which has a different healthcare and welfare system from the U.S., limits the generalizability of the findings of this study cannot be determined.

Details of Programs Evaluated

The self-management group intervention assessed by Brody et al.(26) consisted of six weekly two-hour group sessions with seven to ten participants in each group. Groups were led by an experienced professional in public health and behavioral medicine. Each session incorporated two elements: didactic presentations and group problem solving with guided practice. The didactic component of each session was comprised of brief presentations and formal lectures by professionals in several fields (ophthalmologists, rehabilitation specialists, nutritionists, physical therapists, etc.). In the group

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[25] High = Characteristics of all enrolled patients typical of Medicare population; Fair = Characteristics of some enrolled patients typical of Medicare population; Poor = Characteristics of only a few enrolled patients typical of Medicare population or enrolled patients represent a subgroup of Medicare population.

problem solving component, participants were guided through a hierarchy of behavioral challenges to improve problem-solving skills with the support and experience of peers and professionals.

The intervention was composed of both cognitive and behavioral components. Cognitive components included information about the biological processes of AMD, suggestions of ways to maintain or increase activity levels, and hands on demonstrations and discussions of available visual aids and services. Reevaluation of each individual's perceived barriers to independence was encouraged, and positive challenges were provided by peers and the group leader.

Behavioral components included behavioral skills training in communication with others about visual disability, handling a variety of challenges associated with AMD, and requesting assistance when needed. Vignettes were presented to the group, covering various problems encountered by people with AMD. In addition, participants presented situations they had faced to the group. Adaptive behaviors were modeled for the participants. A simple exercise program designed for individuals with AMD was also incorporated into the program.

The group-based program intervention assessed by Dahlin Ivanoff et al.(27) consisted of groups of 4 to 6 participants led by an occupational therapist experienced in leading groups. The occupational therapist provided information and skills training for a number of daily activities (self care, meal preparation,

communication, shopping, etc.). Other health care professionals, such as an ophthalmologist, an optometrist, a low-vision therapist, and a light expert, were invited to give information to the participants.

Intervention sessions occurred once a week for two hours over an eight week period. During each session, strategies and skills training were presented as a problem-solving model. Participants were taught to use the model as a way of thinking when performing daily activities. Individuals enrolled in the program were expected to prepare for each session in advance by reading relevant chapters of a booklet.

Outcomes Assessed

Outcomes addressed by the two included studies that assessed the effectiveness of group intervention programs are presented in Table 15.

Table 15. Outcomes Assessed

Reference	Year	Program	Quality of Life	Psycho-social status	Mood	Activities of Daily Living
Brody et al.(26)	2002		✓		✓	
Dahlin Ivanoff et al.(27)	2002					✓

Both Brody et al. and Dahlin Ivanoff et al. measured outcomes using validated psychometric instruments. Brody et al. measured changes in quality of life using the NEI VFQ instrument and changes in mood

were measured using the Profile of Mood States. Dahlin Ivanoff et al. measured activities of daily living using the 29 item Dahlin Ivanoff ADL Scale. Details of the instruments used to measure outcomes in the two included studies are described in Table D-1 of Appendix D.

Findings of Included Studies

Brody et al.(26) found that after four months of followup, quality of life and mood among individuals with low vision who had been exposed to their self-management group intervention program were significantly improved when compared to controls ($p = 0.04$ and $p = 0.02$, respectively).

Dahlin Ivanoff et al. reported that after four months of followup, statistically significant benefits were observed across 13 of the 29 items assessed among those individuals who were exposed to the group health education program when compared to controls who received standard low-vision services. In addition, these investigators reported that confidence in participant's ability to perform activities of daily living following participation in the group health education program were either maintained or improved for 75.8% of items, whereas confidence among those in the standard intervention group was maintained or improved for only 41.4% of items. This between-groups difference in confidence was statistically significant ($p < 0.01$).

Relative Effectiveness of Different Group Intervention Programs

Neither study included in this section of the report directly compared the effectiveness of different group intervention programs. Indirect

comparisons were precluded by the fact that neither study evaluated effectiveness using the same outcomes.

Influence of the Frequency and Intensity of Service Provision on Outcome

Neither study included in this section of the report directly evaluated the relationship between outcome and frequency and intensity of service provision. We could not perform an indirect analysis because the included studies evaluated different programs and neither study used the same outcome measure.

Relationship between Staffing Model and Outcome

Neither study included in this section of the report directly evaluated the relationship between staffing model and outcome. We were precluded from performing an indirect analysis because the included studies evaluated different programs and neither study used the same outcome measure.

Relationship between pattern of vision loss, the etiology of vision loss, and the prognosis following exposure to group intervention programs

Evidence from included studies is not sufficient to allow one to explore the relationship between pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to group intervention programs.

Findings of Systematic Reviews

No systematic reviews were identified by our searches that evaluated the literature on group intervention programs.

Subsection Summary

The Lewin Group report identified four studies that evaluated the effectiveness of group intervention programs. Based on the findings of these studies, the Lewin Group concluded that group intervention "…appears to be effective, based on attitudinal outcomes and perceptions of activity levels."(2)

Our searches identified two relevant articles describing two RCTs.(26,27) One of these articles presented updated data emanating from an RCT that was included in the Lewin Group report.(27) These updated data, along with data from the other RCT, lend support to the findings of the Lewin Group. Both studies found that exposure to a group intervention program led to significant improvements in patient outcomes. Brody et al. (USPSTF Quality Rating: I-Fair) found that quality of life and mood among individuals with low vision (all had AMD) who had been exposed to their self-management group intervention program were significantly improved when compared to controls ($p = 0.04$ and $p = 0.02$, respectively).(26) Dahlin Ivanoff et al. (USPSTF Quality Rating: I-Low) found that exposure to their group health education program led to significant improvements across a number of activities of daily living.(27)

Available data do not allow one to draw evidence-based conclusions regarding the relative effectiveness of the two group intervention programs, the optimal frequency and intensity of these programs, or the most effective staffing model. Nor does the evidence allow one to draw evidence-based conclusions regarding the relationship between the pattern of vision loss, the etiology of vision loss, and the prognosis for an individual patient's future vision following exposure to group intervention programs.

Supervision of Services and Outcome

The personnel included in each study and whether the program was directly supervised by a Medicare-defined physician (a medical doctor or a doctor of optometry) is summarized in Table 16.

Table 16. Rehabilitation Services Supervision and Personnel

Reference	Year	Rehabilitation service	Services directly overseen by Medicare-defined physician? [a]	Personnel providing services
De l'Aune et al.(32)	2004	Comprehensive services (VA BRC)	No	Ophthalmologists Optometrists Psychologists Low-vision nurses Social workers Low-vision therapists Rehabilitation teachers Orientation and mobility Specialists
Eperjesi et al.(33)	2004	Optical aids and low-vision devices	Yes	Optometrists PhD level investigators
Nilsson et al.(36)	2003	Adaptive training	Yes	Low-vision therapists
Peterson et al.(29)	2003	Optical aids and low-vision devices	Yes	Optometrists Others?

Reference	Year	Rehabilitation service	Services directly overseen by Medicare-defined physician? [a]	Personnel providing services
Brody et al.(26,131)	2002	Group intervention	Yes	Groups supervised by low-vision specialists Presentations given by ophthalmologists, rehabilitation experts, nutritionists, exercise physiologists, low-vision optometrists
Dahlin Ivanoff et al.(27)	2002	Group intervention	Yes	Groups supervised by occupational therapists Presentations given by ophthalmologists, optometrists, low-vision therapists, and lighting experts
Hinds et al.(35)	2002	Comprehensive services (ILVS)	Yes	Ophthalmologists Ophthalmic Nurses Optometrists Social workers Rehabilitation therapists
Tejeria et al.(38)	2002	Optical aids and low-vision devices	Yes	Ophthalmologists Optometrists Others?
Stelmack et al.(37)	2002	Comprehensive services (*VA VICTORS)*	Yes	Ophthalmologists Optometrists Psychologists Low-vision nurses Social workers Low-vision therapists
		Comprehensive services *(VA BRC)*	No	Ophthalmologists Optometrists Psychologists Low-vision nurses Social workers Low-vision therapists Rehabilitation teachers Orientation and mobility Specialists
Goodrich and Kirby(30)	2001	Optical Devices and Low-vision Aids	Yes	Reading rehabilitation instructor
Soong et al.(31)	2001	Orientation and Mobility Training	Yes	Optometrists PhD level investigators Orientation and mobility trainers (some pts only)

Reference	Year	Rehabilitation service	Services directly overseen by Medicare-defined physician? [a]	Personnel providing services
Engel et al.(34)	2000	Orientation and mobility training	NR	NR
Goodrich et al.(28)	2000	Optical Devices and Low-vision Aids	Yes	Optical aids prescribed by optometrist Training provided by optometrists and PhD level investigators with expertise in low vision

Because of limitations in the literature, it is not possible to provide an analysis of how the outcomes of the included studies might be generalizable to the question of whether providers, specifically the three types of providers specified in the law (low-vision therapists, orientation and mobility specialists, and rehabilitation teachers), can provide quality services in the absence of direct physician supervision.

The only direct evidence, albeit weak, to demonstrate that quality services can be provided by low-vision therapists, orientation and mobility specialists, and rehabilitation teachers in the absence of direct physician supervision comes from two before-after-studies (USPSTF Quality Ratings: II-3-Fair and II-3-Low) both of which evaluated the effectiveness of the Veterans Affairs Blind Rehabilitation Centers program.(32,37) Although Medicare-defined physicians are involved in this rehabilitation program (they are responsible for the clinical management of enrolled individuals and are members of the rehabilitation team that develops an individualized care plan for new enrollees), they do not supervise the

implementation of vision rehabilitation services directly. The implementation of the care plan is instead coordinated by a rehabilitation specialist (orientation and mobility specialists, vision rehabilitation teachers, and low-vision therapists). Both De l'Aune et al.(32) and Stelmack et al.(37) demonstrated that exposure to this service significantly improves the ability of "blind" veterans to perform activities of daily living, which in turn enhances their quality of life.

BIBLIOGRAPHY

1. Medicare Prescription Drug, Improvement, and Modernization Act of 2003, H.R.1, 105th Cong. (2003).

2. Agency for Healthcare Research and Quality (AHRQ). Vision rehabilitation: care and benefit plan models. Literature review. [internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2002 Oct [cited 2004 Feb 11]. [various]. Available: http://www.ahrq.gov/clinic/vision/.

3. Massof RW. A model of the prevalence and incidence of low vision and blindness among adults in the U.S. Optom Vis Sci 2002 Jan;79(1):31-8.

4. Klein R, Klein BE, Linton KL, De Mets DL. The Beaver Dam Eye Study: visual acuity. Ophthalmology 1991 Aug;98(8):1310-5.

5. Sommer A, Tielsch JM, Katz J, Quigley HA, Gottsch JD, Javitt JC, Martone JF, Royall RM, Witt KA, Ezrine S. Racial differences in the cause-specific prevalence of blindness in east Baltimore. N Engl J Med 1991 Nov 14;325(20):1412-7.

6. Rahmani B, Tielsch JM, Katz J, Gottsch J, Quigley H, Javitt J, Sommer A. The cause-specific prevalence of visual impairment in an urban population. The Baltimore Eye Survey. Ophthalmology 1996 Nov;103(11):1721-6.

7. Tielsch JM, Sommer A, Witt K, Katz J, Royall RM. Blindness and visual impairment in an American urban population. The Baltimore Eye Survey. Arch Ophthalmol 1990 Feb;108(2):286-90.

8. Kahn HA, Leibowitz HM, Ganley JP, Kini MM, Colton T, Nickerson RS, Dawber TR. The Framingham Eye Study. I. Outline and major prevalence findings. Am J Epidemiol 1977 Jul;106(1):17-32.

9. Gordon T, Kannel WB. The Framingham, Massachusetts, study, twenty years later. In: Kessler II, Levin ML, editors. The community as an epidemiologic laboratory: a casebook of community studies. Baltimore (MD): Johns Hopkins Press; 1970. p. 123-46.

10. Leibowitz HM, Krueger DE, Maunder LR, Milton RC, Kini MM, Kahn HA, Nickerson RJ, Pool J, Colton TL, Ganley JP, Loewenstein JI, Dawber TR. The Framingham Eye Study monograph: an ophthalmological and epidemiological study of cataract, glaucoma, diabetic retinopathy, macular degeneration, and visual acuity in a general population of 2631 adults, 1973-1975. Surv Ophthalmol 1980 May-Jun;24(Suppl):335-610.

11. Dana MR, Tielsch JM, Enger C, Joyce E, Santoli JM, Taylor HR. Visual impairment in a rural Appalachian community. Prevalence and causes. JAMA 1990 Nov 14;264(18):2400-5.

12. Rubin GS, West SK, Munoz B, Bandeen-Roche K, Zeger S, Schein O, Fried LP. A comprehensive assessment of visual impairment in a population of older Americans. The SEE Study. Salisbury Eye Evaluation Project. Invest Ophthalmol Vis Sci 1997 Mar;38(3):557-68.

13. Szlyk JP, Seiple W, Laderman DJ, Kelsch R, Stelmack J, McMahon T. Measuring the effectiveness of bioptic telescopes for persons with central vision loss. J Rehabil Res Dev 2000 Jan-Feb;37(1):101-8.

14. American Academy of Ophthalmology (AAO). Vision rehabilitation for adults. San Francisco (CA): American Academy of Ophthalmology (AAO); 2001 Feb. 32 p.

15. American Optometric Association. Care of the patient with low vision. St. Louis (MO): American Optometric Association; 1997. 72 p. (Optometric clinical practice guideline; no. 14).

16. State legislative update: O.D.s push for more privileges in 1999. Rev Optom 1999 Jan 15;4. Also available: http://www.revoptom.com/archive/issue/ro01news.htm.

17. Licensing Now! An index of essential information. [internet]. New York (NY): Lighthouse International; 2004 [cited 2004 Mar 22]. [various]. Available: http://www.lighthouse.org/advocacy_licensing.htm.

18. Academy for Certification of Vision Rehabilitation & Education Professionals. Low vision therapist eligibility application. Tucson (AZ): Academy for Certification of Vision Rehabilitation & Education Professionals; 2003 Jul. 21 p. Also available: http://www.acvrep.org/downloads/LVapplicationpacket.pdf.

19. Outlaw D. (National Vision Rehabilitation Coop). Personal communication. 2004 Apr 5. 11 p.

20. Outlaw D. (National Vision Rehabilitation Coop). Personal communication. 2004 Apr 7. 1 p.

21. Adams E, Flynn K, Alligood E, Johnson T. Optical devices for adults with low vision: a systematic review of published studies of effectiveness. Final report. Boston (MA): VA Technology Assessment Program, Office of Patient Care Services; 2003 May. 46 p. Also available: http://www.va.gov/vatap.

22. Canadian Coordinating Office for Health Technology Assessment. Implantable miniature telescope for treating age-related macular degeneration. Ottawa (ON): Canadian Coordinating Office for Health Technology Assessment; 2004 Feb. 4 p. (Emerging technology list; no. 20).

23. Eperjesi F, Fowler CW, Evans BJ. Do tinted lenses or filters improve visual performance in low vision? A review of the literature. Ophthal Physiol Opt 2002 Jan;22(1):68-77.

24. Stelmack J. Quality of life of low-vision patients and outcomes of low-vision rehabilitation. Optom Vis Sci 2001 May;78(5):335-42.

25. Virgili G, Rubin G. Orientation and mobility training for adults with low vision. Cochrane Database Syst Rev 2003;(4):CD003925.

26. Brody BL, Roch-Levecq AC, Gamst AC, Maclean K, Kaplan RM, Brown SI. Self-management of age-related macular degeneration and quality of life: a randomized controlled trial. Arch Ophthalmol 2002 Nov;120(11):1477-83.

27. Ivanoff SD, Sonn U, Svensson E, Horowitz A, Reinhardt JP, Boerner K, Travis LA. A health education program for elderly persons with visual impairments and perceived security in the performance of daily occupations: a randomized stud. Am J Occup Ther 2002;56(3):322-30.

28. Goodrich GL, et al, Keswick C, Oros T, Wagstaff P, Donald B, Hazan J, Peters LJ. Training the patient with low vision to read: does it significantly improve function? In: Vision '99: vision rehabilitation--assessment, intervention, and outcomes. New York (NY): Swets & Zeitlinger Publishers; 2000. p. 230-6.

29. Peterson RC, Wolffsohn JS, Rubinstein M, Lowe J. Benefits of electronic vision enhancement systems (EVES) for the visually impaired. Am J Ophthalmol 2003 Dec;136(6):1129-35.

30. Goodrich GL, Kirby J. A comparison of patient reading performance and preference: optical devices, handheld CCTV (Innoventions Magni-Cam), or stand-mounted CCTV (Optelec Clearview or TSI Genie). Optometry 2001 Aug;72(8):519-28.

31. Soong GP, Lovie-Kitchin JE, Brown B. Does mobility performance of visually impaired adults improve immediately after orientation and mobility training. Optom Vis Sci 2001 Sep;78(9):657-66.

32. De l'Aune W, Williams M, Watson GR, Schuckers P, Ventimiglia G. Clinical application of a self-report, functional independence outcomes measure in the DVA's Blind Rehabilitation Service. J Vis Impairm Blindn 2004;87(4):197-211.

33. Eperjesi F, Fowler CW, Evans BJ. Effect of light filters on reading speed in normal and low vision due to age-related macular degeneration. Ophthal Physiol Opt 2004 Jan;24(1):17-25.

34. Engel RJ, Welsh RL, Lewis LJ. Improving the well-being of vision-impaired older adults through orientation and mobility training and rehabilitation: an evaluation. RE:view 2000;32(2):67-76.

35. Hinds A, Sinclair A, Park J, Suttie A, Paterson H, Macdonald M. Impact of an interdisciplinary low vision service on the quality of life of low vision patients. Br J Ophthalmol 2003 Nov;87(11):1391-6.

36. Nilsson UL, Frennesson C, Nilsson SE. Patients with AMD and a large absolute central scotoma can be trained successfully to use eccentric viewing, as demonstrated in a scanning laser ophthalmoscope. Vision Res 2003 Jul;43(16):1777-87.

37. Stelmack JA, Stelmack TR, Massof RW. Measuring low-vision rehabilitation outcomes with the NEI VFQ-25. Invest Ophthalmol Vis Sci 2002 Sep;43(9):2859-68.

38. Tejeria L, Harper RA, Artes PH, Dickinson CM. Face recognition in age related macular degeneration: perceived disability, measured disability, and performance with a bioptic device. Br J Ophthalmol 2002 Sep;86(9):1019-26.

39. Harris RP, Helfand M, Woolf SH, Lohr KN, Mulrow CD, Teutsch SM, Atkins D. Current methods of the U.S. Preventive Services Task Force. A review of the process. Am J Prev Med 2001 Apr;20(3 Suppl):21-35.

40. Agency for Healthcare Research and Quality (AHRQ). Statement of work: vision rehabilitation services. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2003. 5 p.

41. Massoff RW, Lidoff L, editors. Issues in low vision rehabilitation: service, delivery, policy and funding. New York (NY): AFB Press; 2001. 354 p.

42. Morse AR. (President & CEO, The Jewish Guild for the Blind. New York, NY). Personal communication. 2004 May 2. 38 p.

43. Pazell S. Implementing a visual rehabilitation program. Caring 1998 Sep;17(9):36-41, 43, 45.

44. Green J, Siddall H, Murdoch I. Learning to live with glaucoma: a qualitative study of diagnosis and the impact of sight loss. Soc Sci Med 2002 Jul;55(2):257-67.

45. Brabyn J, Schneck M, Haegerstrom-Portnoy G, Lott L. The Smith-Kettlewell Institute (SKI) longitudinal study of vision function and its impact among the elderly: an overview. Optom Vis Sci 2001 May;78(5):264-9.

46. Lamoureux EL, Hassell JB, Keeffe JE. The determinants of participation in activities of daily living in people with impaired vision. Am J Ophthalmol 2004 Feb;137(2):265-70.

47. Haymes SA, Johnston AW, Heyes AD. Relationship between vision impairment and ability to perform activities of daily living. Ophthal Physiol Opt 2002 Mar;22(2):79-91.

48. Sumi I, Shirato S, Matsumoto S, Araie M. The relationship between visual disability and visual field in patients with glaucoma. Ophthalmology 2003 Feb;110(2):332-9.

49. 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. Salisbury Eye Evaluation. Arch Ophthalmol 2002 Jun;120(6):774-80.

50. Crews JE, Campbell VA. Health conditions, activity limitations, and participation restrictions among older peole reporting vision impairment. J Vis Impair Blind 2001 Aug;95(8):453-67.

51. Lamoureux EL, Hassell JB, Keeffe JE. The impact of diabetic retinopathy on participation in daily living. Arch Ophthalmol 2004 Jan;122(1):84-8.

52. Wolffsohn JS, Cochrane AL. Low vision perspectives on glaucoma. Clin Exp Optom 1998 Nov-Dec;81(6):280-289.

53. Rovner BW, Casten RJ. Neuroticism predicts depression and disability in age-related macular degeneration. J Am Geriatr Soc 2001 Aug;49(8):1097-100.

54. Rovner BW, Zisselman PM, Shmuely-Dulitzki Y. Depression and disability in older people with impaired vision: a follow-up study. J Am Geriatr Soc 1996 Feb;44(2):181-4.

55. Rovner BW, Casten RJ, Tasman WS. Effect of depression on vision function in age-related macular degeneration. Arch Ophthalmol 2002 Aug;120(8):1041-4.

56. Horowitz A, Reinhardt JP. Mental health issues in vision impairment. Research in depression, disability, and rehabilitation. In: Silverstone B, Lang MA, Rosenthal BP, Faye EE, editors. The Lighthouse handbook on vision impairment and vision rehabilitation. Vol. 2, Vision rehabilitation. New York (NY): Oxford University Press; 2000. p. 1089-109.

57. Horowitz A, Reinhardt JP, Brennan M, Cimarolli V. Depression, disability, and rehabilitation among vision impaired elders. Project overview. [internet]. New York (NY): Lighthouse International; [cited 2004 Feb 11]. Available: http://www.lighthouse.org/research_program.htm.

58. Horowitz A, Reinhardt JP. Depression among low vision elders. In: Stuen C, Arditi A, Horowitz A, Lang MA, Rosenthal B, Seidman K, editors. Vision rehabilitation: assessment, intervention and outcomes. Amsterdam: Swets & Zeitlinger; 2000. p. 655-8.

59. Horowitz A, Reinhardt JP, Boerner K, Travis LA. The influence of health, social support quality and rehabilitation on depression among disabled elders. Aging Ment Health 2003;7(5):342-50.

60. Chia EM, Wang JJ, Rochtchina E, Smith W, Cumming RR, Mitchell P. Impact of bilateral visual impairment on health-related quality of life: the Blue Mountains Eye Study. Invest Ophthalmol Vis Sci 2004 Jan;45(1):71-6.

61. McCarty CA, Nanjan MB, Taylor HR. Vision impairment predicts 5 year mortality. Br J Ophthalmol 2001 Mar;85(3):322-6.

62. Lee DJ, Gomez-Marin O, Lam BL, Zheng DD. Visual impairment and unintentional injury mortality: the National Health Interview Survey 1986-1994. Am J Ophthalmol 2003 Dec;136(6):1152-4.

63. Lee DJ, Gomez-Marin O, Lam BL, Zheng DD. Visual acuity impairment and mortality in US adults. Arch Ophthalmol 2002 Nov;120(11):1544-50.

64. Glynn RJ, Seddon JM, Krug JH Jr, Sahagian CR, Chiavelli ME, Campion EW. Falls in elderly patients with glaucoma. Arch Ophthalmol 1991 Feb;109(2):205-10.

65. Ivers RQ, Cumming RG, Mitchell P, Attebo K. Visual impairment and falls in older adults: the Blue Mountains Eye Study. J Am Geriatr Soc 1998 Jan;46(1):58-64.

66. Lord SR, Dayhew J. Visual risk factors for falls in older people. J Am Geriatr Soc 2001 May;49(5):508-15.

67. McCarty CA, Fu CL, Taylor HR. Predictors of falls in the Melbourne visual impairment project. Aust N Z J Public Health 2002 Apr;26(2):116-9.

68. Jack CI, Smith T, Neoh C, Lye M, McGalliard JN. Prevalence of low vision in elderly patients admitted to an acute geriatric unit in Liverpool: elderly people who fall are more likely to have low vision. Gerontology 1995;41(5):280-5.

69. Harwood RH. Visual problems and falls. Age Ageing 2001 Nov;30 Suppl 4:13-8.

70. De Boer MR, Pluijm SM, Lips P, Moll AC, Volker-Dieben HJ, Deeg DJ, Van Rens GH. Different aspects of visual impairment as risk factors for falls and fractures in older men and women. J Bone Miner Res 2004 Sep;19(9):1539-1547.

71. Coleman AL, Stone K, Ewing SK, Nevitt M, Cummings S, Cauley JA, Ensrud KE, Harris EL, Hochberg MC, Mangione CM. Higher risk of multiple falls among elderly women who lose visual acuity. Ophthalmology 2004 May;111(5):857-62.

72. Rose S, Maffulli N. Hip fractures. An epidemiological review. Bull Hosp Jt Dis 1999;58(4):197-201.

73. Legood R, Scuffham P, Cryer C. Are we blind to injuries in the visually impaired? A review of the literature. Inj Prev 2002 Jun;8(2):155-60.

74. Ivers RQ, Cumming RG, Mitchell P, Simpson JM, Peduto AJ. Visual risk factors for hip fracture in older people. J Am Geriatr Soc 2003 Mar;51(3):356-63.

75. Ivers RQ, Norton R, Cumming RG, Butler M, Campbell AJ. Visual impairment and risk of hip fracture. Am J Epidemiol 2000 Oct 1;152(7):633-9.

76. Table 11. Frequency distributions of hearing and vision trouble and frequencies of absence of teeth among persons 18 years of age and over, by selected characteristics: United States, 2000. In: Centers for Disease Control and Prevention, National Center for Health Statistics. Summary health statistics for U.S. adults: National Health Interview survey, 2000. Hyattsville (MD): Centers for Disease Control and Prevention, National Center for Health Statistics; 2003 Dec. p. 34-5. (Vital and health statistics; vol. 10, no. 215).

77. Table 12. Percent distributions (with standard errors) of hearing and vision trouble and percents (with standard errors) of absence of teeth among persons 18 years of age and over, by selected characteristics: United States, 2000. In: Centers for Disease Control and Prevention, National Center for Health Statistics. Summary health statistics for U.S. adults: National Health Interview survey, 2000. Hyattsville (MD): Centers for Disease Control and Prevention, National Center for Health Statistics; 2003 Dec. p. 36-7. (Vital and health statistics; vol. 10, no. 215).

78. Lighthouse International, Inc. The Lighthouse National Survey on vision loss: the experience, attitudes, and knowledge of middle-aged and older Americans. New York (NY): Lighthouse International, Inc.; 1994 Apr. 24 p.

79. Third National and Nutrition Examination survey (NHANES III). Hyattsville (MD): National Center for Health Statistics, Division of Data Services; 1996.

80. Prevent Blindness America, National Eye Institute. Vision problems in the US. [internet]. Schaumburg (IL): Prevent Blindness America; 2002 [cited 2003 Feb 13]. [42 p]. Available: http://www.nei.nih.gov/eyedata/pdf/VPUS.pdf.

81. Agency for Healthcare Research and Quality (AHRQ). Medical Expenditure Panel Survey (MEPS). [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [cited 2004 May 24]. [various]. Available: http://www.meps.ahrq.gov.

82. Rodriguez J, Sanchez R, Munoz B, West SK, Broman A, Snyder RW, Klein R, Quigley H. Causes of blindness and visual impairment in a population-based sample of U.S. Hispanics. Ophthalmology 2002 Apr;109(4):737-43.

83. Congdon N, O'Colmain B, Klaver CC, Klein R, Munoz B, Friedman DS, Kempen J, Taylor HR, Mitchell P, Hyman L. Causes and prevalence of visual impairment among adults in the United States. Arch Ophthalmol 2004 Apr;122(4):477-85.

84. Nottle HR, McCarty CA, Hassell JB, Keeffe JE. Detection of vision impairment in people admitted to aged care assessment centres. Clin Experiment Ophthalmol 2000 Jun;28(3):162-4.

85. Foran S, Mitchell P, Wang JJ. Five-year change in visual acuity and incidence of visual impairment: the Blue Mountains Eye Study. Ophthalmology 2003 Jan;110(1):41-50.

86. Foran S, Wang JJ, Mitchell P. Causes of visual impairment in two older population cross-sections: the Blue Mountains Eye Study. Ophthalmic Epidemiol 2003 Oct;10(4):215-25.

87. Mitchell P, Smith W, Attebo K, Healey PR. Prevalence of open-angle glaucoma in Australia. The Blue Mountains Eye Study. Ophthalmology 1996 Oct;103(10):1661-9.

88. Wensor MD, McCarty CA, Stanislavsky YL, Livingston PM, Taylor HR. The prevalence of glaucoma in the Melbourne Visual Impairment Project. Ophthalmology 1998 Apr;105(4):733-9.

89. Klaver CC, Wolfs RC, Vingerling JR, Hofman A, de Jong PT. Age-specific prevalence and causes of blindness and visual impairment in an older population: the Rotterdam Study. Arch Ophthalmol 1998 May;116(5):653-8.

90. Leinhaas MA, Massof RW. Clinical management of patients with low vision in the U.S. health care system. In: Massoff RW, Lidoff L, editors. Issues in low vision rehabilitation: service, delivery, policy and funding. New York (NY): AFB Press; 2001. p. 39-52.

91. Stetten D Jr. Coping with blindness. N Engl J Med 1981 Aug 20;305(8):458-60.

92. Overbury O, Collin C. Vision rehabilitation services in the Americas. In: Silverstone B, Lang MA, Rosenthal BP, Faye EE, editors. The Lighthouse handbook on vision impairment and vision rehabilitation. Vol. 2, Vision rehabilitation. New York (NY): Oxford University Press; 2000. p. 717-32.

93. Orr AL. Aging and blindness: toward a systems approach to service delivery. In: Orr AL, editor. Vision and aging: crossroads for service delivery. New York (NY): American Foundation for the Blind; 1992. p. 3-31.

94. Seidman KR. Personnel preparation in vision rehabilitation. In: Silverstone B, Lang MA, Rosenthal BP, Faye EE, editors. The Lighthouse handbook on vision impairment and vision rehabilitation. Vol. 2, Vision rehabilitation. New York (NY): Oxford University Press; 2000. p. 763-78.

95. Stelmack J. (Staff Optometrist, Hines Blind Rehabilitation Center. Hines, IL). Personal communication. 2004 May 7. 6 p.

96. U.S. Department of Labor, Bureau of Labor and Statistics. Occupational therapists. [internet]. Washington (DC): U.S. Department of Labor, Bureau of Labor Statistics; 2004 [cited 2004 May 24]. [6 p]. Available: http://www.bls.gov.

97. NBCOT (National Board for Certification in Occupational Therapy, Inc). [Web site]. Gaithersburg (MD): National Board for Certification in Occupational Therapy, Inc.; [cited 2004 May 30]. [various]. Available: http://www.nbcot.org.

98. National Board for Certification in Occupational Therapy. NBCOT 2004 certification candidate handbook. Gaithersburg (MD): National Board for Certification in Occupational Therapy, Inc.; 2004. 36 p. Also available: http://www.nbcot.org.

99. University of Alabama at Birmingham. Low vision rehabilitation graduate certificate program. [internet]. Birmingham (AL): University of Alabama at Birmingham; 2004 [cited 2004 Jun 2]. [3 p]. Available: http://www.uab.edu/ot/lvrcert/program_description.htm.

100. Valuzzi J. (Agency for Healthcare Research and Quality (AHRQ)). Personal communication. 2004 May 7. 203 p.

101. American Physical Therapy Association. 2002 fact sheet: physical therapist education programs. Alexandria (VA): American Physical Therapy Association; 2002 Oct. 37 p.

102. Accreditation [CAPTE Web Site]. [internet]. Alexandria (VA): American Physical Therapy Association (APTA); 2004 [cited 2004 Jun 1]. [various]. Available: http://www.apta.org/Education/accreditation.

103. U.S. Department of Labor, Bureau of Labor Statistics. Physical therapists. [internet]. Washington (DC): U.S. Department of Labor, Bureau of Labor Statistics; 2004 Mar 21 [cited 2004 May 24]. [6 p]. Available: http://www.bls.gov/oco/ocos080.htm.

104. Massof RW, Dagnelie G, Deremeik JT, DeRose JL, Alibhai SS, Glasner NM. Appendix I: low vision rehabilitation in the U.S. health care system. In: Massoff RW, Lidoff L, editors. Issues in low vision rehabilitation: service, delivery, policy and funding. New York (NY): AFB Press; 2001. p. 267-99.

105. Fishburn MJ. Overview of physical medicine and rehabilitation. In: Massof RW, Lidoff L, editors. Issues in low vision rehabilitation. Service delivery, policy and funding. New York (NY): AFB Press; 2001. p. 61-70.

106. Watson G. (Department of Veterans Affairs, Rehabilitation Research & Development Center, Decatur, GA). Personal communication. 2004 Jun 2. 1 p.

107. Academy for Certification of Vision Rehabilitation & Education Professionals. Low vision therapist certification handbook. Tucson (AZ): Academy for Certification of Vision Rehabilitation & Education Professionals; 2003 Jul. 41 p. Also available: http://www.acvrep.org.

108. Academy for Certification of Vision Rehabilitation & Education Professionals. Rehabilitation teacher certification handbook. Tucson (AZ): Academy for Certification of Vision Rehabilitation & Education Professionals; 2003 Jul. 39 p. Also available: http://www.acvrep.org.

109. Academy for Certification of Vision Rehabilitation & Education Professionals. Orientation and mobility specialist certification handbook. Tucson (AZ): Academy for Certification of Vision Rehabilitation & Education Professionals; 2003 Jul. 42 p. Also available: http://www.acvrep.org.

110. American Academy of Ophthalmology (AAO), Anterior Segment Panel. Cataract in the adult eye. San Francisco (CA): American Academy of Ophthalmology (AAO); 2001. 62 p.

111. American Academy of Ophthalmology (AAO). Primary angle closure. San Francisco (CA): American Academy of Ophthalmology (AAO); 2000. 20 p.

112. American Academy of Ophthalmology Retina Panel, Preferred Practice Patterns Committee. Diabetic retinopathy. San Francisco (CA): American Academy of Ophthalmology (AAO); 2003. 33 p.

113. American Academy of Ophthalmology (AAO). Bacterial keratitis. San Francisco (CA): American Academy of Ophthalmology (AAO); 2000 Sep. 25 p.

114. American Academy of Ophthalmology (AAO). Corneal opacification and ectasia. San Francisco (CA): American Academy of Ophthalmology (AAO); 2000 Sep. 21 p.

115. American Academy of Ophthalmology Retina Panel, Preferred Practice Patterns Committee. Idiopathic macular hole. San Francisco (CA): American Academy of Ophthalmology (AAO); 2003. 17 p.

116. American Academy of Ophthalmology Glaucoma Panel, Preferred Practice Patterns Committee. Primary open-angle glaucoma. Limited revision. San Francisco (CA): American Academy of Ophthalmology (AAO); 2003. 37 p.

117. American Academy of Ophthalmology Retina Panel, Preferred Practice Patterns Committee. Age-related macular degeneration. San Francisco (CA): American Academy of Ophthalmology (AAO); 2003. 29 p.

118. American Optometric Association. Care of the patient with age-related macular degeneration. 2nd ed. St. Louis (MO): American Optometric Association; 1997. 47 p. (Optometric clinical practice guideline; no. 6).

119. Warren M. Occupational therapy practice guidelines for adults with low vision. Bethesda (MD): American Occupational Therapy Association (AOTA), Incorporated; 1999. 25 p. (Lieberman D, editor. AOTA Practice guidelines series).

120. American Geriatric Society, British Geriatrics Society, American Academy of Orthopaedic Surgeons. Guideline for the prevention of falls in older persons. J Am Geriatr Soc 2001 May;49(5):664-72.

121. National Guideline Clearinghouse (NGC). Inclusion criteria. [internet]. Bethesda (MD): National Guideline Clearinghouse (NGC); [cited 2004 Apr 13]. [1 p]. Available: http://www.guidelines.gov/about/inclusion.aspx.

122. National Eye Institute. National plan for eye and vision research. [Web site]. Bethesda (MD): National Eye Institute; 2003 Nov [cited 2004 Feb 26]. [various]. Available: http://www.nei.nih.gov.

123. Raasch TW, Leat SJ, Kleinstein RN, Bullimore MA, Cutter GR. Evaluating the value of low-vision services. J Am Optom Assoc 1997 May;68(5):287-95.

124. Chalmers I, Adams M, Dickersin K, Hetherington J, Tarnow-Mordi W, Meinert C, Tonascia S, Chalmers TC. A cohort study of summary reports of controlled trials. JAMA 1990 Mar 9;263(10):1401-5.

125. Neinstein LS. A review of Society for Adolescent Medicine abstracts and Journal of Adolescent Health Care articles. J Adolesc Health Care 1987 Mar;8(2):198-203.

126. De Bellefeuille C, Morrison CA, Tannock IF. The fate of abstracts submitted to a cancer meeting: factors which influence presentation and subsequent publication. Ann Oncol 1992 Mar;3(3):187-91.

127. Scherer RW, Langenberg P. Full publication of results initially presented in abstracts. In: Cochrane Library [Cochrane methodology review]. Issue 2. Oxford: Update Software; 2001 [cited 2001 Apr 23]. [35 p]. Available: http://www.cochranelibrary.com.

128. Marx WF, Cloft HJ, Do HM, Kallmes DF. The fate of neuroradiologic abstracts presented at national meetings in 1993: rate of subsequent publication in peer-reviewed, indexed journals. AJNR Am J Neuroradiol 1999 Jun-Jul;20(6):1173-7.

129. Yentis SM, Campbell FA, Lerman J. Publication of abstracts presented at anaesthesia meetings. Can J Anaesth 1993 Jul;40(7):632-4.

130. Maino JH. Low vision and blindness rehabilitation in the VA: inpatient rehabilitation. In: Massoff RW, Lidoff L, editors. Issues in low vision rehabilitation: service, delivery, policy and funding. New York (NY): AFB Press; 2001. p. 187-202.

131. Brody BL, Williams RA, Thomas RG, Kaplan RM, Chu RM, Brown SI. Age-related macular degeneration: a randomized clinical trial of a self-management intervention. Ann Behav Med 1999 Fall;21(4):322-9.

132. Ithaca College. Occupational therapy courses. [internet]. Ithaca (NY): Ithaca College; 2003 [cited 2004 Jun 2]. [12 p]. Available: http://www.ithaca.edu.

133. Ithaca College. Physical therapy courses. [internet]. Ithaca (NY): Ithaca College; 2002 [cited 2004 Jun 2]. [7 p]. Available: http://www.ithaca.edu.

134. Pennsylvania College of Optometry. Graduate studies: programs in low vision rehabilitation. [internet]. Elkins Park (PA): Pennsylvania College of Optometry; 2003 [cited 2004 Jun 3]. [3 p]. Available: http://www.pco.edu/acad_progs/grad/gs_lvr.htm.

135. University of Arkansas at Little Rock. O&M curriculum online. [internet]. Little Rock (AR): University of Arkansas at Little Rock; 2004 [cited 2004 Jun 2]. [1 p]. Available: http://www.teletrain.com/ualr/om/curriconline.htm.

136. University of Arkansas at Little Rock. Introduction to sample sequence of courses. [internet]. Little Rock (AR): University of Arkansas at Little Rock; [cited 2004 Jun 2]. [7 p]. Available: http://www.ualr.edu.

137. West SK, Friedman D, Munoz B, Roche KB, Park W, Deremeik J, Massof R, Frick KD, Broman A, McGill W, Gilbert D, German P. A randomized trial of visual impairment interventions for nursing home residents: study design, baseline characteristics and visual loss. Ophthalmic Epidemiol 2003 Jul;10(3):193-209.

138. Ivanoff D, Sonn S, Svensson E. Development of an ADL instrument targeting elderly with age-related macular degeneration. Disabil Rehabil 2001;23:69-79.

139. De l'Aune WR, Welsh RL, Williams MD. A national outcomes assessment of the rehabilitation of adults with visual impairment. J Vis Impairm Blindn 2000;94(5):281-91.

140. De l'Aune WR, Williams MD, Welsh RL. Outcome assessment of the rehabilitation of the visually impaired. J Rehabil Res Dev 1999 Oct;36(4):273-93.

141. Granger CV, Hamilton BB, Linacre JM, Heinemann AW, Wright BD. Performance profiles of the functional independence measure. Am J Phys Med Rehabil 1993 Apr;72(2):84-9.

142. Deutsch A, Braun S, Granger C. The Functional Independence Measures (FIMsm Instrument) and the Functional Independence Measure for Children (WEEFIM Instrument): ten years of development. Crit Rev Phys Rehabil Med 1996;8(4):267-81.

143. Ottenbacher KJ, Hsu Y, Granger CV, Fiedler RC. The reliability of the functional independence measure: a quantitative review. Arch Phys Med Rehabil 1996 Dec;77(12):1226-32.

144. Long RG, Crews JE, Mancil R. Creating measures of rehabilitation outcomes for people who are visually impaired: the FIMBA project. J Vis Impair Blind 2000;94(5):292-306.

145. Head DN, Babcock JL, Goodrich GL, Boyless JA. A geriatric assessment of functional status in vision rehabilitation. J Vis Impair Blind 2000;94(6):357-71.

146. Weih LM, Hassell JB, Keeffe J. Assessment of the impact of vision impairment. Invest Ophthalmol Vis Sci 2002 Apr;43(4):927-35.

147. Hassell JB, Weih LM, Keeffe JE. A measure of handicap for low vision rehabilitation: the impact of vision impairment profile. Clin Experiment Ophthalmol 2000 Jun;28(3):156-61.

148. Harper R, Doorduyn K, Reeves B, Slater L. Evaluating the outcomes of low vision rehabilitation. Ophthal Physiol Opt 1999 Jan;19(1):3-11.

149. Haymes SA, Johnston AW, Heyes AD. The development of the Melbourne low-vision ADL index: a measure of vision disability. Invest Ophthalmol Vis Sci 2001 May;42(6):1215-25.

150. Haymes SA, Johnston AW, Heyes AD. Preliminary investigation of the responsiveness of the Melbourne Low Vision ADL index to low-vision rehabilitation. Optom Vis Sci 2001 Jun;78(6):373-80.

151. Haymes SA, Johnston AW, Heyes AD. A weighted version of the Melbourne Low-Vision ADL Index: a measure of disability impact. Optom Vis Sci 2001 Aug;78(8):565-79.

152. Applied Psychological Measurements. Center for Epidemiologic Studies depression scale. West Publishing Company; 1977. 10 p.

153. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). Am J Prev Med 1994 Mar-Apr;10(2):77-84.

154. Verdier-Taillefer MH, Gourlet V, Fuhrer R, Alperovitch A. Psychometric properties of the Center for Epidemiologic Studies-Depression scale in multiple sclerosis. Neuroepidemiology 2001 Oct;20(4):262-7.

155. Galaria II, Casten RJ, Rovner BW. Development of a shorter version of the geriatric depression scale for visually impaired older patients. Int Psychogeriatr 2000 Dec;12(4):435-43.

156. McNair DM, Lorr M, Droppleman LF. Profile of mood states (POMS) manual. San Diego (CA): Educational and Industrial Testing Service; 1980.

157. McNair DM, Lorr M, Droppleman LF. POMS manual: profile of mood states (revised). San Diego (CA): Educational and Industrial Testing Service; 1992.

158. Mangione CM, Lee PP, Pitts J, Gutierrez P, Berry S, Hays RD. Psychometric properties of the National Eye Institute Visual Function Questionnaire (NEI-VFQ). NEI-VFQ Field Test Investigators. Arch Ophthalmol 1998 Nov;116(11):1496-504.

159. Massof RW, Fletcher DC. Evaluation of the NEI visual functioning questionnaire as an interval measure of visual ability in low vision. Vision Res 2001 Feb;41(3):397-413.

160. Rossi GC, Milano G, Tinelli C. The Italian version of the 25-item National Eye Institute Visual Function Questionnaire: translation, validity, and reliability. J Glaucoma 2003 Jun;12(3):213-20.

161. Clemons TE, Chew EY, Bressler SB, McBee W. National Eye Institute Visual Function Questionnaire in the Age-Related Eye Disease Study (AREDS): AREDS Report No. 10. Arch Ophthalmol 2003 Feb;121(2):211-7.

162. Wolffsohn JS, Cochrane AL. Design of the low vision quality-of-life questionnaire (LVQOL) and measuring the outcome of low-vision rehabilitation. Am J Ophthalmol 2000 Dec;130(6):793-802.

163. Wolffsohn JS, Cochrane AL, Watt NA. Implementation methods for vision related quality of life questionnaires. Br J Ophthalmol 2000 Sep;84(9):1035-40.

164. Frost NA, Sparrow JM, Hopper CD, Peters TJ. Reliability of the VCM1 Questionnaire when administered by post and by telephone. Ophthalmic Epidemiol 2001 Feb;8(1):1-11.

165. Mitchell J, Bradley C. Psychometric evaluation of the 12-item Well-being Questionnaire for use with people with macular disease. Qual Life Res 2001;10(5):465-73.

166. Goodrich GL, Ludt R. Assessing visual detection ability for mobility in individuals with low vision. Vis Impair Res 2003 Aug 1;5(2):57-71.

167. Reinhardt JP, Boerner K, Benn D. Predicting individual change in support overtime among chronically impaired older adult. Psychol Aging 2003;18(4):770-9.

168. Teresi JA, Morse AR, Holmes D, Yatzkan ES, Ramirez M, Rosenthal B, Kong J. The impact of a low vision intervention on affective state among nursing home residents. J Ment Health Aging 2003;9(2):73-84.

169. Office of Special Education and Rehabilitative Services, Rehabilitation Services Administration.
Independent living services for older individuals who are blind.
Annual report fiscal year 2002. Washington (DC): U.S. Department of Education; 2003 Jan 15. 23 p. Also available: http://www.vdbvi.org/text/03-02%20OBGP%20Annual%20Report%20FY%2001-02.doc.

170. Arnold RW. Use of a consumer video system to enhance low vision in children and adults. J Pediatr Ophthalmol Strabismus 2002 Jul-Aug;39(4):245-7.

171. Khan SA, Das T, Kumar SM, Nutheti R. Low vision rehabilitation in patients with age-related macular degeneration at a tertiary eye care centre in southern India. Clin Experiment Ophthalmol 2002 Dec;30(6):404-10.

172. Li CY, Lin KK, Lin YC, Lee JS. Low vision and methods of rehabilitation: a comparison between the past and present. Chang Gung Med J 2002 Mar;25(3):153-61.

173. Ludt R, Goodrich GL. Change in visual perceptual detection distances for low vision travelers as a result of dynamic visual assessment and training. J Vis Impairm Blindn 2002;96(1):7-21.

174. Mississippi State University, Rehabilitation Research and Training Center on Blindness and Low Vision. Virginia 2002 report. [internet].
Richmond (VA): Virginia Department for the Blind and Vision Impaired; 2003 [cited 2004 Feb 12]. [20 p].
Available: http://www.vdbvi.org/text/VA2002report.doc.

175. Kleweno CP, Seibel EJ, Viirre ES, Kelly JP, Furness TA 3rd.
The virtual retinal display as a low-vision computer interface: a pilot study. J Rehabil Res Dev 2001 Jul-Aug;38(4):431-42.

176. Lavinsky J, Tomasetto G, Soares E. Use of a contact lens telescopic system in low vision patients. Int J Rehabil Res 2001 Dec;24(4):337-40.

177. Moore JE, Giesen JM, Weber JM, Crews JE. Functional outcomes reportedby consumers of the independent living program for older individuals who are blind. J Vis Impair Blind 2001;95(7):403-17.

178. Babcock JL, Goodrich GL, Head DN, Boyless JA. Developing geriatric training outcome assessments in vision rehabilitatio. J Vis Impairm Blindn 2000;94(5):307-21.

179. Ballinger R, Lalle P, Maino J, Stelmack J, Tallman K, Wacker R. Veterans Affairs Multicenter Low Vision Enhancement System (LVES) study: clinical results. Report 1: effects of manual-focus LVES on visual acuity and contrast sensitivity. 2000 Dec;71(12):764-74.

180. Horowitz A, Leonard R, Reinhardt JP. Measuring psychosocial and functional outcomes of a group model of vision rehabilitation services for older adults. J Vis Impair Blind 2000 May;94(5):328-37.

181. Khan SA. A retrospective study of low-vision cases in an Indian tertiary eye-care hospital. Indian J Ophthalmol 2000 Sep;48(3):201-7.

182. Laderman DJ, Szlyk JP, Kelsch R, Seiple W. A curriculum for training patients with peripheral visual field loss to use bioptic amorphic lenses. J Rehabil Res Dev 2000 Sep-Oct;37(5):607-19.

183. Lowe JB, Rubinstein MP. Distance telescopes: a survey of user success. Optom Vis Sci 2000 May;77(5):260-9.

184. Margrain TH. Helping blind and partially sighted people to read: the effectiveness of low vision aids. Br J Ophthalmol 2000 Aug;84(8):919-21.

185. McCabe P, Nason F, Demers Turco P, Friedman D, Seddon JM. Evaluating the effectiveness of a vision rehabilitation intervention using an objective and subjective measure of functional performance. Ophthalmic Epidemiol 2000 Dec;7(4):259-70.

186. Rogers P, Menchetti B, Lai SC. Using existing databases to evaluate rehabilitation outcomes of older persons who are visually impaired. J Vis Impair Blind 2000;94(5):338-42.

187. Russell W, Harper R, Reeves B, Waterman H, Henson D, McLeod D. Randomised controlled trial of an integrated versus an optometric low vision rehabilitation service for patients with age-related macular degeneration: study design and methodology. Ophthal Physiol Opt 2001 Jan;21(1):36-44.

188. Dahlin Ivanoff S. Focus group discussions as a tool for developing a health education programme for elderly persons with visual impairment. Scand J Occup Ther 2002;9(1):3-9.

189. Centers for Medicare and Medicaid Services. Medicare benefit policy manual. Baltimore (MD): Centers for Medicare and Medicaid Services; 2004 Jan 23 (Rev. 6). Chapter 15 - covered medical and other health services. p. 10 to 300.5.
Also available: http://www.cms.hhs.gov/manuals/102_policy/bp102c15.pdf.

APPENDICES: SUPPORTING DOCUMENTATION AND EVIDENCE TABLES

Appendix A. Full Text of Medicare Program Memorandum (29th May 2002)

SUBJECT: Provider Education Article: Medicare Coverage of Rehabilitation Services for Beneficiaries With Vision Impairment

This Program Memorandum (PM) alerts the physician and provider community that Medicare beneficiaries who are blind or visually impaired are eligible for physician-prescribed rehabilitation services from approved health care professionals on the same basis as beneficiaries with other medical conditions that result in reduced physical functioning. We are issuing this PM in response to the language in the committee report accompanying the FY 2002 Labor/Health and Human Services/Education appropriations bill. It states: *"Medicare beneficiaries who are blind or visually impaired are eligible for physician-prescribed rehabilitation services from approved health care professionals on the same basis as beneficiaries with other medical conditions that result in reduced physical functioning. The Committee urges CMS to direct its carriers to inform physicians and other providers about the availability of medically necessary rehabilitation services for these beneficiaries."*

The attached article is for publication in your next regularly scheduled bulletin. For your information, the applicable manual sections pertaining to rehabilitation services are as follows: Medicare Intermediary Manual, Part 3, Chapter I, §3030, Medicare Intermediary Manual, Part 3, Chapter II, §§3147 and 3148, and in the Medicare Carriers Manual, Part 3, Chapter II, §§2020, 2050, 2210 and 2217.

Publish this article in your next regularly scheduled bulletin and post it, within two weeks after receipt of this PM, on any Internet sites or bulletin boards you maintain.

Within 30 days of publication of the article, forward a copy *of the bulletin article* to central office at this address:
Mary K. Loane
CMS/CMM/PBEG/DPET
C4-10-07
7500 Security Boulevard
Baltimore, Maryland 21244-1850

The *effective date* for this PM is May 29, 2002.

The *implementation date* for this PM is May 29, 2002.

These instructions should be implemented within your current operating budget.

This PM may be discarded after May 31, 2003.

Attachment CMS–Pub. 60AB

Attachment

Medicare Coverage of Rehabilitation Services for Beneficiaries With Vision Impairment

Background

A Medicare beneficiary with vision loss may be eligible for rehabilitation services designed to improve functioning, by therapy, to improve performance of activities of daily living, including self-care and home management skills. Evaluation of the patient's level of functioning in activities of daily living, followed by implementation of a therapeutic plan of care aimed at safe and independent living, is critical and should be performed by an occupational or physical therapist. (Physical Therapy and Occupational Therapy assistants cannot perform such evaluations.)

Vision impairment ranging from low vision to total blindness may result from a primary eye diagnosis, such as macular degeneration, retinitis pigmentosa or glaucoma, or as a condition secondary to another primary diagnosis, such as diabetes mellitus or acquired immune deficiency syndrome (AIDS).

Coverage and Limitations

In accordance with established conditions, all rehabilitation services to beneficiaries with a primary vision impairment diagnosis must be provided pursuant to a written treatment plan established by a Medicare-defined physician, and implemented by approved Medicare providers (occupational or physical therapists) or incident to physician services. Some of the following rehabilitation programs/services for beneficiaries with vision impairment may include Medicare covered therapeutic services:

- Mobility;
- Activities of Daily Living; and
- Other rehabilitation goals that are medically necessary.

The patient must have a potential for restoration or improvement of lost functions, and must be expected to improve significantly within a reasonable and generally predictable amount of time. Rehabilitation services are not covered if the patient is unable to cooperate in the treatment program or if clear goals are not definable. Most rehabilitation is short-term and intensive, and maintenance therapy – services required to maintain a level of functioning – are not covered. For example, a person with an ICD-9 diagnosis 369.08 (profound impairment in both eyes, i.e., best corrected visual acuity is less than 20/400 or visual field is 10 degrees or less) would generally be eligible for, and may be provided, rehabilitation services under HCPCS code 97535, (self care/home management

training, i.e., activities of daily living, compensatory training, meal preparation, safety procedures, and instruction in the use of adaptive equipment).

Services may be provided by a physician as defined in §1861(r)(1) and (4) of the Social Security Act, a qualified occupational therapist, or a qualified physical therapist. Services furnished by an employee of the physician may only be provided incident to the physician's professional services, must be furnished under the physician's direct personal supervision, and must meet other incident to requirements provided in §2050 of the Medicare Carriers Manual. Certified occupational therapy and physical therapy assistants must perform under the appropriate level of supervision as other therapy services.

Applicable HCPCS Therapeutic Procedures

The following list contains examples which are not meant to limit the provision of other medically necessary services:

97110 Therapeutic procedure, one or more areas, each 15 minutes; therapeutic exercises to develop strength and endurance, range of motion, and flexibility;

97116 Gait training (includes stair climbing);

97532 Development of cognitive skills to improve attention, memory, problem solving, (includes compensatory training), direct (one-on-one) patient contact by the provider, each 15 minutes;

97533 Sensory integrative techniques to enhance sensory processing and promote adaptive responses to environmental demands, direct (one-on-one) patient contact by the provider, each 15 minutes;

97535 Self-care/home management training, e.g., activities of daily living, compensatory training, meal preparation, safety procedures, and instruction in use of adaptive equipment, direct one-on-one contact by provider, each 15 minutes; and

97537 Community/work reintegration (e.g., shopping, transportation, money management, avocational activities and/or work environment modification analysis, work task analysis, direct one on one contact by provider, each 15 minutes.

ICD-9 Codes for Vision Impairment that Support Medical Necessity

The following are appropriate diagnoses to use for the therapeutic procedures specified above:

368.41	Scotoma central area	369.12	BE – severe impairment LE – total impairment
368.45	Generalized contraction or constriction	369.13	BE – severe impairment LE – near-total impairment
368.46	Homonymous bilateral field defects	369.14	BE – severe impairment LE – profound impairment
368.47	Heteronymous bilateral field defects	369.16	BE – moderate impairment LE – total impairment
369.01	BE – total impairment LE – total impairment	369.17	BE – moderate impairment LE – near-total impairment
369.03	BE – near-total impairment LE – total impairment	369.18	BE – moderate impairment LE – profound impairment
369.04	BE – near-total impairment LE – near-total impairment	369.22	BE – severe impairment LE – severe impairment
369.06	BE – profound impairment LE – total impairment	369.24	BE – moderate impairment LE – severe impairment
369.07	BE – profound impairment LE – near-total impairment	369.25	BE – moderate impairment LE – moderate impairment
369.08	BE – profound impairment LE – profound impairment		

BE = Better seeing eye LE = Lesser seeing eye

Definition of Levels of Vision Impairment:

Moderate =	Best corrected visual acuity is less than 20/60
Severe (legal blindness) =	Best corrected visual acuity is less than 20/160, or visual field is 20 degrees or less
Profound (moderate blindness) =	Best corrected visual acuity is less than 20/400, or visual field is 10 degrees or less
Near-total (severe blindness) =	Best corrected visual acuity is less than 20/1000, or visual field is 5 degrees or less
Total (total blindness) =	No light perception

Appendix B. Education and Certification of Non-Medicare Physician Vision Rehabilitation Personnel

Included in Appendix B is information on the education and training of selected personnel who currently provide vision rehabilitation services but who do not meet the definition of a Medicare Physician. These selected vision rehabilitation personnel are:

- Occupational Therapists
- Physical Therapists
- Orientation and Mobility Specialists
- Low-Vision Therapists
- Rehabilitation Teachers

The purpose of Appendix B is to provide the reader with detailed information on the education, training and credentialing of selected vision rehabilitation personnel who are not considered to be Medicare physicians.

Occupational Therapists

Typical Curriculum for Occupational Therapy Degrees

Below we provide a summary of the areas covered by the curriculum of a "typical" occupational therapy degree. This information was obtained from the prospectus of Ithaca College (2003-2004).(132)

Table B-1. Typical Curriculum of a Degree Course in Occupational Therapy

Course	Description
Freshman Seminar in Occupational Therapy	Exploration of critical thinking, values, and interpersonal and professional issues related to the successful study of occupational therapy. Readings, discussion, and class experiences introduce concepts and skills used in occupational therapy
Introduction to Occupational Therapy	An introduction to the history and philosophy of occupational therapy. The scope and practice of occupational therapy, and the roles and responsibilities of the occupational therapist are explored. Opportunity is provided for observation of clinical practice.
Human Development	The study of developmental theories and factors influencing normal development from prenatal to adolescence. Developmental norms and sequences are examined, with emphasis on sensorimotor, cognitive, and psychosocial tasks. Beginning skills in the observation of normal children are developed. Designed for students in occupational science/occupational therapy.
Human Development II	Continued study of developmental theories and factors influencing normal development from adolescence through older adulthood. Developmental norms and sequences are examined, with emphasis on sensorimotor, cognitive, and psychosocial tasks. Designed for students in occupational science/occupational therapy.
Occupations and Occupational Therapy	Introduction to the concepts, selected theories, and frames of reference of occupational therapy, emphasizing the occupational therapy process and the use and analysis of human activities and occupations by occupational therapists.
Kinesiology	The application of gross anatomy to the study of human movement, with emphasis on understanding the interrelated kinetics of normal motions of the musculoskeletal system as they influence functional activities. Evaluation procedures such as manual muscle testing, joint range of motion measurement, and kinesiological analysis of functional activities are used in laboratory sessions
Clinical Psychiatry in Occupational Therapy	Study of basic concepts of identification, definition, and management of psychosocial problems. Major pathological syndromes and their etiologies and prognoses are examined. An introduction to pharmacology and medical terminology is included. Emphasis is placed on understanding not only the pathology and medical treatment, but also the effect of the condition on the individual's ability to perform functional activities.

Course	Description
Occupations I	The science of occupation as the base for occupational therapy is examined, emphasizing the centrality of occupation for maintenance of life and health. The meaning of occupations and activities to the individual is stressed. The processes, analysis, and synthesis of selected activities, including traditional therapeutic play and craft activities, are demonstrated. Theoretical models and frames of reference in occupational therapy are discussed, as are core concepts of work, self-care, play, and leisure. The teaching-learning process and the use of self in the therapeutic process are introduced
Occupations II	Emphasis is placed on the adaptation of activities and the use of orthotic and adaptive equipment in the therapeutic process. Splinting and orthotics, low technology equipment, and activity synthesis are explored. Individual teaching and learning concepts and strategies continue to be stressed.
Occupational Therapy in Pediatrics	Presents various frames of reference and therapeutic approaches used in the evaluation and intervention process for children. Emphasis is placed given to theoretical constructs and therapeutic applications based on principles of human development. Pediatric theories and principles are related to practice in a variety of settings. Laboratory experiences emphasize the assessment of children and adolescents based on these principles.
Practicum in Pediatric Occupational Therapy	Concepts and theories in occupational therapy are applied in observing, evaluating, planning, and implementing services for children. Emphasis is placed on the development of skills based on sound theoretical concepts and on the process of clinical reasoning. Exposure to clients through clinical placement.
Clinical Pediatrics in Occupational Therapy	Exploration of the salient medical background of pediatric diseases and conditions. Principles of medical management of selected systemic diseases in children and young adults as a basis for intervention by an occupational therapist.
Clinical Orthopedics in Occupational Therapy	Study of selected orthopedic conditions. The fundamental facts and principles of orthopedic conditions and surgical procedures are related to occupational therapy practice
Selected Topics in Occupational Therapy	Topics of current interest to faculty and students. Experimental courses are offered under this number and title. This course may be repeated for credit for different selected topics.
Neuroscience	Course provides a framework for understanding the nervous system and an introduction to applied neuroscience. This course provides a scientific basis for improved patient care by clarifying the relationship between the nervous system and behavior. Laboratory experiences, including wet specimens, models, computer aids, and case studies, enhance lecture and reading materials
Professional Concepts I	Discussion of professionalism in occupational therapy and issues facing professional. Topics include clinical education expectations and performance, multicultural issues, seeking and using supervision, legal and ethical issues, current issues in occupational therapy practice, and responsibility for lifelong learning and service.
Occupations III	Continued examination of the science of occupation as the basis for occupational therapy. Emphasis is placed on the interaction of the person, the task, and the environment in occupational therapy theory and treatment. Discussion of research on the value of occupation for health maintenance and treatment of dysfunction for individuals with disabilities. Assessment, modification, and adaptation of the environment to support occupational function. Introduction of computers, environmental controls, seating, mobility devices, and other technology that promotes occupational adaptation

Course	Description
Occupational Therapy with Adults	Frames of reference provide a link between theory and practice, and guide the therapeutic process from selecting an evaluation tool to prescribing a specific activity. These frames of reference, both physically and psychologically based, develop a holistic approach to occupational therapy practice.
Practicum in Adult Occupational Therapy	Analysis and synthesis of activities used to provide therapeutic intervention in physical and psychosocial dysfunction for the adult. Specific intervention techniques of occupational therapy programs based on sound theoretical and clinical reasoning. Emphasis is placed on the development of programs to maximize the functional performance of individuals with disabilities and evaluate treatment outcomes. This course includes a clinical fieldwork requirement and a problem-based seminar.
Research Methods in Occupational Therapy	The methods and designs used in occupational therapy research and inquiry. Includes conceptual foundations, basic research methodology, analysis and interpretation of data, reading and use of scholarly literature. An appreciation is developed for professional research and objective analysis. Students discuss and critically review research articles, construct a structured research paper developing a research problem and questions suitable for thesis research, and support these elements with background, definitions, and rationale.
Clinical Medicine in Occupational Therapy	Study of selected systemic disease, medical-surgical, and neurological conditions. The focus is on basic concepts in the identification, definition, and medical management of these conditions, primarily with adults and older persons. Emphasis is placed on understanding not only the etiology, pathology, and medical treatment, but also the effect of the condition and its treatment on the person's ability to perform functional activities and meet life role demands.
Occupational Therapy in Geriatrics	Principles and practice issues in the assessment and treatment of older persons. Application of theory to practice in the use of frames of reference (FOR) to develop programs for selected case studies addressing the issues of long-term care and community living. Case- and problem-based learning are used in this seminar course.
Practicum in Geriatric Occupational Therapy	The use of assessment and evaluation tools and treatment techniques for older persons. Long-term care options are discussed. Housing options, including adaptations needed to keep patients in their homes longer, are identified. Students work with well elderly and frail elderly in various settings in the community as part of their Fieldwork I experience.
Independent Study in Occupational Therapy	Individual research and writing in a particular area of occupational therapy, supervised by a faculty member in the department. An approved design statement is required before registration for this course.
Special Topics in Occupational Therapy	Formal instruction in topics of current interest to graduate students and faculty in occupational therapy. Experimental and topical courses will be offered under this number and title. Course may be repeated for credit, for different selected topics.
Clinical Fieldwork II - Children and Adolescents	Three months of full-time, supervised clinical experience with the opportunity to treat pediatric patients/clients. Assignment in a training center program approved in accordance with the American Occupational Therapy Association's *Standards of Practice for Occupational Therapy Education*
Supervision in Occupational Therapy	An applied course in supervision relating to the practice of occupational therapy. Includes elements of supervision, organizational behavior, and interaction strategies to further psychomotor, cognitive, and affective learning outcomes.

Course	Description
Professional Concepts II	In-depth exploration of the concerns and issues of professional career development in occupational therapy. Consideration is given to the elements of professional career development, appropriate selection of professional positions, legal issues of licensing, reimbursement policies, maintenance of professional competence, and issues related to cultural diversity in the clinic and the worksite. This is a continuation of Professional Concepts I, with a deeper analysis of ethics and multicultural issues
Advanced Theory and Practice	Examination and critique of definitions, philosophy, generic base, and concepts in occupational therapy. Occupational therapy theory development, structure, and function are analyzed and critiqued as they relate to basic assumptions, frames of reference, and implications for practice and research. Focus is on research and theory development, and the application of theory to occupational therapy practice.
Preventive Health Care and Patient Education	The process of adapting patterns of behavior so they will lead to improved health and heightened life satisfaction. The link between health, prevention of health problems, and behavior patterns and lifestyles is discussed. States of mind, thoughts, feelings, self-efficacy, coping strategies, and use of social support mechanisms in wellness and prevention are considered. Roles of therapists as educators are discussed, and skills in patient education are developed
Consultation, Community, and Alternative Models	The practice of occupational therapy in nontraditional and community-based settings. Emphasis is placed on alternative models of delivery, including consultation and monitoring. Roles of occupational therapists in industry, private practice, prevention programs, and emerging areas of practice are explored. Skills and issues related to effective and ethical practice are addressed.
Activity Group Process	The use of groups in occupational therapy, with special emphasis on activity-based groups. Concepts and theories of group formation, development, structure, and leadership introduced in earlier courses are expanded and practiced as they apply to adults and children. Development of group protocols and management of groups are practiced. Research on the use of groups is discussed.
Adaptation and Environmental Modification	Study of theories regarding human behavioral adaptation and development of skills to modify physical, emotional, social, and cultural environments to promote appropriate behavioral adaptations that facilitate engagement with the tasks that comprise life roles. Methods of environmental assessment and techniques for modification of physical spaces and equipment, temporal structures, and patterns of use are examined.
Cognitive Rehabilitation	Occupational therapy assessment and intervention for persons with cognitive dysfunction. Evaluation instruments are derived from various theoretical perspectives. The focus is on assessment and intervention with brain-injured adults, but other patient populations are also considered. Intervention strategies and critical analysis of research are emphasized.
Technology in Occupational Therapy Intervention	Theoretical concepts and principles related to the application of assistive technology. Assistive devices are used to increase functional abilities and foster independence in clients of all ages, in self-care, work, and leisure pursuits. Simple and complex high-technology devices are described. Client assessment, selection of appropriate devices, and training in the use of the devices are discussed.
Vocational Readiness	The role of occupational therapy in the vocational readiness process. Includes a review of vocational development and values, theoretical models, assessment, planning, treatment, and documentation. Vocational programming for children, adolescents, and adults with a variety of disabilities is discussed. Laboratory activities in vocational assessment and training are included. Students completing the course will be certified in the McCarron-Dial Work Evaluation System.

Course	Description
Applied Pediatric Neuroscience	Pediatric neuroscience and neuroscientific theories as they apply to pediatric practice. Theoretical and treatment models investigated include sensory integration (SI) theory, neurodevelopmental theory (NDT), and theories of motor control and motor learning for the treatment of children with a variety of developmental disorders. Clinical laboratories deal with treatment for children having cerebral palsy, learning disabilities, and related conditions
Group Research	A research course for students who do not elect to conduct individual research for a thesis. It includes the reading and criticism of research related to a faculty-designed research project, collecting and analyzing data, and the writing of results and discussion of findings of the project.
Individual Thesis Research I	Preparation of a thesis proposal and the first three chapters (introduction, literature review, and methodology) of an independent, scholarly research paper under the supervision of a member of the graduate faculty in occupational therapy. Data collection is initiated. The graduate committee must approve the proposal.
Individual Thesis Research II	Completion of independent research, including collecting data and analyzing results, and preparation of a scholarly research paper under the supervision of a member of the graduate faculty in occupational therapy. An oral presentation of the thesis is required
Advanced Concepts in Physical Disabilities	A seminar examining current literature and thought in the treatment of adults with disabilities, with opportunities to expand skills and knowledge in advanced techniques. Research into the effectiveness of occupational therapy modalities is included.
Advanced Concepts in Psychosocial Occupational Therapy	A seminar on current trends in occupational therapy in mental health care. Focus is on advanced concepts of human adaptation and treatment for psychiatric dysfunction. Implications for the future of occupational therapy in mental health are explored.
Advanced Concepts in Geriatric Rehabilitation	A seminar on health care and community support as they relate to the needs of disabled and nondisabled elderly people. Covers the importance of interdisciplinary practice; the rationale for prevention, environmental adaptation, and activity; factors involved in healthy, successful aging; and major health care legislation and reimbursement mechanisms and their ramifications in gerontological rehabilitation.
School-Based Occupational Therapy	A seminar exploring current trends in occupational therapy in schools. Includes the Individual Educational Plan (IEP) process, the education team and system, treatment implementation, and documentation methodologies appropriate to school systems. Programming for children from birth to age 21 is included.
Hand Therapy	Seminar on the knowledge, skills, and practices of hand therapy and rehabilitation. Hand injuries and surgery, use of physical agent modalities in hand therapy, treatment protocols, advanced splinting, and ethical and legal issues are covered
Occupational Therapy in Early Intervention	Study of the impact of biological, psychological, and sociocultural factors on the occupational development of young children with special needs. Designed to provide skills in assessment and family-centered intervention for infants and toddlers with special needs and their families.
Clinical Fieldwork II - Adult/Geriatric	Three months of full-time, supervised clinical experience with the opportunity to treat adult/geriatric patients. Assignment in training center programs approved in accordance with the American Occupational Therapy Association *Standards of Practice for Occupational Therapy Education*.
Clinical Fieldwork II - Elective Specialty	Two or three months of full-time, supervised clinical experience with opportunity to plan, implement, and evaluate treatment for patients or clients in a specialty area selected by the student in consultation with the fieldwork coordinator.

Course	Description
Elective Internship	An eight-week, full-time (or equivalent) internship that will provide the opportunity for the student to apply occupational therapy theory and principles in a nontraditional setting under the supervision of a person with demonstrated competence in a specialized area of consultation or service delivery.
Graduate Independent Study	Individual research and writing in an area of occupational therapy practice, research, or theory under supervision of an occupational therapy faculty member. An approved design statement is required upon registration.

Physical Therapists

Typical Curriculum for Occupational Therapy Degrees

Below we provide a summary of the areas covered by the curriculum of a "typical" physical therapy degree. This information was obtained from the prospectus of Ithaca College (2003-2004).(133)

Table B-2. Typical Curriculum of a Degree Course in Physical Therapy

Course	Description
Introduction to Physical Therapy	Orientation to the roles and responsibilities of a physical therapist, the representative professional association, and the related professional literature. Experiential activities are included to enhance learning.
Rehabilitation for Older Adults	Strategies aimed toward maximizing function of older adults. A team approach is emphasized, drawing on disciplines such as physical, occupational, and recreational therapy, speech-language pathology and audiology, and rehabilitation nursing. Legal and ethical issues that pertain to the rehabilitation of this population are also addressed
Preclinical Conference I	Series of sessions to explain clinical education policies and procedures and choose sites for clinical affiliations
Preclinical Conference II	Series of sessions to explain clinical education policies and procedures and choose sites for clinical affiliations.
Human Anatomy	Study of the gross anatomical components of the human body through the use of lecture and cadaver dissection. Emphasis on the musculoskeletal and neurovascular systems found in the extremities, trunk, chest, and abdominal walls, and in the head and neck.
Massage and Surface Anatomy	This predominantly laboratory-based course includes a presentation of theory, principles, and techniques of various forms of therapeutic massage. Regional palpation and surface anatomy are emphasized.
Mobility Training	Principles and skills involved in ambulation training with and without assistive devices, transfer training, wheelchair management, safety in patient handling, and proper body mechanics.
Clinical Physiology	The study of human physiology from a clinical perspective, addressing normal function in the primary physiologic systems and how therapeutic interventions influence system functions. Introduces pathophysiologic syndromes common to patients receiving therapy. Describes physiologic responses in patients receiving specific physical or occupational therapy interventions.

Course	Description
Musculoskeletal Assessment	A clinical decision making model is introduced and reinforced on selected techniques for assessment of musculoskeletal problems. Emphasis on problems related to the extremities, but some basic evaluation techniques for cervical and lumbar regions are introduced. Assessment includes subjective history taking and objective measurements, including passive ROM and goniometry, manual muscle testing, flexibility testing, ligament testing, special orthopedic tests, and posture analysis.
Physical Agents for Physical Therapists	The study of the biophysical, physiological, and clinical principles and procedures associated with the application of electromagnetic and acoustic energy in the prevention and treatment of pathological conditions.
Biostatistics	Discussion of descriptive and inferential statistics. Particular emphasis on the statistical interpretation of basic science and clinical research studies.
Selected Topics in Physical Therapy	Clinical and professional topics of current interest to faculty and students. This course may be repeated for credit for different selected topics
Biomechanics	Application of mechanical principles to human movement. Particular attention to the effect of forces in producing normal movement. Students are required to apply their knowledge of anatomy toward understanding individual joint function as well as the integrated function of several joints during complex activities such as normal gait
Exercise, Muscle Physiology, and Plasticity	A comprehensive analysis of the physiology of skeletal muscle, including a review of developmental concepts and adaptations of muscle to changes in activity and hormone or drug levels. Forms of exercise are analyzed in terms of their physiological effects and their relationship to training and treatment programs
Histology-Pathology	The interrelationship of animal biological form and function. Fundamental principles of morphology, physiology, and pathology are explored at the microscopic level. These principles are applied to changes observed in organs in response to a variety of health problems.
Clinical Education I	The initial assignment to one of a variety of health care facilities for six weeks. The student is assigned to specified clinical tasks under the close supervision of the clinical instructor. Professional conduct and appearance, basic musculoskeletal assessment and treatment, and application of physical agents are emphasized.
Clinical Conference I	Focuses on attitudinal and interpersonal communication issues pertinent to a clinical affiliation, including professional behavior, motivation, and effective communication
Clinical Administration I	The practice of effective and efficient administration of a rehabilitation setting. Emphasis is on the impact of health care reform on departmental organization and planning, reimbursement, foundations of control, management information systems, fiscal planning, risk management and quality assurance, legal issues and external regulatory mechanisms, marketing and public relations, and assessment of service outcomes.
Clinical Administration II	An examination of how basic personnel management techniques are applied in the rehabilitation clinical setting. Included are concepts and theories of motivation, leadership and power, organizational behavior, organizational climate, performance rewards and appraisal, and conflict management. A case study approach is used in this course.
Neuroanatomy	Comprehensive study of the structural features and connectivity of the human central and peripheral nervous systems.
Neurophysiology	Study of the concepts, terms, and methods of investigating the physiology of the human nervous system.

Course	Description
Pharmacology	Presents the basic drug classes and the physiological basis of their action. Drugs are grouped according to their general effects and the type of disorders they are routinely used to treat. Special emphasis on drugs commonly used to treat disorders frequently seen in patients receiving physical therapy.
Normal Motor Development	Normal motor developmental processes from the embryo to old age. Review of research, theory; evaluation of gross motor and fine motor development; and the influence of perception, vision, and auditory, kinesthetic, and cognitive input on the acquisition of motor skills.
Electrophysiological Assessment	Current and historical perspectives in the electrophysiological evaluation of neuromuscular disease and disorders. Students perform fundamental electrodiagnostic tests, including electromyography and measurement of nerve conduction velocity.
Soft Tissue and Peripheral Joint Examination and Mobilization	This lecture and lab course is an introduction to the physical therapy methods of stretching, soft tissue treatment techniques, and mobilization of peripheral joints. It is designed to expose the student to the broad spectrum of techniques while teaching the skills of the most current methods.
Assessment and Treatment of the Spine	Assessment and treatment of the spine, using a clinical decision making model. Objective assessment includes postural analysis, active and passive physiological movement, strength tests, passive accessory joint motion, and reflex testing. Several treatment approaches are presented
Mechanical Diagnosis and Therapy of the Lumbar Spine	Introduction to mechanical diagnosis and treatment of the lumbar spine. Develops understanding of basic theories and thought processes in mechanical diagnosis. Exposes students to basic treatment interventions and skills in performing them
Clinical Education II	The second placement for the student in a clinical environment where he or she has the close supervision of a clinical instructor. This experience provides an opportunity to practice and develop skills in analyzing motor performance, evaluating and treating joint and soft tissue pathologies.
Independent Study	This course allows students to complete an in-depth study or project in an area of their interest and related to physical therapy. Includes a final presentation. Requires a faculty sponsor.
Clinical Conference II	The final course in a series designed to prepare the physical therapy student for learning in a clinical environment. As students prepare to enter clinical settings where complex treatments occur, they receive instructions on how to determine their own learning style, perform self-evaluation, and incorporate this information into the clinical education objectives. Included in the course are techniques for problem solving, trends in physical therapy education, concepts of adult learning, and techniques for teaching patient skills.
Pathokinesiology	Presents specific pathological conditions (primarily organized according to anatomical regions) that result in disorders of posture, movement, and locomotion. The presentations and analyses of these pathokinesiological conditions include neurological, neuromotor, and musculoskeletal aspects with respect to the causes of dysfunction. Laboratory exercises require the student to use movement analysis equipment to demonstrate pathomechanics and abnormal movement patterns
Psychosocial Aspects of Patient Care	A review of psychological and social issues affecting patients and therapists in the clinic, home, and community environments. Addresses special topics relevant to assessing a patient's and a clinician's response to illness. These topics include terminal illness, sexuality and illness or disability, psychosomatic illness, and selected psychiatric disorders.

Course	Description
Cardiopulmonary Testing and Management	Extensive study of common cardiopulmonary pathologies and the response of this system to disease, exercise, and medical and surgical management. Evaluation procedures utilized to determine the status of cardiopulmonary performance are studied in depth. Clinical management procedures used by all members of the rehabilitation team are studied, with emphasis on specific physical therapy procedures
Orthotics/Prosthetics	An in-depth review of the principles and practices of orthotics and prosthetics as applied by a physical therapist. This includes a survey of the basic biomechanical principles used in applying orthotic and prosthetic appliances as well as principles of patient application, training, and management of complications.
Research I	Principles and methods of scholarly inquiry. Topics include formulation of research problems, literature review, hypothesis testing, techniques of data collection, and analysis of results. Historical and philosophical methods are introduced, but the course focuses on descriptive and experimental methods. Culminates in a written preliminary research outline.
Research II	Application of research theory to interpretation, analysis, and synthesis of scientific literature. Through group projects, the student is required to perform a literature review and define methodologies including sampling, instrumentation, design analysis of data, and issues concerning reliability and validity. Culminates in a project presentation
Clinical Education III	The third placement for a student in a clinical environment, giving the opportunity to apply more advanced theories and treatment procedures to a selected patient caseload with guidance from a clinical instructor.
Clinical Education IV, V	Clinical Education IV and V are the final placements of the student in a clinical environment. Two six-week sessions.
Clinical Science I - Orthopedics	Covers pathogenesis, clinical presentation, medical and surgical management, and rehabilitation of orthopedic disorders
Clinical Science II - Medicine	Survey of the most common diseases found in the practice of general medicine. Presentations emphasize medical management procedures and include discussion of physical therapy procedures that may be applied to this varied patient population
Clinical Science III - Neurology	Assessment and management of adult patients with acquired brain disorders
Clinical Science IV -Surgery	A survey of the most common forms of general surgery encountered in the practice of physical therapy. Emphasis is on general surgical techniques, including indications, expected outcomes, and complications, as well as the pre- and postoperative role of the physical therapist. An in-depth review of decubitus ulcer and burn management is presented.
Clinical Science V - Neurology II	Covers the medical and physical therapy management of brain stem, spinal cord, and lower motor neuron disorders. Special emphasis is on the rehabilitation of the spinal cord injured patient and the patient with multiple sclerosis.
Clinical Science VI - Pediatrics	The etiology, pathology, diagnosis, medical, surgical, and clinical assessment, and physical therapy management of pediatric disorders of the neuromuscular system. The physiological basis and therapeutic techniques of neurophysiological approaches to exercise are examined.
Geriatrics in Physical Therapy	A study of the special needs of the older adult. It prepares the student to plan effective physical therapy management of the problems of older individuals through consideration of age-related changes, psychosocial characteristics, and the continuum of services available for this population. Adaptations of evaluation and treatment methods for older persons are also discussed.

Course	Description
Professional Issues in Physical Therapy	Presents specific issues concerning the practice, education, specialization, and recruitment of physical therapists; how physical therapists relate to other health care professionals, from a local to a global perspective; various ethical and health care reform issues that specifically affect physical therapy

Low-Vision Therapist

Typical Curriculum for Low-Vision Therapist Degree

At the time of writing a specialized degree program in low-vision therapy is only available at one U.S. institution; the Pennsylvania College of Optometry. This institution offers a post graduate certificate and a Master's program.(134) We provide a summary of the areas covered by the curriculum of the Pennsylvania College of Optometry program in Table B-3.

Table B-3. Pennsylvania College of Optometry Low-Vision Therapy Certificate and Master's Program Courses

Course	Description
Foundations of Vision Rehabilitation and Education	History, definitions, legislation, referral processes, education and rehabilitation planning, procedures and resources (human, physical, and financial), cultural diversity, and learning theories related to the needs of individuals who are blind or visually impaired are introduced. Professionalism and ethics as well as issues related to accessibility, privacy, confidentiality, and advocacy are explored.
Low-Vision Assessment and Intervention I	Course focuses on critical components of functional measurement, assessment, and evaluation of low-vision individuals. Areas emphasized include: clinical examination, functional vision assessment related to education, work, home related tasks, and functioning within the community. Emphasis is placed on applying various visual functioning assessment strategies with individuals of all ages who are visually impaired, including those with multiple impairments.
Visual Impairment and Functional Implications	Course addresses the anatomy and physiology of the eye including ocular development and development of the visual system. Areas covered include learning to see, age related changes in the eye, innervation of the eye, basic optics, and medications with their side effects. Functional visual implications of diseases of the eye, syndromes, and brain injury are explored. Students observe primary and low-vision eye exams, learn about prescriptions of low-vision devices, and demonstrate the ability to interpret eye reports and discuss their functional implications.
Assessment	Course provides an introduction to various types of assessments (e.g. psychological, educational, vocational, and physical) used to evaluate people with visual impairments and additional disabilities. Course covers a variety of informal and formal screening, assessment, and evaluation methods, including alternative and statewide tests, observation, history taking, and interviews. Additional assessments include outcomes-based, curriculum-based, and portfolio approaches. Students study general testing procedures such as reliability, validity, and test bias. Students examine their role and that of other professionals in the testing process, the interpretation of test results, and the importance of accurate and confidential record keeping.

Course	Description
Low-vision Assessment and Intervention 1	Covers methods of assessing functional vision and strategies for enhancing visual performance without optical devices. Course emphasizes theory and practice in the following assessment areas: functional visual acuity and fields and visual performance in everyday tasks for individuals with visual impairments, including infants, children, adults, and those with additional disabilities.
Critical Analysis of Research	Course provides students with tools for becoming critical readers of research. Students taught about basic attributes of quantitative methods of research, including experimental and non-experimental designs, and qualitative methods of research. Research designs covered include true experimental, quasi-experimental, descriptive, correlational, single-subject, survey, ethnographic and case study approaches. The course also presents a basic survey of statistical methods used in these approaches
Managing Low-vision Services	Introductory course on management of the human, financial, physical, and technological resources in a comprehensive low-vision program that may be situated in a private or group practice, hospital, university, rehabilitation center, residential school, mobile unit, or itinerant system. Course participants overview classical and current theories of management related to managerial roles and functions, leadership skills, motivation, communication, conflict resolution, innovation, and change.
Low-vision Assessment and Intervention 2	Covers methods of assessing functional vision and strategies for enhancing visual performance with optical devices. This course emphasizes theory and practice in the following assessment and intervention areas: visual efficiency, use of optical and non-optical devices, environmental features, and visual field enhancement techniques. Students explore specialized topics such as visual intervention strategies for individuals with head injury, driving with low vision, implications of reading and writing with low vision, and state of the art low-vision technology
Psychological and Social Dynamics of Visual Impairment	Course explores psychosocial factors affecting the process of adjustment to visual impairment across the life span. Issues related to adjustment including demographics, life stage, type of visual impairment, personality, self-concept, social support network, and the grieving process are explored. The impact of societal attitudes and stereotypes toward blindness and visual impairmen are also explored.
Teamwork and Collaboration	Course explores the ways in which professionals collaborate individually or collectively to address the needs of individuals with visual impairments. The course overviews types of teams, their composition, and team building strategies. Students will discuss members' roles, relationships, and responsibilities. Strategies to maintain effective team functioning, as well as resolving team conflict, are also covered.
Visual Impairment and Additional Disabilities	Course provides an introduction to a number of concomitant medical, social, and psychological conditions that may have an impact upon the provision of educational and rehabilitation services to children and adults who are blind or visually impaired. The course explores functional implications of additional disabilities with emphasis on cognition, perception, communication, behavior, balance, and movement as well as medical conditions and health issues. Students are familiariarized with a range of adaptive assessment and intervention strategies for individuals with visual impairment and additional disabilities.
Functional Applications of Research	Course teaches students how to conceptualize and conduct research in their professional environments. Students investigate ethical research practices, the process for obtaining research approval at various institutions, and methods of data collection. Students use varied methods and tools, including computer software, to organize, analyze, interpret, and apply research data.

Course	Description
Human Development Across the Life Span	Course covers the course of human development from conception through late adulthood. Topics include normative changes in motor development, sensory motor integration, cognition, sensation and perception, physiology, and social development. Special emphasis is placed upon the critical role of vision and the accompanying process of visual change across the life span. In addition, demographic trends and an in-depth study of the network of services for older adults are provided.
Developing and Financing Low-vision Services	Course covers components, standards and strategies involved in developing aneffective program of comprehensive low-vision services. They explore major public and private funding sources, their application processes, and ways to influence funding priorities.
Low-vision Technology and Practice	Course learning activities activities include comparative analysis of low-vision devices, developing instructional resource plans, videotape analysis of instruction, peer instruction, case conferencing, and review of latest low-vision products. Students also learn how to guide individuals with low vision and additional disabilities in the selection and effective use of appropriate assistive technology.
Independent Living Skills for Vision Professionals	Course provides students with hands-on instruction and laboratory practice (using low-vision simulators and blindfolds) in the methods and adaptive techniques used by vision professionals in the following independent living skill areas: (a) cleaning skills and household safety, (b) labeling, (c) money identification, (d) grooming and self care skills, (e) time identification, (f) basic food preparation, (g) telephone skills, and (h) signature and handwriting guides.
Orientation and Mobility for Vision Professionals	Course addresses basic indoor orientation and mobility (O&M) techniques and teaching strategies for individuals who are visually impaired, including those with additional disabilities, across the life span. Course designe to provide the skills and knowledge to necessary to support the work of the O&M specialist. Emphasis is on development of functional skills and concepts required for successful O&M, including efficient utilization of low vision and remaining sensory modalities for travel. Vision simulators and blindfolds are an integral part of the learning experience.
Certificate level Internship	The Certificate in Low-Vision Rehabilitation Internship includes 10 weeks, 50 days, or 350 hours of skill building practice in pre-approved clinical low-vision service settings and related rehabilitation or educational service settings. Interns observe, team teach, and then conduct functional vision assessments and instruction in vision enhancing techniques and devices under site and college supervision. Interns integrate and use case history, observations, functional assessments, low vision and primary eye exam reports, and referral information in working with individuals of diverse backgrounds and ages. Interns maintain daily performance logs, prepare rehabilitation kits, and provide presentations on low vision or complete special service projects that benefit their respective sites. All internship sites and supervisors meet the certification criteria of the Academy for Certification of Vision Rehabilitation and Education Professionals (ACVREP).

Course	Description
Masters level Internship	The Master of Science Low-vision Rehabilitation Internship assists students in developing and refining skills needed to provide quality professional services in their specific disciplines. Emphasis is placed on (a) working with cases from the beginning (where possible); (b) using an interdisciplinary and multidisciplinary approach; (c) alternative strategies for planning and delivering services; and (d) applying learned techniques, strategies, and methods specific to individuals who are blind or visually impaired. Interns assess student/client needs, formulate plans in keeping with their respective service settings, and instruct under joint agency/PCO supervision. Interns contract with the On-Site Supervisor and the PCO Supervisor to perform the specialty skills they have developed. Students keep daily performance logs and complete a project in conjunction with their internship experiences. Interns complete 15 weeks, 75 days, or 525 hours of practice in low-vision assessment and intervention. All internship sites and supervisors meet the certification criteria of the Academy for Certification of Vision Rehabilitation and Education Professionals (ACVREP).

ACVREP Certification Requirements and Eligibility Criteria(18)

Category 1 Certification

To be eligible for category 1 certification, candidates must provide proof of a minimum of a Bachelor's degree (or foreign equivalent, as verified through an independent credential evaluation company) from an accredited college or university with a concentration (major/degree) in low-vision therapy. This degree should be granted from a university or college with a program of study in low vision that meets the 13 CLVT core curriculum areas, which are as follows:

1. The human visual system including pathology and disorders, treatment, and implications for daily functioning.
2. Human development and the visual system.
3. Psychosocial aspects of vision impairment.
4. Basic optics of the eye and optical principles of lenses, including magnification, minification, prisms, and correction of refractive errors.
5. Principles of teaching and learning in general and specifically related to low vision.
6. The components of the low-vision clinical examination, including procedures, instruments, and equipment.
7. Optical and non-optical devices for enhancing low vision, and their characteristics, uses, advantages, and disadvantages.
8. Techniques and strategies for assessment of environmental factors impacting visual efficiency.
9. Techniques and strategies for enhancing vision through visual environmental adaptations and the use of environmental cues.
10. Techniques and strategies for assessment of visual efficiency when completing everyday tasks of daily living.

11. Instruction in the use of adaptive techniques and strategies for using vision efficiently.
12. Techniques for teaching visual skills, such as fixating, focusing, eccentric viewing, tracing, scanning, tracking, and localizing with and without optical devices.
13. The impact of additional disabilities on low vision, and resources for meeting these needs.

Supporting documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree.
- Written documentation that the candidate has received education in the areas listed above. Documentation should include course content or course catalog descriptions or syllabi showing the components of the CLVT core curriculum.

To obtain certification the candidate must complete 350 hours of discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by a CLVT and a physician (OD or MD) practicing in low vision. The CLVT supervisor may be offsite.

Supporting documentation is required to prove that the above requirement has been met. This supporting documentation should include the following:

- A "Performance Evaluation of the Clinical Practice for CLVT Candidates" form must be completed by both supervisors (the CLVT and OD/MD).
- If the CLVT practice supervisor is offsite, a "Provisional Contract Application" must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place.

- Following the practice, the “Provisional Contract Terms of Completion” form must be completed by the practice supervisor, signed by the practice supervisor and applicant, and submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the LV written exam demonstrating knowledge of low-vision principles and applications.

Category 2 Certification

To be eligible for category 2 certification, candidates must provide proof of a minimum of a Bachelor’s degree (or foreign equivalent, as verified through an independent credential evaluation company) in any field, with additional coursework/specialized training in low-vision therapy provided by an accredited college or university. This degree should be granted from a university or college with specialized training in low vision that meets the 13 CLVT core curriculum areas, which are as follows:

1. The human visual system, including pathology and disorders, treatment, and implications for daily functioning.
2. Human development and the visual system.
3. Psychosocial aspects of vision impairment.
4. Basic optics of the eye and optical principles of lenses, including magnification, minification, prisms, and correction of refractive errors.
5. Principles of teaching and learning in general and specifically related to low vision.
6. The components of the low-vision clinical examination, including procedures, instruments, and equipment.
7. Optical and non-optical devices for enhancing low vision, and their characteristics, uses, advantages, and disadvantages.

8. Techniques and strategies for assessment of environmental factors impacting visual efficiency.
9. Techniques and strategies for enhancing vision through visual environmental adaptations and the use of environmental cues.
10. Techniques and strategies for assessment of visual efficiency when completing everyday tasks of daily living.
11. Instruction in the use of adaptive techniques and strategies for using vision efficiently.
12. Techniques for teaching visual skills, such as fixating, focusing, eccentric viewing, tracing, scanning, tracking, and localizing with and without optical devices.
13. The impact of additional disabilities on low vision, and resources for meeting these needs.

Supporting documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree.
- Written documentation that the candidate has received education in the areas listed above. Documentation should include course content or course catalog descriptions or syllabi showing the components of the CLVT core curriculum.

To obtain certification the candidate must complete 350 hours of discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by a CLVT and a physician (OD or MD) practicing in low vision. The CLVT supervisor may be offsite.

Supporting documentation is required to prove that the above requirement has been met. This supporting documentation should include the following:

- A “Performance Evaluation of the Clinical Practice for CLVT Candidates” form must be completed by both supervisors (the CLVT and OD/MD).
- If the CLVT practice supervisor is offsite, a “Provisional Contract Application” must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place.
- Following the practice, the “Provisional Contract Terms of Completion” form must be completed by the practice supervisor, signed by the practice supervisor and applicant, and submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the LV written exam demonstrating knowledge of low-vision principles and applications.

Category 3 Certification

To be eligible for category 3 certification, candidates must provide proof of a minimum of a Bachelor’s degree (or foreign equivalent, as verified through an independent credential evaluation company) in a related health, education or rehabilitation field.

Documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree.

To obtain certification the candidate must complete 350 hours of discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc.”

The practice must be supervised by a CLVT and a physician (OD or MD) practicing in low vision. The CLVT supervisor may be offsite.

Have completed 350 hours of “discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc.” The practice must be supervised by a CLVT and a physician (OD or MD) practicing in low vision. The CLVT practice supervisor may be offsite. The applicant must meet the CLVT clinical competencies. Also, the CLVT practice supervisor must verify that the applicant possesses knowledge of the 13 CLVT core curriculum areas, which are as follows:

1. The human visual system including pathology and disorders, treatment, and implications for daily functioning.
2. Human development and the visual system.
3. Psychosocial aspects of vision impairment.
4. Basic optics of the eye and optical principles of lenses, including magnification, minification, prisms, and correction of refractive errors.
5. Principles of teaching and learning in general and specifically related to low vision.
6. The components of the low-vision clinical examination, including procedures, instruments, and equipment.
7. Optical and non-optical devices for enhancing low vision, and their characteristics, uses, advantages, and disadvantages.
8. Techniques and strategies for assessment of environmental factors impacting visual efficiency.
9. Techniques and strategies for enhancing vision through visual environmental adaptations and the use of environmental cues.
10. Techniques and strategies for assessment of visual efficiency when completing everyday tasks of daily living.

11. Instruction in the use of adaptive techniques and strategies for using vision efficiently.
12. Techniques for teaching visual skills, such as fixating, focusing, eccentric viewing, tracing, scanning, tracking, and localizing with and without optical devices.
13. The impact of additional disabilities on low vision, and resources for meeting these needs.

To ensure the applicant has met the CLVT clinical competencies, a “Performance Evaluation of the Clinical Practice for CLVT Candidates” form must be completed by both supervisors (the CLVT and OD/MD). Also, to verify that the applicant possesses knowledge of the 13 CLVT core curriculum areas, the CLVT practice supervisor must complete a “CLVT Core Curriculum Checklist.” If the CLVT practice supervisor is offsite, a “Provisional Contract Application” must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place. Following the practice, the “Provisional Contract Terms of Completion” form must be completed by the CLVT practice supervisor and signed by the practice supervisor and applicant. Upon completion of the discipline specific clinical practice, the “Performance Evaluation of the Clinical Practice for CLVT Candidates” form and the “Provisional Contract Application” must be submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the LV written exam demonstrating knowledge of low-vision principles and applications.

Category 4 Certification

To be eligible for category 4 certification, candidates must provide proof of having been a professional registered nurse for a minimum of 15 years.

Supporting documentation should include the following:

- Official transcripts documenting the RN degree and letters of support signed by supervisors or Human Resource departments, verifying a minimum of 15 years of employment as a RN.

Have completed 350 hours of “discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc. The practice must be supervised by a CLVT and a physician (OD or MD) practicing in low vision. The CLVT practice supervisor may be offsite. The applicant must meet the CLVT clinical competencies. Also, the CLVT practice supervisor must verify that the applicant possesses knowledge of the 13 CLVT core curriculum areas, which are as follows:

1. The human visual system including pathology and disorders, treatment, and implications for daily functioning.
2. Human development and the visual system.
3. Psychosocial aspects of vision impairment.
4. Basic optics of the eye and optical principles of lenses, including magnification, minification, prisms, and correction of refractive errors.
5. Principles of teaching and learning in general and specifically related to low vision.
6. The components of the low-vision clinical examination, including procedures, instruments, and equipment.
7. Optical and non-optical devices for enhancing low vision, and their characteristics, uses, advantages, and disadvantages.
8. Techniques and strategies for assessment of environmental factors impacting visual efficiency.

9. Techniques and strategies for enhancing vision through visual environmental adaptations and the use of environmental cues.
10. Techniques and strategies for assessment of visual efficiency when completing everyday tasks of daily living.
11. Instruction in the use of adaptive techniques and strategies for using vision efficiently.
12. Techniques for teaching visual skills, such as fixating, focusing, eccentric viewing, tracing, scanning, tracking, and localizing with and without optical devices.
13. The impact of additional disabilities on low vision, and resources for meeting these needs.

To ensure the applicant has met the CLVT clinical competencies listed above, a "Performance Evaluation of the Clinical Practice for CLVT Candidates" form must be completed by both supervisors (the CLVT and OD/MD). Also, to verify that the applicant possesses knowledge of the 13 CLVT core curriculum areas, the CLVT practice supervisor must complete a "CLVT Core Curriculum Checklist." If the CLVT practice supervisor is offsite, a "Provisional Contract Application" must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place. Following the practice, the "Provisional Contract Terms of Completion" form must be completed by the CLVT practice supervisor and signed by the practice supervisor and applicant. Upon completion of the discipline specific clinical practice, the "Performance Evaluation of the Clinical Practice for CLVT Candidates" form and the "Provisional Contract Application" must be submitted to the ACVREP office.

Orientation and Mobility Specialists

Typical Curriculum for Orientation and Mobility Specialist Degrees

Below we provide a summary of the areas covered by the curriculum of a "typical" orientation and mobility specialist degree. This information was obtained from the prospectus of the University of Arkansas at Little Rock (2003-2004).(135)

Table B-4. Typical Curriculum of an O&M Specialist Degree Course

Course	Description
Foundations of rehabilitation	Course provides a conception overview of the professional, historical, theoretical, research and applied foundations of the rehabilitation profession as they relate to the services for individuals with disabilities
Psychological Aspects of Disability	Course covers psychological and sociological aspects of disability, including community attitudes toward individuals with disabilities, strategies to change negative attitudes, adjustment factors in living with disabilities, and methods for supporting successful adjustment to disabilities.
Techniques for Counseling Interviews	Course covers techniques, procedures for counseling interviews: emphasis on mastery of levels of skills within a micro-skills hierarchy for counseling interviews, appropriate use of skills in various stages of counseling.
Medical Aspects of Blindness and Associated Disabilities	Covers anatomy, structure, and function of the eye; frequently occurring diseases, malfunctions in children, adults; includes treatment procedures for disease process, rehabilitation/education implications of handicapped effects.
Principles of Orientation and Mobility	Introduces fundamental principles, theory of sensory information acquisition by the severely visually impaired for non-visual locomotion; practical applications.
Low-vision Implications	Course covers principles of visual perception development; implications of visual field losses; introduction to optics; optical, non-optical low-vision aids; procedures for vision screening; vision stimulation activities; low-vision simulation experiences.
Introduction to Research and Its Applications	Examines the application of scientific approaches, methodology to problem solving; includes research design, data techniques analysis, their relation to action research; requires a research project.
Managing the Learning Environment	Course covers theory, research, and application for behavioral management. Current issues and research in applied behavioral analysis and other forms of classroom management; cognitive behavioral and emerging management procedures, emphasis on application of research.
Disability Law	Course examines state, federal laws, litigation, policies, and administrative practices relevant to education, employment, treatment of individuals with disabilities; includes historical development, current issues.

Course	Description
Introduction to Methods of Orientation and Mobility	Covers practical application of orientation and mobility techniques used by blind, visually impaired in indoor, residential and small business environments; blindfolds, low-vision simulators emphasize use of residual senses to perceive, integrate, react to environmental stimuli.
Advanced Methods of Mobility	Covers techniques of independent mobility for the blind; includes supervised blindfold and low-vision simulation activities in commercial, rural environments; requires special travel situations, use of public assistance and public transportation, shopping malls, in-store travel.
Practicum in Orientation and Mobility	Professionally supervised work experience is offered with individuals with visual impairments in an appropriate rehabilitation or educational setting.
Internship in Orientation and Mobility	Professionally supervised work experience with individuals with visual impairments is offered in an appropriate rehabilitation or educational setting.

ACVREP Certification Requirements for Orientation and Mobility Specialists(109)

Category 1 Certification

To be eligible for Category 1 certification, candidates must provide proof of a minimum of a Bachelor's degree (or foreign equivalent, as verified through an independent credential evaluation company), with an emphasis in Orientation and Mobility (O&M), from an AER approved university or college O&M program at the time the degree or program of study was granted or completed.

Supporting documentation should include the following:

- Official transcripts documenting the degree.

In conjunction with the university program, successful completion of 350 hours of "discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by an onsite COMS.

Supporting documentation required includes the following:

- An "ACVREP Clinical Competency Evaluation Form for Certified Orientation & Mobility Specialists (COMS)" completed by the on-site COMS supervisor.
- Applicants completing more than one internship, to meet the minimum hour or competency requirements, are required to submit "ACVREP Clinical Competency Evaluation Forms for Certified Orientation & Mobility Specialists (COMS)" for each internship, as completed by the on-site COMS supervisors.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the COMS written exam demonstrating knowledge of low-vision principles and applications.

Category 2 Certification

To be eligible for Category 2 certification, candidates must provide proof of having a minimum of a Bachelor's degree (or foreign equivalent, as verified through an independent credential evaluation company), with an emphasis in O&M, from a university or college program of study in O&M that meets the core curriculum content in O&M. The core curriculum content is defined as the twelve course content areas/domains listed in the ACVREP Orientation and Mobility Specialist Certification Handbook. These core areas include:

1. Medical Aspects of Blindness and Visual Impairment.
2. Sensory Motor Functioning.
3. Psychosocial Aspects of Blindness and Visual Impairments.
4. Human Growth and Development Over the Lifespan.
5. Concept Development.
6. Multiple Disabilities.
7. Systems of Orientation and Mobility.
8. Orientation and Mobility Skills and Techniques.
9. Instructional Methods, Strategies, and Assessment.
10. History and Philosophy of Orientation and Mobility.
11. Professional Information.
12. Development, Administration, and Supervision of Orientation and Mobility Programs.

Supporting documentation should include the following:

- Official transcripts documenting the degree; completion of the “O&M Core Domain Area Chart”, demonstrating where each core domain has been met in the applicant’s coursework (include course numbers and titles); and course catalog descriptions or course syllabi.

Having completed of 350 hours of “discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc.” The practice must be supervised by an onsite COMS.

Supporting documentation required to demonstrate that the candidate has met the above requirements include the following:

- An “ACVREP Clinical Competency Evaluation Form for Certified Orientation & Mobility Specialists (COMS)” completed by the on-site COMS supervisor.

- Applicants completing more than one internship, to meet the minimum hour or competency requirements are required to submit “ACVREP Clinical Competency Evaluation Forms for Certified Orientation & Mobility Specialists (COMS)” for each internship, as completed by the on-site COMS supervisors.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the COMS written exam demonstrating knowledge of low-vision principles and applications.

Category 3 Certification

To be eligible for Category 3 certification, candidates must provide proof of completion of an orientation and mobility certification preparation program from a

university or college that meets the core curriculum content in O&M, and proof of a minimum of a Bachelor's degree (or foreign equivalent, as verified through an independent credential evaluation company) in any field of study. The core curriculum content is defined as the twelve course content areas/domains listed in the ACVREP Orientation and Mobility Specialist Certification Handbook. These core areas include:

1. Medical Aspects of Blindness and Visual Impairment.
2. Sensory Motor Functioning.
3. Psychosocial Aspects of Blindness and Visual Impairments.
4. Human Growth and Development Over the Lifespan.
5. Concept Development.
6. Multiple Disabilities.
7. Systems of Orientation and Mobility.
8. Orientation and Mobility Skills and Techniques.
9. Instructional Methods, Strategies, and Assessment.
10. History and Philosophy of Orientation and Mobility.
11. Professional Information.
12. Development, Administration, and Supervision of Orientation and Mobility Programs.

Supporting documentation required include the following:

- Official transcripts documenting at least a Bachelor's degree and showing completion of the orientation and mobility certification preparation program; completion of the "O&M Core Domain Area Chart", demonstrating where each core domain has been met in their coursework (include course numbers and titles); and course catalog descriptions or course syllabi.

In conjunction with the university program, successful completion of 350 hours of "discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by an onsite COMS.

Supporting documentation required to demonstrate that the candidate has met the above requirements include the following:

- An "ACVREP Clinical Competency Evaluation Form for Certified Orientation & Mobility Specialists (COMS)" completed by the on-site COMS supervisor.

- Applicants completing more than one internship, to meet the minimum hour or competency requirements, please submit "ACVREP Clinical Competency Evaluation Forms for Certified Orientation & Mobility Specialists (COMS)" for each internship, as completed by the on-site COMS supervisors.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the COMS written exam demonstrating knowledge of low-vision principles and applications.

Rehabilitation Teacher

Typical Curriculum for a Degree in Rehabilitation Teaching

We provide a summary of the areas covered by the curriculum of a "typical" degree in rehabilitation teaching in Table B-5. The information contained within this table originates from the prospectus of the University of Arkansas at Little Rock (2003 to 2004).(136)

Table B-5. Typical Curriculum of Rehabilitation Teacher Degree Program

Course	Description
Braille and relevant formats	Teaches skills of reading and writing using Braille and other relevant formats Grade II Standard English Braille, including transcription rules and formats, use of slate and stylus, use of Perkins Braillers.
Medical Aspects of Blindness and Associated Disabilities	Anatomy, structure, and function of the eye; frequently occurring diseases, malfunctions in children and adults; includes treatment procedures for disease process, rehabilitation and education implications of handicapped effects.
Implications of Low Vision	Principles of visual perception development; implications of visual field losses; introduction to optics; optical, non-optics low-vision aids, procedures for vision screening; vision stimulation activities; low-vision simulation experiences.
Psychological Aspects of Disability	Outlines the psychological and sociological aspects of disability, including community attitudes toward individuals with disabilities, strategies to change negative attitudes, adjustment factors in living with disabilities, and methods for supporting successful adjustment to disabilities.
Methods of Teaching Communication Skills to Persons with Impaired Vision	Methodologies for teaching expressive and receptive adaptive communication skills, including Braille, keyboarding, handwriting, recording, and use of assistive computer technology.
Principles of Rehabilitation Teaching	Principles and philosophies of providing rehabilitation teaching services to adults of all ages with visual impairments; includes conducting needs assessment interviews, writing individualized teaching plans.
Introduction to Rehabilitation	Philosophy of vocational rehabilitation; includes history, legislation, related professional organizations, particularly as they relate to services for visually impaired.
Techniques of the Counseling Interview	Techniques, procedures for counseling interviews, emphasis on mastery of levels of skills within a microskills hierarchy for counseling interviews, appropriate use of skills in various stages of counseling.

Course	Description
Methods of Teaching Independent Living Skills to Persons with Impaired Vision	Introduction to concepts and techniques used to teach individuals with visual impairments the skills and knowledge needed to function in diverse environments. Topics include: concept and motor development, spatial organization and orientation, and skills in the areas of basic orientation and mobility, personal management, communication, and recreation & leisure.
Introduction to Research	Application of scientific approaches and methodology; includes research design, data techniques analysis, their relation to action research, requires a research project.
RT Practicum	Faculty supervised practice in the use of required skills and competencies in the rehabilitation of individuals with visual impairments in rehabilitation or education settings
RT Internship	Professional rehabilitation work experiences in an appropriate rehabilitation or educational setting with individuals with visual impairments.

ACVREP Certification Requirements for Rehabilitation Teachers(108)

Category 1 Certification

To be eligible for category 1 certification, candidates must provide proof of a minimum of a Bachelor's degree (or foreign equivalent, as verified through an independent credential evaluation company), with a specialization in the area of Rehabilitation Teaching (RT), from an AER approved RT program at the time the degree was granted. If you are unsure of the status of your school's program when your degree was granted, contact your university program coordinator.

Supporting documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree.

To obtain certification the candidate must complete at least 350 hours of "discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by a Rehabilitation Teacher Certified (RTC). The practice can be supervised by an onsite or offsite RTC. The internship must include the provision of a variety of direct services to adults with vision impairments or blindness.

Supporting documentation is required to prove that the above requirement has been met. This supporting documentation should include the following:

- A "Clinical Performance Evaluation" form completed by your RTC practice supervisor.
- If the RTC practice supervisor is offsite, a "Provisional Contract Application" must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place.

- Following the practice, the “Provisional Contract Terms of Completion” form must be completed by the practice supervisor, signed by the practice supervisor and applicant, and submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the RT written exam demonstrating knowledge of low-vision principles and applications.

Category 2 Certification

To be eligible for category 2 certification, candidates must provide proof of a minimum of a Bachelor’s degree (or foreign equivalent, as verified through an independent credential evaluation company), with a specialization in the area of RT. This degree should be granted from a university or college with a program of study in RT that meets the core curriculum of RT. The core curriculum must meet all 14 of the following coursework areas:

1. Principles of adult education and learning.
2. Counseling/professional interpersonal relations.
3. Assessment.
4. Human development (including child development, gerontology or aging).
5. Medical and psychological aspects of disability.
6. Medical aspects of blindness and low vision.
7. Introduction to the rehabilitation process.
8. Cultural diversity.
9. Research.
10. Adapted communication systems.

11. Adapted techniques of daily living skills.
12. Case management.
13. Computer literacy/assistive technology.
14. Program of study in contracted braille reading, writing, and instruction.

Supporting documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree.
- Written documentation that the candidate has received education in the areas listed above. Documentation can include course descriptions or course syllabi, certificates of completion, continuing education (CE) hour information, continuing education unit (CEU) information, etc.

To obtain certification the candidate must complete at least 350 hours of discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc. The practice must be supervised by a Rehabilitation Teacher Certified (RTC). The practice can be supervised by an onsite or offsite RTC. The internship must include the provision of a variety of direct services to adults with vision impairments or blindness.

Supporting documentation is required to prove that the above requirement has been met. This supporting documentation should include the following:

- A “Clinical Performance Evaluation” form completed by the RTC practice supervisor.
- If the RTC practice supervisor is offsite, a “Provisional Contract Application” must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place.

- Following the practice, the “Provisional Contract Terms of Completion” form must be completed by the practice supervisor, signed by the practice supervisor and applicant, and submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the RT written exam demonstrating knowledge of low-vision principles and applications.

Category 3 Certification

To be eligible for Category 3 certification, candidates must provide proof of a minimum of a Bachelor’s degree (or foreign equivalent, as verified through an independent credential evaluation company) in any field and documentation of education in the following core curriculum components:

1. Principles of adult education and learning.
2. Counseling/professional interpersonal relations.
3. Assessment.
4. Human development (including child development, gerontology or aging).
5. Medical and psychological aspects of disability.
6. Medical aspects of blindness and low vision.
7. Introduction to the rehabilitation process.
8. Cultural diversity.
9. Research.
10. Adapted communication systems.
11. Adapted techniques of daily living skills.
12. Case management.

13. Computer literacy/assertive technology.
14. Successful completion of a Braille proficiency test or recognized program of study in contracted Braille.

Supporting documentation required to demonstrate eligibility includes:

- Official transcripts documenting the degree. Also, to demonstrate knowledge of the 14 coursework areas, the applicant must provide written documentation that s/he has received education in these areas. Examples of documentation include course descriptions or course syllabi, certificates of completion, continuing education (CE) hour information, continuing education unit (CEU) information, etc.

To obtain certification the candidate must complete at least 350 hours of "discipline specific, supervised practice that includes, but is not limited to, direct service hours, and related phone calls, meetings, observations, report writing, etc." The practice must be supervised by a Rehabilitation Teacher Certified (RTC). The practice can be supervised by an onsite or offsite RTC. The internship must include the provision of a variety of direct services to adults with vision impairments or blindness.

Supporting documentation is required to prove that the above requirement has been met. This supporting documentation should include the following:

- A "Clinical Performance Evaluation" form completed by the RTC practice supervisor.
- If the RTC practice supervisor is offsite, a "Provisional Contract Application" must also be completed, signed by the practice supervisor and applicant, and approved by the ACVREP office prior to the practice taking place.
- Following the practice, a "Provisional Contract Terms of Completion" form must be completed by the practice supervisor, signed by the

practice supervisor and applicant, and submitted to the ACVREP office.

Having met all of the requirements above, candidates must sign a written statement agreeing to uphold high ethical and professional standards and pass the RT written exam demonstrating knowledge of low-vision principles and applications.

Appendix C. Ongoing Trials

Table C-1. Ongoing Trials

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
A randomized trial of visual impairment interventions for nursing home residents(137)	Sheila K. West, PhD Wilmer Eye Institute, Rm 129 600 North Wolfe Street Baltimore, MD 21287 Email: unknown	To compare, within the confines of a randomized controlled trial, quality of life experienced by a group of institutionalized individuals who receive usual care and a group of comparable individuals who receive targeted vision restoration and vision rehabilitation interventions.	Functioning of residents at 6 months and 12 months Mood and behavior patterns to be assessed using the Minimum Data Set section E (Mood and Behavior Patterns Physical function: to be assessed using Minimum Data Set section G (activities of daily life and mobility) Socialization: Instrument name not reported Recreational Activities: to be assessed using the Minimum Data Set (questions on activities, supplemented with other activities pertinent to goals for low-vision patients.	National Institute of Aging (AG 15812)	Not reported
Evaluating independent living outcomes for blind and visually impaired older people	Corinne Kircher, PhD American Foundation for the Blind 11 Penn Plaza Suite 300 New York, NY 10001 Email: corinne@afb.net	To develop and pilot test a nationally standardized minimum dataset through which research can be conducted on the outcomes of services for older persons with visual impairments.	Dataset will contain information on pre-service consumer data, post-service consumer profiles, functional outcomes assessment data, consumer satisfaction and perceived outcome data	NIDRR	October, 2003[a]

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
Model distance-learning computer training program for blind and visually impaired individuals	Curtis Chong Iowa Department for the Blind 524 Fourth Street Des Moines, IA 50309 Email: assist@blind.state.ia.us	To create a model distance-learning program that delivers training to people who are blind or who have visual impairments. The purpose being to increase IT educational oppotunites and employability in the IT field	NR	NIDRR	December, 2006
Information technology for independence	Bambang Parmanto, PhD University of Pittsburgh 6026 Forbes Tower Pittsburgh, PA 19260 Email: parmanto@pitt.edu	To explore methods and technologies to mitigate barriers to computer and internet use encountered by people with visual impairments	Accessibility	NIDRR	January, 2008
Smith-Kettlewell Rehabilitation Engineering Research Center	John A. Brabyn, PhD The Smith Kettlewell Eye Research Insitute 2318 Fillmore Street San Francisco, CA 94115 Email: rerc@ski.org	To explore practical tools allowing lay personnel to screen and assess visual impairments affecting problems unique to this age group. The purpose being to allow timely identification and referral to appropriate clinical rehabilitation specialists	NR	NIDRR	August, 2005
Wayfinding technologies for people with visual impairments	Micheal May Sendero Group, LLC 1118 maple Lane Davis, CA 95616 Email: mikemay@senderogroup.com	To develop hardware and software platforms that provide accessible location and navigation information for people who are blind or who have visual impairments who are traveling in indoor or outdoor environments	Improvements in ability to travel and navigate indoors and outdoors	NIDRR	December, 2006

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
RRTC on improving vocational rehabilitation services for individuals who are blind or have severe visual impairments	J. Elton Moore, EdD Mississippi State University PO Box 6189 Mississippi State, MS 39762 Email: schaefer@ra.msstate.edu	To improve vision rehabilitation services for individuals who are blind or have severe visual impairments	Documentation of impact of changes in disability and employment legislation Documentation and analysis of existing state and federal data sets to determine different employment outcomes Documenting how VR services overcome environmental barriers to improve employment outcomes.	NIDRR	December, 2006
Indoor orientation and wayfinding aid for vision loss	Joseph A. Devita Charmed Technology 4961 Coldstream Drive Atlanta, GA 30360 Email: joe@charmed.com	To develop a product that increases the functional independence and quality of life of both older and younger people with vision loss by giving them a simple means of 1) orienting to and navigating through indoor spaces, 2) identifying office names and numbers in public buildings, 3) identifying products and pricing information on store shelves, and 4) easily locating and reading Braile labels from a distance.	NR	NEI Grant #: 1R43EY014747-01	July, 2004
Interventions for visual loss in nursing home residents	Sheila K. West, PhD Johns Hopkins University 3400 N Charles Street Baltimore, MD 21218 Email: shwest@jhmi.edu	To measure, in a randomized controlled trial, the impact on socialization, and a variety of other measures of function, of a visual impairment intervention program in patients living in nursing homes	Socialization scores (instrument not described) Utilization of appropriate eye care services Changes in physical function and mobility (instrument not described) Changes in mood (instrument not described) Changes in psychoactive drug use.	NEI Grant #: 5R01AG015812-04	April, 2004

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
Engineering approaches to low-vision rehabilitation	Eli Peli, PhD Schepens Eye Research Institute Boston, MA 02114 Email: eli@vision.eri.harvard.edu	To explore various engineering approaches to low-vision rehabilitation. These include multiplexing dynamic control of displays, and image enhancement.	NR	NEI Grant # 5R24EY012890-04	September, 2005
Object recognition and navigation—Normal and low vision	Gordon E. Legge, PhD University of Minnesota 200 Oak Street SE Minneapolis, MN 55455 Email: legge@umn.edu	To develop a conceptual framework for describing visual exploration of objects and environments.	NR	NEI Grant #5R01EY002857-23	March, 2004
Predictors of successful optical rehabilitation in ARM	Dawn K. Decarlo, PhD Nova Southeastern University College Avenue Fort Lauderdale, FL 33314 Email: ddecarlo@nova.edu	The long-term goals of this study are to develop a model of low-vision rehabilitation for pts with AMD that significantly increases quality of life. The first stage of the study is to develop a test, or battery of tests, to determine which patients are most likely to be successful with optical low-vision rehabilitation.	NR	NEI Grant #1R15EY015108-01	January, 2007
Distance learning system for low-vision rehabilitation	Robert W. Massof, PhD Emerald Events, Inc. 1409 Saybrook Court Pasadena, CA 21122 Email: rmassof@lions.med.jhu.edu	To develop and implement a distance learning system for educating low-vision therapists and other healthcare providers who work with the visually impaired by means of self-paced courses.	NR	NEI Grant #1R41EY014734-01	March, 2004

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
A smart telescope for low vision	Mark J. Nitzberg Blindsight Corporation 45-A Fayerweaher St. Cambridge, MA 02138 Email: nitzberg@blindsightcorp.com	To test the feasibility of a "Smart Telescope" for use to improve the ability of visually impaired individuals in tasks such as travel, navigation and social interaction	NR	NEi Grant # 3R43EY014487-01S1	August, 2004
Enhanced video for older adults with low vision	Elizabeth Dugan New England Research Institutes, Inc. 9 Galen Street Watertown, MA 02472 Email: dbugan@neri.org	To produce and test a specially enhanced video and accompanying resource pamphlet about living with low vision.	None	NEI Grant # 5R44EY012443-03	Feb, 2004
Epidemiology of age-related ocular disease	Ronald Klein, PhD University of Wisconsin Madison 750 University Avenue Madison, WI 53706 Email: kleinr@epi.ophth.wisc.edu	To followup a population-based cohort for 15 years with the aim of determining the long-term impairments of aging. In addition, to determine the incidence and associated risk factors for ocular disorders such as branch-retinal vein occlusion, retinal arteriolar emboli, and epiretinal membranes	Occurrence and type of ocular disease Risk factors	NEI Grant #: 5U10EY006594-17	May, 2007

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
Depression, disability and rehabilitation in vision impaired elders	Amy Horrowitz Lighthouse International 111 E 59th Street New York, NY 10022 Email: ahorowitz@lighthouse.org	To examine the course of depression over time among elderly individuals with visual impairment. Specific aims include: 1) to document prevalence, course, and severity of depression among visually impaired elders over time, 2) to examine influence of depression in utilization of vision rehabilitation services, 3) to examine mechanisms by which vision rehabilitation service affect the severity and course of depression, 4) to test a longitudinal model explicating the interrelationships among vision impairment severity, co-morbid health conditions, functional disability, rehabilitation service utilization and depression, 5) to examine gender differences relative to aims 1-4.	NR	NEI Grant #: 5R01EY012563-05	September, 2004
Reading enhancement for patients with visual field loss	Michael A. Sandberg Harvard University Medical School Medical School Campus Boston, MA 02115 Email: masandberg@aol.com	To develop assistive devices and rehabilitation strategies to minimize the impact of visual impairment in everyday life, and reduce disability and societal limitations among visually impaired individuals	Reading performance No other outcomes reported	NEI Grant #: 5R03EY013769-03	December, 2004
Visual control of mobility in low vision	Kathleen A. Turano, PhD Johns Hopkins University 3400 N Charles Street Baltimore, MD 21218 Email: Kathy@lions.med.jhu.edu	To understand how vision impairment affects the ways in which information is explored and sources of environmental information are used to guide mobility	Gaze patterns and trajectories	NEI Grant #: 5R01YE007839-15	June, 2006

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
Locating and reading informational signs	Alan L. Yuille University of California Los Angeles 10920 Wilshire Blv Los Angeles, CA 90024 Email: yuille@stat.ucla.edu	To construct computer systems to enable the blind and severely visually impaired to detect and read informational text in city scenes	NR	NEI Grant #: 5R01EY013875-02	August, 2004
Binocular electronic magnifier for the visually impaired	Noa M. Rensing Microoptical Engineering Corporation 33 Southwest Park Westwood, MA 02090 Email: rensing@microopticalcorp.com	To develop a head mounted binocular electronic magnifier.	NR	NEI Grant #: 1R43EY014721-01	April, 2004
VA outcome measurement tools development project	PI Joan Stelmack, OD Blind Rehabilitation Center Edward Hines VA Hospital Hines, IL 60141 Email: Joan.Stelmack@med.va.gov	To develop methods and tools that can be used in a clinical trial to evaluate the effectiveness of eccentric viewing training.	Assessed with scanning laser ophthalmoscope, AVIAS visual fields system, EYESCAN eye tracking and VA LV VFQ-48 visual function questionnaire	Veterans Administration	NR
VA outcome measurement tools development project	PI Joan Stelmack, OD Blind Rehabilitation Center Edward Hines VA Hospital Hines, IL 60141 Email: Joan.Stelmack@med.va.gov	To test the sensitivity of the Veteran Affairs 48 item Low-vision Visual Functioning Questionnaire to assess changes in the difficulty patients with vision loss have performing daily activities before and after low-vision rehabilitation.	Difficulty performing daily activities	Veterans Administration	NR

Project Title	Principal Investigator	Study Objective	Outcomes Assessed	Funding Agency	Study completion date?
Evaluation of a new outpatient low-vision program for legally blind veterans	PI Joan Stelmack, OD Blind Rehabilitation Center Edward Hines VA Hospital Hines, IL 60141 Email: Joan.Stelmack@med.va.gov	Study objectives are to: (1) Conduct a multi-center randomized clinical trial to evaluate the effectiveness of an outpatient low-vision rehabilitation program for legally blind veterans with central visual field loss. (2) Determine if the mean change in VA LV VFQ scores from baseline to 3 months after rehabilitation can be predicted by baseline measures of visual impairment, functional status, and life state measures or explained by measures of functional status after rehabilitation. (3) Perform an economic evaluation of costs and cost-effectiveness of the new outpatient low-vision program.	Primary outcome is comparison of the mean change in self-report of difficulty performing daily activities measured with the Veterans Affairs Low Vision Visual Functioning Questionnaire (VA LV VFQ) from baseline to three months after veterans participate in a low-vision outpatient program or usual care (waiting list for inpatient blind rehabilitation services) control group. Functional Status: SF-36 (version modified for veterans) Adjustment to Vision Loss: Adaptation to Vision Loss Scale Cognitive Status: Telephone Interview for Cognitive Status Visual Skills for Reading: Pepper Visual Skills for Reading Test Teacher ratings of veteran visual skills and use of low-vision devices	VA Rehabilitation Research and Development Service	October, 2007

[a] Although completion date has passed study is still ongoing.

NR Not reported

Appendix D. Outcome Measures

Table D-1. Instruments used to Evaluate Activities of Daily Living

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Dahlin Ivanoff ADL Scale	None	Yes Dahlin Ivanoff et al.(138)	A 29 item instrument divided into 7 performance domains: meals, self-care, care of clothing, communication, cleaning, mobility, shopping, and financial management. Perceived confidence in performing a number of tasks is rated on a scale of 1 to 4 (1 = secure, 4 = very insecure). Lower scores indicate less disability.	Dahlin Ivanoff et al.(27)
Blind Rehabilitation Services Functional Outcomes Survey	BRCFOS	Yes De l'Aune et al.(139,140)	This instrument is a modified and extended version of FIMBA. Two versions of this instrument are available. One for use in veterans (BRCFOS) and one for use in non-veterans (BRCFOSn). BRCFOS originally consisted of 50 items but was reduced using factor analysis to its current 28 items. BRCFOSn currently consists of 60 items (10 items were added to the 50 item version of BRCFOS.	
Functional Independence Measure	FIM	No Granger(141) Deutsch et al.(142) Ottenbacher et al.(143)	18 item, 5-domain scale developed to assess an individual's degree of independence. The domains are: sphincter management, mobility, locomotion, communication, and social cognition. This instrument is widely used in many physical medicine and rehabilitation programs across the U.S.A.(139) Each item is rated according to a seven-level scale which ranges from 1 (total assistance is required for task) to 7 (no assistance is required at all for task). Lower scores = lower disability	
Functional Independence Measure for Blind Adults	FIMBA	Yes Long and Crews(144) (Also see D'lune et al.(139))	An adaptation of FIM (see above) for specific use in patients with visual impairment. Developed by the VA's Blind Rehabilitation Service Task Group on Outcomes Research in conjunction with the VA's Rehabilitation Research and Development Center. The present form of the FIMBA is a 40 item checklist. Lower scores = lower disability.	

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Engel activities of daily living subscale	None	No Custom instrument developed by Engel et al.(34) for use in their study	Consists of a series of questions aimed at assessing the difficulty associated with a number of different activities of daily living on a scale of 1 to 3 (1 = not at all difficult, 3 = very difficult). Areas assessed include use of the phone, preparing meals, paying bills, walking inside home, walking outside the home, use of public transport, taking medications. Lower scores = lower disability.	Engel et al.(34)
Face recognition: Familiar face recognition	FFR	No Custom outcome measure developed by Tejara et al.(38) for use in their study.	Facial images of familiar persons digitized from a range of photographs in popular magazines. Images cropped to head only and resized to 483 by 471 pixel size (24-bit color depth). Images displayed so that they were "life sized" at a viewing distance of 4 meters with an angular subtense of 4.9 degrees. Face recognition ability scored as the percentage of correctly identified images as a proportion of the number of images identified at 0.35 meters (facial angular subtense :30 degrees). This was to distinguish between failed recognition due to visual impairment and failed recognition due to a lack of familiarity with the displayed images. In each case the control task is carried out after the FFR test data has been collected.	Tejara et al.(38)
Face recognition: Face expression difference	FED	No (Custom outcome measure developed by Tejara et al.(38) for use in their study).	Four images of the same person (300 by 391 pixel image size and 24-bit color depth) displayed on a CRT screen at a distance of 4 meters (angular subtense: 11.0 degrees). Images presented in a two by two arrangement. Three of the images are identical while fourth image differed in facial expression. Patients are instructed to choose the "odd one out." No naming of the facial expression is required. Following a demonstration trial, 40 presentations with a range of facial expressions ("happy," "sad," "surprised," etc.) displayed. Each image set is presented for 6 seconds. FED scored as the percentage of images correctly identified as a proportion of the number of presentations.	Tejara et al.(38)

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Functional Assessment of Self-Reliance on Tasks	FAST	Yes Head et al.(145)	A 14 item, three domain scale. Domains include everyday activities of daily life, health promotion, and mobility. Items are scored on a 5-point ordinal scale (1 = extreme problem, 5 = no problem). Higher scores = lower disability.	
Impact of Vision Impairment	IVI	Yes Weih et al.(146) Hassell et al.(147)	A 32 item, 5-domain questionnaire developed to measure the impact of vision on restriction of participation in daily activities. Domains include: leisure, household, social, mobility, emotional. Items are scored on a 6-point ordinal scale (0 = vision does not interfere with activity at all, 5 = vision interferes with activity all the time or cannot do because of eyesight). Lower scores = lower disability.	
Manchester Low-vision Questionnaire	MLVQ	Yes (AMD pts) Harper et al.(148)	A 20 item, 2 section questionnaire. Section 1 measure the use and satisfaction with low-vision aids and the second section measures the effectiveness of low-vision aids in improving activities of daily life. Items are scored using a 5-point scale.	Hinds et al.(35)
Melbourne Low-vision Activities of Daily Living Index	MLVAI	Yes Haymes et al.(149-151)	A 25 item, 2 section instrument. Section 1 involves the observation of the performance of 16 complex instrumental activities of daily living. Section 2 is a self report questionnaire on the performance of nine basic self-care activities of daily living. Scores for each item range from 1 to 4. A score of 1 = subject unable to complete task and a score of 4 = subject completed task quickly and efficiently without errors. Higher scores = lower disability	
Veterans Affairs 13 Item Functional Outcome Survey	VA-13	Yes De l'Aune et al.(32)	Refined version of the 50-item BRCFOS described above. A 13–item, self-report instrument designed to measures the frequency of, independence in, and satisfaction with performing a number of specific tasks. The instrument is applied after discharge from rehabilitation services and individuals are asked whether since discharge they have performed a number of tasks.	

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Mobility performance	PPWS and LOGER	No Custom outcome measure developed by Soong et al.(31) for use in their study	Mobility performance measured using an indoor obstacle course. Two measures of mobility performance determined: preferred walking speed (PPWS) and error score. PPWS is actual walking speed/preferred walking speed. Preferred walking speed determined by recording the time taken for a subject to walk an unobstructed, straight 20 m corridor illuminated at 291 lux. Error score is the number of errors made while traversing the obstacle course. Errors defined as follows: body contact with obstacles, errors made in task performance, straying off mobility path. Two errors counted if subject is unable to reorient as a result of contact with an obstacle or straying off path. Total number of errors converted into a log transformed error score (LOGER) using the formula: LOGER = $\log_{10}[100/(1+\text{number of errors})]$.	Soong et al.(31)
Reading performance	None	NA	Usually consists of reading speed and/or reading duration. Reading speed is typically measured as the number of words read per minute. Reading duration is typically measured as the maximum time spent reading	Nilsson et al.(36) Peterson et al.(29) Goodrich and Kirby(30) Eperjesi et al.(33)

AMD Age-related macular degeneration
NA Not applicable

Table D-2. Instruments used to Evaluate Mood

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Center for Epidemiologic Studies Depression Scale	CES-D	No Radloff et al.(152) Andreson et al.(153) Verdier-Tailefer et al.(154)	A 20 item, six domain scale. Domains include: depression: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. The CES-D may be self or interviewer-administered. Response categories indicate the frequency of occurrence of each item, and are scored on a 4-point ordinal scale (0 = rarely or none of the time, 3 = most or all of the time). Scores for items 4, 8, 12, and 16 of this instrument are reversed before summing all items to yield a total score. Total scores can range from 0 to 60. Higher scores = higher level of depression.	Engel et al.(34)
Geriatric Depression Scale-Abbreviated	GDS-A	Yes Galaria et al.(155)	A four item scale developed from the 15 item GDS for use in visually impaired older patients. Each item is scored using a binomial scoring system (Yes = 1, No = 0). Higher scores = higher level of depression	
Profile of Mood States	POMS	No McNair et al.(156,157)	A 65 item, self report instrument designed to assess emotional distress during previous week. Each item is scored on a 5-point Likert scale ranging from 0 = not at all distressed to 4 = extremely distressed. Scores range from 0 to 232. Higher scores = higher level of emotional distress.	Brody et al.(26)

AMD Age-related macular degeneration
NA Not applicable

Table D-3. Instruments used to Evaluate Psychosocial Functioning

Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
Engel social activities subscale	None	No Custom instrument developed by Engel et al.(34) for use in their study	Consists of a series of questions aimed at assessing patients participation in social activities on a scale of 1 to 4 (1 = participates often, 4 = rarely or never participates). Areas assessed include socialization with relatives and friends, phone interactions, participation in club-related activities, senior center activities, hobbies, physical activities, satisfaction with activity. Also includes a question on the patient's perspective on their degree of isolation. This latter question is also scored on a scale of 1 to 4 (1 = does not feel isolated, 4 = feels very isolated). Higher scores = poorer psychosocial status.	Engel et al.(34)
Macular Degeneration Self Efficacy Questionnaire	AMD-SEQ	Yes Body et al.(131)	A 13 item 3-domain instrument rated on a scale of 1 to 100. Domains include: knowledge self-efficacy, activity self-efficacy, and communications self-efficacy. High scores = reduced disability.	Brody et al.(26)

AMD Age-related macular degeneration
NA Not applicable

Table D-4. Instruments used to Evaluate Quality of Life

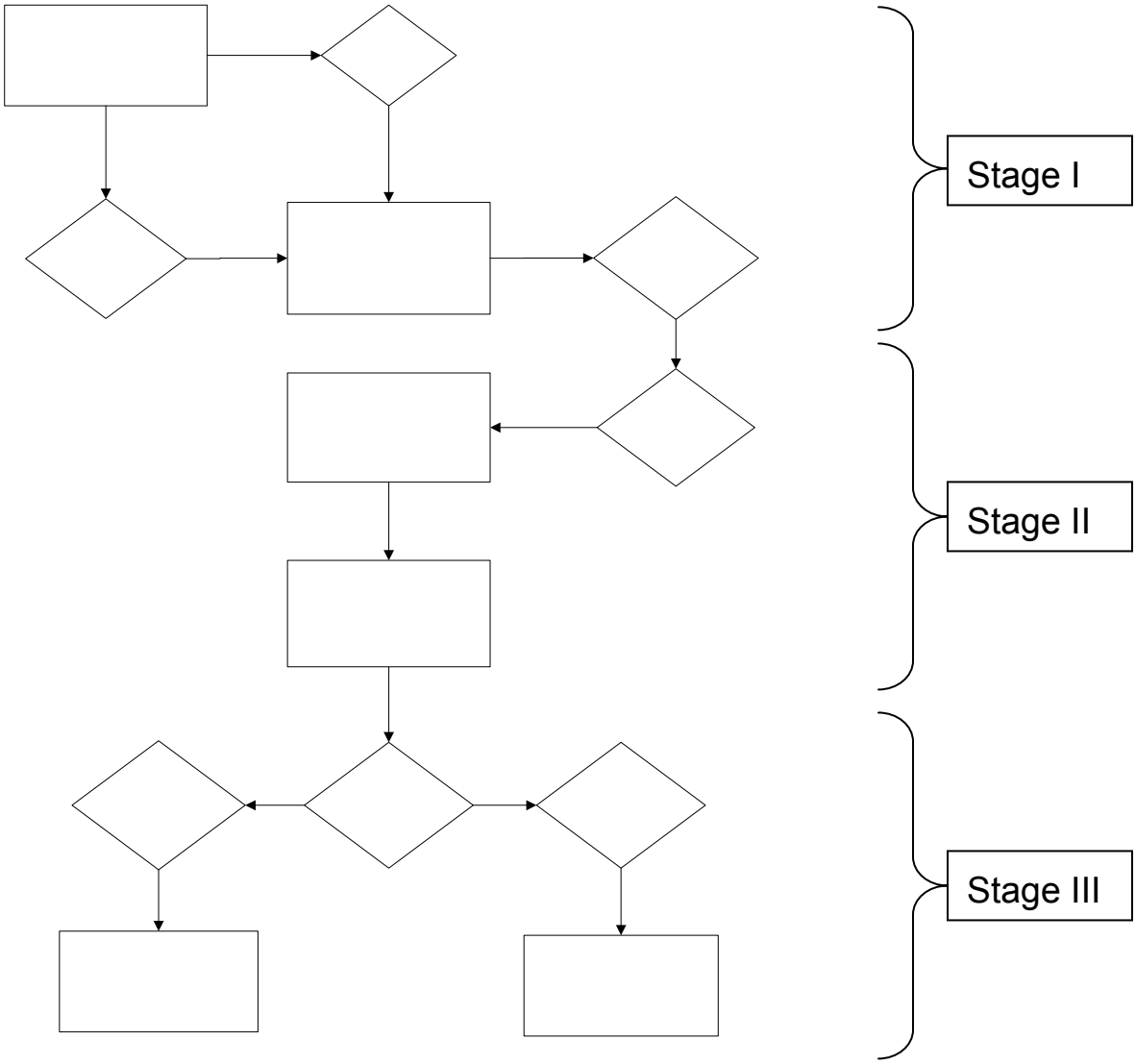
Measure	Acronym	Validated in target population? Relevant references	Description	Included studies that utilized this instrument
National Eye Institute Visual Function Questionnaire	NEI VFQ	Yes Mangione et al.(158) Massof et al.(159)	A 51 item, 13-domain instrument designed to provide a functional measure of health-related quality of life in relation to vision. Domains assessed include: 1) General health, 2) general vision, 3) ocular pain, 4) near vision, 5) distance vision, 6) social functioning, 7) emotional well-being, 8) vision expectations, 9) role difficulties, 10) dependency, 11) driving, 12) color, 13) peripheral vision. The NEI-VFQ is scored by linearly transforming the patient's rating for each item to values that range from 0 to 100. The average of the item scores for each subscale is computed to produce 13 domain scores each of which ranges from 0 to 100 to produce a single instrument score.	Body et al.(26)
25 item version of the National Eye Institute Visual Function Questionnaire	NEI VFQ-25	Yes Rossi et al.(160) Stelmack et al.(37) Rossi et al.(160) Clemons et al.(161)	A 25 item instrument consisting of statements specific to disabilities that result from vision loss (instrument also includes a number of optional items pertaining to general health and well-being). This instrument is sometimes used with a supplement that contains a further 14-tems. Each item is scored from 1 to 5 (1 = statement is definitely true, 5 = statement is definitely false). Higher scores = higher quality of life.	Stelmack et al.(37)
Low Vision Quality of Life Questionnaire	LVQOL	Yes Wolffsohn et al.(162,163)	A 25 item instrument. Each item graded on an ordinal scale from 1 to 5 (1 = great difficulty due to vision, 5 = no problem due to vision). Higher scores = lower disability.	
Vision-related quality of life "core questionnaire"	VCM1	Yes Frost et al.(164)	A 10 item questionnaire covering physical, social and psychological issues. Each item is scored on a 6-pont ordinal scale (0 = no problem, 5 = extreme problem. A total score is obtained by taking the means of the scores. Low score = higher quality of life.	Hinds et al.(35)
12 item Well-Being Questionnaire	W-BQ12	Yes (AMD pts only) Mitchell and Bradley(165)	A 12 item, three domain scale. Domains are the following: positive well-being, energy and negative well-being. Each item asks the patient how often they have experienced the feelings mentioned in each statement over the past few weeks. Each item is scored using an ordinal scale ranging from 1 to 3 (1 =-not at all, 3 = all the time). Low scores = higher quality of life.	

AMD Age-related macular degeneration
NA Not applicable

Appendix E. Literature Searches

The clinical studies included in this report were identified using the algorithm shown in Figure E-1. The first stage of this multi-staged study selection process consisted of a comprehensive literature search. The second stage of the process consisted of the retrieval of all articles that met a set of *a priori* retrieval criteria. The final stage of the study selection algorithm consisted of the selection of the actual studies that form the evidence base for this report using a set of *a priori* inclusion criteria.

Figure E-1. Study Selection Algorithm



Electronic Database Searches

To obtain information for this report, we searched the following databases for relevant information:

Searches in the PubMed, CINAHL, EMBASE, and PsycINFO databases were limited to English language and human populations. When possible, letters, news, notes, comments, editorials, and case reports were excluded from the retrieval.

PubMed (2000 – 2004)

1) vision, low[mh] OR visually impaired persons[mh] OR “low vision” OR “low-vision” OR “legally-blind” OR “vision-impaired” OR “visually impaired” OR “partially sighted” OR “sub-optimal vision”

2) rehabilitation[sh] OR rehabilitation[mh] OR rehabil*[ti,ab] OR rehabilitation centers[mh] OR “vision rehabilitation” OR model*

3) occupational therapy[mh] OR “occupational therapy” OR “OT” OR train* OR orientation OR mobility OR self-help devices[mh] OR sensory aids[mh] OR image enhancement[mh] OR image process, computer-assisted[mh] OR communication aids for disabled[mh] OR eyeglasses[mh] OR glasses[ti,ab] OR lenses

4) activities of daily living[mh] OR “ADL” OR “activities of daily living” OR reading[mh] OR self care[mh] OR self efficacy[mh]

5) eligibility determination[mh] OR referral and consultation[mh]

6) patient care team[mh] OR patient education[mh] OR social services OR delivery of healthcare[mh]

7) “quality of life” OR QOL

8) “electronic vision enhancement systems” OR “EVES” OR magnif* OR “low vision aids” OR “low vision services” OR “DirectX overlays” OR biofeedback OR “LVA” OR telescope* OR telescopic OR “virtual retinal display” OR “VRD” OR “CCTV” OR “MagniCam” OR “Clearview” OR “TSI Genie” OR “vision multiplexing” OR prisms OR “low vision enhancement system” OR “LVES”

9) #1 AND (#2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8)

Embase (2002 – 2004)

s1) (vision, low or visually impaired persons or visual impairment or visual disorder)/de

s2) low()vision or visual?()impair? or partial?()sight? or legal?()blind

s3) s1 or s2

s4) s3 and (rehab? or orient? or mobil? or vocation? or occupation? or train?)

s5) s3 and (program? or model? or service? or method?)

s6) s s4 or s5

PsycINFO (2000 - 2004)

s1) partially sighted or visually disabled or visually handicapped or vision disorders or low vision or exp vision, subnormal.

s2) exp rehabilitation counselors or exp rehabilitation centers or rehab? or psychosocial rehabilitation! or neuropsychological rehabilitation! or rehabilitation counseling! or vocational rehabilitation! or rehabilitation education! or rehabilitation! or vision rehabilitation or rehabilitation training

s3) mobility aids or visual stimulation or coping behavior or social services or perceptual orientation or orientation training or independent living or mobility training.

4) s1 and (s2 or s3)

CINAHL (2000 – 2004)

Low vision or exp vision, subnormal

Results were manually scanned for relevant citations.

The Cochrane Library (2000 through 2004 Issue 2)

low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant citations.

OTseeker

low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant citations.

RehabDATA/NARIC Web site

low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant citations.

Low Vision: The Reference **(found at:** www.visionconnection.org)

Model OR program OR service OR training

LexisNexis

Limited to State Administrative Codes & Registers, Combined

1) “low vision” w/s (rehab* or service)

2) “low vision” and (certif* or qualif* or credential* or credential*)

3) vision rehabilitation

4) orientation w/2 mobility and (licens* or certif* or credential* or qualify*)

CIRRIE

low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant citations.

National Guideline Clearinghouse (NGC)

Low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant guidelines.

National Quality Measures Clearinghouse (NQMC)

Low vision or visually impaired or vision rehabilitation or partial* sight*

Results were manually scanned for relevant measures.

The National Health Services Centre for Reviews and Dissemination (NHS CRD)

Low vision OR visual impairment OR visually impaired OR legally blind OR partial sight OR partially sighted

Results were manually scanned for relevant citations.

The following Web sites have been examined:

- Academy for Certification of Vision Rehabilitation and Education Professionals
- American Foundation for the Blind
- American Macular Degeneration Foundation
- American Occupational Therapy Association
- Association for Education and Rehabilitation of the Blind and Visually Impaired
- Blind American Veterans Foundation (BAVF)
- CMS
- ED.gov
- ECRI
- Eurosight
- Jewish Guild for the Blind
- Lions Club International
- Low Vision Council
- National Association for the Visually Handicapped
- National Council of State Agencies for the Blind
- National Eye Institute (NEI)
- National Federation of the Blind
- NY Academy of Medicine Grey Literature Report
- Vision2002

The tables of contents of the following journals were scanned back to 2000:

RE:view - Rehabilitation and Education for Blindness and Visual Impairment

Association for Education and Rehabilitation of the Blind

Searchable archive: http://pqasb.pqarchiver.com/heldref/

Journal of Visual Impairment and Blindness (J Vis impairm blindn)

American Foundation for the Blind

Back issue TOCs: http://www.afb.org/jvib/jvib_main.asp

Technology and Disability (Technol disabil)

http://iospress.metapress.com/link.asp?id=103188 (1999-2003)

http://www.ingenta.com/journals/browse/els/10554181 (1995-1998)

Hand Searches of Journal and Nonjournal Literature

Journals and supplements maintained in ECRI's collections were routinely reviewed. Nonjournal publications and conference proceedings from professional organizations, private agencies, and government agencies were also screened. Other mechanisms used to retrieve additional relevant information included review of bibliographies/reference lists from peer-reviewed and gray literature. (Gray literature consists of reports, studies, articles, and monographs produced by federal and local government agencies, private organizations, educational facilities, consulting firms, and corporations. These documents do not appear in the peer-reviewed journal literature).

Appendix F. Excluded Studies

Table F-1. Excluded Studies

Reference	Year	Reason for exclusion
Horowitz et al.(59)	2003	Study examined influence of health, social support, disability, and vision rehabilitation on depression among visually impaired older adults using hierarchical modeling. Study included an unknown number of individuals with cataract. Thus, an unknown number of study enrollees would not be considered to be suitable candidates for vision rehabilitation services. Although 81% of respondents received some type of rehabilitation services at some point between baseline and followup, no details of the service provided were reported.
Goodrich and Ludt(166)	2003	Study evaluates the effect of orientation and mobility training plus filters (to reduce glare) on visual perceptual detection distances. This is a measure of the *potential* for an individual to improve orientation and mobility performance but is not a measure of actual performance. The study did not, therefore, measure any of the outcomes of interest in this report. Purpose of study was to evaluate and validate a new outcome measure for measuring the effects of orientation and mobility training.
Reinhardt et al.(167)	2003	Study examined influence of socio-demographic characteristics, rehabilitation use and disability on friendships and family support over time among visually impaired older adults using hierarchical modeling. Study included an unknown number of individuals with cataract. Thus, an unknown number of study enrollees would not be considered to be suitable candidates for vision rehabilitation services. Although 76.2% of respondents received some type of rehabilitation services at some point between baseline and followup, details of the services provided were not detailed enough for our purposes.
Teresi et al.(168)	2003	28% of patients had normal corrected vision.
U.S. Department of Education(169)	2003	Annual report of the Independent Living Services for Older Individuals who are Blind. Provides financial information and data from a small number of selected case reports. Report also summarizes the findings of a patient satisfaction survey in a narrative format. No usable data were presented.
West et al.(137)	2003	Article describes a study's design and methodology. Does not report any outcome data.
Arnold et al.(170)	2002	Not generalizable to the U.S. Medicare population. Age range of participants was 5 to 57 years.
Horowitz and Reinhardt(58)	2002	Superseded by Horowitz et al.(59) (see above)
Khan et al.(171)	2002	Study describes the specific needs and types of low-vision devices prescribed to patients with AMD. No effectiveness data were presented. Study did not address any of the outcomes of interest in this report.
Li et al.(172)	2002	Not generalizable to the U.S. Medicare population. Age range of participants was 5 to 89 years. 36.5% less than 20 years of age.

Reference	Year	Reason for exclusion
Ludt and Goodrich et al.(173)	2002	Study evaluates the effect of orientation and mobility training plus filters (to reduce glare) on visual perceptual detection distances. This is a measure of the potential for an individual to improve orientation and mobility performance but is not a measure of actual performance. The study did not, therefore, measure any of the outcomes of interest in this report. Purpose of study was to evaluate and validate a new outcome measure for measuring the effects of orientation and mobility training.
Maxson et al.(174)	2002	Patient satisfaction survey that examined satisfaction of pts with services they received. None of the outcomes of interest in this report were addressed.
Haymes et al.(150)	2001	Aim of study was to investigate the ability of a new instrument (the Melbourne Low Vision ADL) to detect changes in functional ability as a result of low-vision rehabilitation.
Kleweno et al.(175)	2001	Not generalizable to the U.S. Medicare population. Age range of participants was 30 to 59 years.
Lavinski et al.(176)	2001	Study examined effect of contact lens telescope system on visual performance (Visual acuity and visual field). Study did not address any of the outcomes of interest in this report.
Moore et al.(177)	2001	Study was an evaluation of the perceptions of the services received by 940 elders under the Independent living Program for Older Individuals Who Are Blind (Title VII, Chapter 2 of Rehabilitation Act, 1973). No formal evaluation of patient outcomes performed.
Babcock et al.(178)	2000	Provides an overview of the development of discipline-specific training outcome assessments for the VA Blind Rehabilitation Service. Article presents outcome data but does not provide any details of the patients from whom the data were collected.
Ballinger et al.(179)	2000	Study examined effect of low-vision aids on visual performance (Visual acuity and visual field). Study did not address any of the outcomes of interest in this report.
De l'Aune et al.(139)	2000	Article described the development and validation the Blind Rehabilitation Services Functional Outcomes Survey (BRSFOS) instrument. All outcome data reported in article were interim in nature, were collected as part of the instrument development process (violation of inclusion criterion 10), and were incompletely reported. Pretreatment outcome data were collected from an unidentified subset of enrollees retrospectively (enrollees asked to respond as if data collection was taking place prior to exposure to rehabilitation services). Although Demographic data on the subset of patients for whom outcome data were presented were not provided.
Horowitz et al.(180)	2000	Included in the Lewin Group Report.
Khan et al.(181)	2000	Not generalizable to the U.S. Medicare population. Age range of participants was 9 to 91 years. 58% of enrollees were <50 years old.
Laderman et al.(182)	2000	Not generalizable to the U.S. Medicare population. Age range of participants was 27 to 67 years.
Lowe et al.(183)	2000	Not generalizable to the U.S. Medicare population. Age range of participants was 9 to 91 years. More than 50% of enrollees were <50 years old.
Margrain et al.(184)	2000	Study examined effect of low-vision aids on visual performance (Visual acuity and visual field). Study did not address any of the outcomes of interest in this report.
McCabe et al.(185)	2000	Included in the Lewin Group Report.

Reference	Year	Reason for exclusion
Rogers et al.(186)	2000	Although the aim of the study was to examine the effect of service delivery differences on activities of daily living, no usable data was presented.
Russell et al.(187)	2000	Included in Lewin Group Report. Article describes a study's design and methodology. Does not report any outcome data.
Szlyk et al.(13)	2000	Not generalizable to the U.S. Medicare population. Age range of participants was 16 to 78 years. 36% of enrollees aged <40 years.
Wolffsohn and Cochrane(162)	2000	Aim of study was to investigate the ability of a new instrument (the Melbourne Low Vision ADL) to detect changes in functional ability as a result of low-vision rehabilitation.

Appendix G. Evidence Tables

Table G-1. Systematic Reviews and Technology Assessments

Reference	Year	Organization	Vision rehabilitation component	Methods	Outcome measures assessed	Conclusions
Comprehensive Services						
Stemack et al.(24)	2001	VA BRC and VICTORS	Comprehensive services	Medline and PsychInfo searches from 1990 to 2000 Little critical appraisal fo included studies beyond study focus, populations studies, and the instruments used to measures QoL Studies of instrument development, clinical trials, restorative treatments of vision, and community based studies of sensory impairment were excluded	Quality of Life	Low-vision services are associated with increased self-reported functional status and QoL. Self-reported QoL is a significant outcome measure for low-vision rehabilitation Instruments are needed that are more sensitive to rehabilitation services, patients needs and goals to facilitate development of rehabilitation plans and to compare techniques, devices, and programs
Optical devices and visual aids						
Adams et al.(21)	2003	VA OPCS TAP	Optical devices (Various: All devices used in VA VR program)	Medline, Embase, and Current Contents searched from 1970 to July 2002 Hand searches Only prospective controlled trials >10 pts that presented data on at least one outcome of interest Peer-reviewed articles only 7 studies included Quality of included studies assessed	Objective performance Preferences Ease of use Satisfaction Quality of Life	TA identified a paucity of high quality evidence in the peer-reviewed literature to inform choices about provision of optical low-vision devices Practitioners must continue to rely on marketing literature, clinic-based observations, and real world trials in determining appropriate prescription of devices in low vision Future research is required to determine appropriate candidacy for low-vision devices, suitable prescription for these devices, and outcome measures that define quality of life.

Reference	Year	Organization	Vision rehabilitation component	Methods	Outcome measures assessed	Conclusions
Eperjesi et al.(23)	2002	Aston University, Birmingham, U.K.	Optical devices (tinted filters)	Medline searched for previous 30 years Hand searches Study design critically appraised Commercially available tinted lenses Use of tinted lenses on progressive diseases excluded Peer and non-peer reviewed sources considered No study size limit Children and adults	Objective visual measures and subjective measures	Not possible to base tinted lens use on type of task or eye condition Practitioners must continue to rely on marketing literature, clinic-based observations, and real world trials in determining appropriate prescription of devices in low vision
CCOHTA(22)	2004	CCOHTA	Device (implantable miniature telescope)	NR	Visual performance Activities of daily living	There is limited published evidence on the implantable miniature telescopes' safety and effectiveness. Its cost is still not established.
Orientation and Mobility Training						
Virgili and Rubin(25)	2004	Cochrane	Orientation and mobility training	Cochrane Central Register of Controlled Trials, Medline, Embase, and LILACS searched up to September 2002 Only randomized and quasi-randomized controlled trials included 2 reviewers independently assessed the search results for eligibility No studies found	Performance in travel activities of daily life Walking speed Ability to use a guide dog Social interaction Quality of life Participant's perception of training	Because no evidence was identified, no conclusions were drawn

VA OPCS TAP Veterans Affairs Office of Patient Care Services Technology Assessment Program

Table G-2. Study Design Details

Reference	Year	Study size (N =)	Aim of study	Outcomes assessed (Psychometric instrument used[a])	Length of followup	Site of Rehabilitation Service	Comments
Comprehensive Vision Rehabilitation Programs							
De l'Aune et al.(32)	2004	5067	To investigate the impact of the VA BRC program on activities of daily living	*Primary outcome* Activities of Daily Life (VA-13)	Unclear but at least 4 to six weeks after discharge	10 VA BRC centers	This retrospective study evaluated outcomes from 5067 individuals who were enrolled in the VA BRC program during the financial years 1997 through 2003
Hinds et al.(35)	2002	71	To investigate the impact of an interdisciplinary low-vision service on the vision-related quality of life of service users	*Primary outcome* Quality of life (VCM1) Activities of Daily Life (MLVQ)	6 months	Fife Interdisciplinary Low Vision Service. *U.K.*	Study evaluates a comprehensive service
Stelmack et al.(37)	2002	128	To evaluate the effectiveness of two separate VA low-vision and blind rehabilitation programs (BRC and VICTORS)	*Primary Outcome* Quality of life (NEI-VFQ)	At conclusion of rehabilitation program prior to discharge	VA Hines Blind Rehabilitaion Center (BVR). *U.S.A.* VA Chicago Visual Impairment Center to Optimize Remaining Sight (VICTORS).*U.S.A.*	This study provides outcome data for BRC and VICTORS. These programs represent the continuum of care provided by the Department of Veterans Affairs for patients with mild to severe vision loss.
Low-vision aids and optical devices							
Eperjesi et al.(33)	2004	24	To investigate the effects of light filters on reading performance in normal and low vision due to age-related macular degeneration	*Primary outcome* Reading performance	Single session, no followup	Low Vision Center, Focus on Blindness Program, Birmingham. *U.K.*	

Reference	Year	Study size (N =)	Aim of study	Outcomes assessed (Psychometric instrument used[a])	Length of followup	Site of Rehabilitation Service	Comments
Peterson et al.(29)	2003	70	To examine whether objective performance of near tasks is improved with various electronic vision enhancement systems compared with the subject's own optical magnifier	*Primary outcome* Reading performance Ability to follow a map route Ability to identify specific information on a medicine label	None	Department of Ophthalmology, University Hospital, Nottingham. *U.K.*	This was a three-phase, randomized cross-over study.
Tejaria et al.(38)	2002	30	To quantify the gain in performance for face recognition tasks when subjects use a bioptic telescopic low- ision device.	*Primary outcome* Perceived disability in face recognition Measured disability in face recognition	Single session, no followup	Low Vision Clinic, Manchester Royal Eye Hospital, University of Manchester, *U.K.*	
Goodrich and Kirby(30)	2001	22	To compare the effectiveness of three reading aids (optical devices versus closed-circuit television with a stand-mounted camera versus closed-circuit television with a handheld camera)	*Primary Outcome* Reading performance Patient preference	5 training sessions followed immediately by data collection. No followup beyond last training session	VA Western Blind Rehabilitation Center. *U.S.A.*	Study utilized a four phase within-subjects design. Order of device evaluation not reported.
Goodrich et al.(28)	2000	90	To investigate the minimum amount of training necessary to optimize reading rehabilitation for patients with a central visual field loss.	*Primary Outcome* Reading performance	Various numbers of training sessions followed immediately by data collection No followup beyond last training session	VA Western Blind Rehabilitation Center. *U.S.A.*	

Reference	Year	Study size (N =)	Aim of study	Outcomes assessed (Psychometric instrument used[a])	Length of followup	Site of Rehabilitation Service	Comments
Orientation and mobility training							
Engel et al.(34)	2000	88	To address the following questions: 1) Do rehabilitation services improve health status as indicated by the use of medical and health-related services? 2) Do rehabilitation services increase the ability of vision-impaired elderly adults to perform activities of daily living? 3) Are rehabilitation services related to other improvements in morale and social activities? 4) Are these outcomes related to the number of hours of rehabilitation services received?	*Primary outcome* Physical health (Cust. inst.) Activities of daily living (Cust. inst.) Social activities ((Cust. inst.) Mental health (CES-D)	Unclear	Pittsburgh Blind Association. *U.S.A.* Greater Pittsburgh Guild for the Blind. *U.S.A.* Pittsburgh District Office of Pennsylvania Bureau of Blindness and Vision Services. *U.S.A.*	Post-intervention score was average score on a variable across an unknown number of post-interventional interviews. Taking the average was necessary because respondents had different number of post-intervention interviews.
Soong et al.(31)	2001	37	To investigate the effect of orientation and mobility training on mobility performance of a group of visually impaired adults.	*Primary Outcome* Mobility performance	4 weeks post intervention	School of Optometry, QUT, Queensland. *Australia*	
Adaptive training techniques							
Nilsson et al.(36)	2003	20	To evaluate effectiveness of eccentric viewing in patients with AMD	*Primary outcome* Reading performance	One week after final training session	Department of Ophthalmology, Likoping University. *Sweden*	

Reference	Year	Study size (N =)	Aim of study	Outcomes assessed (Psychometric instrument used[a])	Length of followup	Site of Rehabilitation Service	Comments
Group Intervention Programs							
Brody et al.(26,131)	2002	252	To compare outcome in patients with AMD following a brief, structured self-management program with 2 control groups (tape recorded self-management program; waiting list)	*Primary outcome* Mood (POMS) *Secondary outcome* Quality of life (NEI-VFQ) Self-efficacy (AMD-SEQ)	6 wks post intervention	University of California at San Diego. *U.S.A.*	Data from two control groups were combined in analyses. Thus, all comparisons are self-management versus no treatment or tape intervention.
Dahlin Ivanoff et al.(27)	2002	253	To investigate the impact of an education-based program (Discovering New Ways) on perceived security in performing activities of daily living.	*Primary Outcome* Perceived security in performing activities of daily living (Dahlin Ivanoff ADL Scale)	4 months post intervention.	Discovering New Ways Program, Goteborg University. *Sweden.*	

[a] See section headed "Outcomes Assessed" for details of this psychometric instrument

[b] This study was cited in the Lewin Group report. It is included in this report because the study was incorrectly described as being historically controlled

Table G-3. Study Design Characteristics Pertaining to Internal Validity

Reference	Year	Prospective?	Sampling method	Randomized?	Concealment of allocation?	Blinding Status	Overall Attrition: % (n =)	Differential Attrition: % (n =)	ITT Analysis?	Power of study[a]	Comments	USPSTF Quality Rating
Comprehensive vision rehabilitation services												
De l'Aune et al.(32)	2004	N	NR	N	NA	NB	Unknown	Unknown	N	NR	This study is poorly reported. Outcome data were presented for 5067 individuals but demographic data were only presented for a proportion of	Level-II-3-Low
Hinds et al.(35)	2002	Y	AP	N	NA	NB	11.3% (9)	11.3% (9)	N	NR		Level II-3-Fair
Stelmack et al.(37)	2002	Y	Cons	N	NA	NB	5.5% (7)	5.5% (7)	N	NR	Five of seven patients lost to followup withdrawn due to ill health. Two of seven patients died.	Level II-3-Fair
Optical devices and visual aids												
Eperjesi et al.(33)	2004	Y	NR	N	NA	NB	0.0% (0)	0.0% (0)	NA	NR		Level II-3-Fair

Reference	Year	Prospective?	Sampling method	Randomized?	Concealment of allocation?	Blinding Status	Overall Attrition: % (n =)	Differential Attrition: % (n =)	ITT Analysis?	Power of study[a]	Comments	USPSTF Quality Rating
Peterson et al.(29)	2003	Y	Cons	Y	N	NB	0.0% (0)	0.0% (0)	NA	NR		Level I-Low
Tejeria et al.(38)	2002	Y	NR	N	NA	NB	30% (9) for FFR task 6.7% (2) for FER task	30% (9) for FFR task 6.7% (2) for FER task	N	NR	Study enrolled whites only.	Level II-3-Fair
Goodrich and Kirby(30)	2001	Y	NR	N	NA	NB	0.0% (0)	0.0%	NA	>80% to detect a clinically significant difference in reading performance if 20 pts enrolled.	Study was a 3-phase cross-over study. No detail on the order in which interventions were provided.	Level II-1-Fair
Goodrich et al.(28)	2000	Y	NR	Y	N	NB	0.0% (0)	0.0%	NA	NR	Study was a two phased. Phase 1: outcome of pts who received full training (FTG) compared with pts who received half as much training (HTG). Phase 2 : two addition groups formed -Optical Aid Brief Training Group (OABG) and CCTV brief training group (TVBG).	Level-I-Low

Reference	Year	Prospective?	Sampling method	Randomized?	Concealment of allocation?	Blinding Status	Overall Attrition: % (n =)	Differential Attrition: % (n =)	ITT Analysis?	Power of study[a]	Comments	USPSTF Quality Rating
Orientation and mobility training												
Soong et al.(31)	2001	Y	NR	N	NA	NB	0.0% (0)	0.0%	NA	NR	Subjects who did not receive mobility training were matched as closely as possible to those that did for ocular disease, level of visual impairment, and age.	Level II-1-Fair
Engel et al.(34)	2000	Y	NR	N	NA	NB	20.5% (18)	20.5% (18)	N	NR	Authors reported that results were short-term but did not report on what followup time was. Study did not use validated instruments to measure outcomes.	Level II-3-Low
Adaptive training techniques												
Nilsson et al.(36)	2003	Y	Cons	N	NA	NB	10% (2)	10% (2)	N	NR	2 patients could not be trained to use eccentric viewing. We have counted missing data from these patients as attrition.	Level II-3-Fair

Reference	Year	Prospective?	Sampling method	Randomized?	Concealment of allocation?	Blinding Status	Overall Attrition: % (n =)	Differential Attrition: % (n =)	ITT Analysis?	Power of study[a]	Comments	USPSTF Quality Rating
Group intervention programs												
Brody et al.(26,131)	2002	Y	NR	Y	Y	NB	8.3% (21)	Group intervention: 6.5% (6 pts) Tape intervention: 7.6% (6 pts) Wait list: 11.1% (9 pts)	N	Study had power of 0.8 to detect a standardized mean difference of 0.5 (moderate effect size). Sample size required was 102 participants.	Randomization procedure reportedly successful. No significant differences in demographic or clinical profiles seen at baseline. Attrition did not appear to negate randomization.	Level I-Fair
Dahlin Ivanoff et al.(27)	2002	Y	Cons	Y	N	NB	26.1% (66)	Individual intervention grp: 27.7% (36) Health education grp: 24.3% (30)	N	NR	Attrition rates reported at 4 months followup. Only data from completers presented. Dropouts different from completers. Significantly higher proportion of dropouts used public transport and social services	Level I-Low

Y Yes.
N No.

Patient selection: AP-All patients in vision rehabilitation over a given time period, Cons-Consecutive, RS-Random sample, SP-Selected patients.
Blinding status: EB-Evaluator blinded, IB-Investigator blinded, PB-Patient blinded, NB-Not Blinded.

FFR Familiar face recognition.
FER Face expression recognition.

ITT Intent-to-treat.
NA Not applicable.
NR Not reported.

[a] Power based on primary outcome only.
[b] All individuals at six nursing home units who met inclusion criteria of study enrolled.

Table G-4. Patient Enrollment Criteria

Reference	Year	Inclusion Criteria	Exclusion Criteria
Comprehensive vision rehabilitation services			
De l'Aune et al.(32)	2004	Veterans enrolled in any one of ten VA inpatient BRC units in the U.S. during the financial years 1997 through 2003	NR
Hinds et al.(35)	2002	Patients attending low vision clinic between November 1998 and February 1999 Patients must have an absolute central scotoma	Age 16 years or less Attendance at a low vision clinic in previous 6 months
Stelmack et al.(37)	2002	NR	Severe cognitive or hearing deficits
Optical devices and visual aids			
Eperjesi et al.(33)	2004	NR	Near wording reading VA poorer than LogMAR 1.00 Lens opacity >1 on the Lens Opacity Classification System Pts undergoing ophthalmologic treatment
Peterson et al.(29)	2003	Patients with "visual impairment" attending low-vision clinic at University Hospital, Nottingham, U.K.	None applied
Tejeria et al.(38)	2002	White race UK residents Primary diagnosis of AMD Best corrected LogMAR VA in better seeing eye between 0.4 and 1.4	Non-white race Non-community dwelling Mental illness or dementia

Reference	Year	Inclusion Criteria	Exclusion Criteria
Goodrich and Kirby(30)	2001	Veterans enrolled in residential rehab program of the Western Blind Rehabilitation Center Presence of central scotoma with intact peripheral vision Desire for reading rehabilitation	Cognitive deficits Current use of medications that would impair reading ability Illiteracy
Goodrich et al.(28)	2000	Patients enrolled in the Western Blind Rehabilitation Center	Cognitive or short-term loss Physical impairment which might prevent pts from using low-vision reading devices
Orientation and mobility training			
Soong et al.(31)	2001	Physically active and able to leave home accompanied or unaccompanied	Previous orientation and mobility training
Engel et al.(34)	2000	Age ≥60 years Perception that patient needed rehabilitation training Pts enrolled to receive rehabilitation services from the following sources: The Pittsburgh Blind Association; The Greater Pittsburgh Guild for the Blind; The Pittsburgh District Office of the Pennsylvania Bureaus of Blindness and Visual Services	NR
Adaptive training techniques			
Nilsson et al.(36)	2003	NR	NR

Reference	Year	Inclusion Criteria	Exclusion Criteria
Group intervention programs			
Brody et al.(26,131)	2002	Age ≥60 years Diagnosis of AMD by an ophthalmologist confirmed with fundus photography Best corrected VA 20/60 or worse in better seeing eye and 20/100 or worse in better seeing eye No other unstable eye disease Adequate hearing Physical ability to come to interview	Cognitive impairment as assessed by the Orientation-Memory Concentration Test Current alcohol abuse as assessed by the Short Michigan Alcoholism Screening Test
Dahlin Ivanoff et al.(27)	2002	Age ≥65 years Living at home Primary diagnosis of AMD Best corrected distance visual acuity no lower than 0.1 Ability to participate in group discussions	NR

Table G-5. Characteristics of Enrolled Patients I: Residential Status and Underlying Pathology

Reference	Year	Number in nursing home or residential facility (%)	Number community dwelling (%)	Treatment group (if controlled trial)	Number of participants	Primary pathology underlying low vision: Number of individuals (%)														
						AMD	Glaucoma	Diabetic Retinopathy	Cataract	Retinitis pigmentosa	Macular degeneration (not AMD)	CRVO	Optic atrophy	Stroke	High myopia	Vascular retinopathy	Corneal conditions	Cone dystrophy	Macularhole	Other or not specified
Comprehensive vision rehabilitation services																				
De l'Aune et al.(32)	2004	NR	NR	NA	5067	1934 (43.0)[a]	989 (22.0)[a]	764 (17.0)[a]	584 (13.0)[a]	225 (5.0)[a]	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hinds et al.(35)	2002	0 (0.0)	71 (100)	NA	71	49 (69.0)	2 (2.8)	9 (12.6)	2 (2.8)	2 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.8)	2 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (4.2)
Stelmack et al.(37)	2002	NR	NR	VICTORS	51	20 (39.2)	11 (21.6)	9 (17.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (21.6)
				BRC	77	51 (66.2)	9 (11.7)	12 (15.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (6.5)
Optical devices & visual aids																				
Eperjesi et al.(33)	2004	0 (0.0)	12 (100)	NA	12	12 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Peterson et al.(29)	2003	NR	NR	All pts received all interventions	70	40 (57.1)	4 (5.7)	9 (12.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	11 (15.7)	6 (8.6)	0 (0.0)	0 (0.0)	0 (0.0)

Reference	Year	Number in nursing home or residential facility (%)	Number community dwelling (%)	Treatment group (if controlled trial)	Number of participants	Primary pathology underlying low vision: Number of individuals (%)														
						AMD	Glaucoma	Diabetic Retinopathy	Cataract	Retinitis pigmentosa	Macular degeneration (not AMD)	CRVO	Optic atrophy	Stroke	High myopia	Vascular retinopathy	Corneal conditions	Cone dystrophy	Macularhole	Other or not specified
Tejeria et al.(38)	2002	0 (0.0)	30 (100)	NA	30	30 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Goodrich & Kirby(30)	2001	NR	NR[b]	Cross-over design	22	16 (72.7)	0 (0.0)	2 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	2 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.6)[c]	1 (4.6)	0 (0.0)
Goodrich et al.(28)	2000	NR	NR[b]	*FTG)*	44	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
				HTG)	46	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
				OABG	14	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
				TVBG	25	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Orientation & mobility training																				
Soong et al.(31)	2001	0 (0.0)	(100)	Mobility training	19	6 (31.5)	3 (15.8)	1 (5.3)	0 (0.0)	1 (5.3)	0 (0.0)	1 (5.3)	4 (21.1)	0 (0.0)	0 (0.0)	2 (10.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.3)
				No training	18	5 (27.8)	3 (16.7)	1 (5.6)	0 (0.0)	3 (16.7)	0 (0.0)	1 (5.6)	3 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (11.1)

Reference	Year	Number in nursing home or residential facility (%)	Number community dwelling (%)	Treatment group (if controlled trial)	Number of participants	Primary pathology underlying low vision: Number of individuals (%)														
						AMD	Glaucoma	Diabetic Retinopathy	Cataract	Retinitis pigmentosa	Macular degeneration (not AMD)	CRVO	Optic atrophy	Stroke	High myopia	Vascular retinopathy	Corneal conditions	Cone dystrophy	Macularhole	Other or not specified
Engel et al.(34)	2000	0 (0.0)	88 (100)	NA	88	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Adaptive training techniques																				
Nilsson et al.(36)	2003	0 (0.0)	20 (100)	NA	20	20 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Group intervention programs																				
Brody et al. (26,131)	2002	NR	NR	Group intervention	92	92 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				Tape intervention	79	79 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				Wait list group	81	81 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Dahlin Ivanoff et al.(27)	2002	0 (0.0)	253 (100)	Health education program	130	130 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
				Individual intervention program	123	123 (100)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

[a] Based on data from 4494 of 5067 (88.7%) enrolled individuals
[b] All patient recruited from a residential VA BRC but it is not clear what status of patients was prior to or following rehabilitation

FTG Full training group
HTG Half full training group
OABG optical aid brief training group
TVBG CCTV brief training group

Hollingshead Levels: Level I = Major business or professional; Level II = Medium business or professional; Level III = Skilled worker; Level IV = Semiskilled worker; Level V = unskilled worker

Table G-6. Characteristics of Enrolled Patients II (Demographics)

Reference	Year	Study arm (n =)	Mean Age in Years (SD)	Number Male (%)	Number White (%)	Number Black (%)	Number Hispanic (%)	Number Other Race (%)	Visual acuity	Visual Field	Other Measures of Visual Function
Comprehensive vision rehabilitation services											
De l'Aune et al.(32)	2004	NA	69.8 (12)[b]	4302 (95.0)[a]	3374 (76.9)[b]	657 (15.0)[b]	307 (7.0)[b]	44 (1.0)[b]	Visual acuity distribution[f] 5/200 or worse (28%) 6/200 to 20/200 (51%) 20/190 or better (21%)	Visual field distribution[g] 21 degrees or better (39%) 20 degrees or worse (61%)	NR
Hinds et al.(35)	2002	NA	NR (NR) Age distribution 34 to 55 2 pts 56 to 70 14 pts 71 to 85 38 pts >85 17 pts	22 (31.0)	NR	NR	NR	NR	NR	NR	NR
Stelmack et al.(37)	2002	VICTORS	68 (NR) [Range: 44 to 87]	40 (78.4)	NR	NR	NR	NR	Mean LogMAR VA: 0.54 Snellen VA: 20/63	NR	NR
		BRC	72 (NR) [Range: 38 to 88]	72 (93.5)	NR	NR	NR	NR	Mean LogMAR VA: 1.00 Snellen VA: 20/200	NR	NR

Reference	Year	Study arm (n =)	Mean Age in Years (SD)	Number Male (%)	Number White (%)	Number Black (%)	Number Hispanic (%)	Number Other Race (%)	Visual acuity	Visual Field	Other Measures of Visual Function
Optical devices and visual aids											
Eperjesi et al.(33)	2004	NA	82.4 (4) [Range: 73 to 87]	4 (33.3)	NR	NR	NR	NR	Mean LogMAR VA: 0.60 [Range: 0.3 to 1.0]	NR	NR
Peterson et al.(29)	2003	Cross-over trial. All pts exposed to all interventions	Males: 68.3 (22.8) Females: 71.8 (20.6)	35 (50%)	NR	NR	NR	NR	Males: Mean LogMAR VA: 0.67 (SD: 0.38) Females: Mean LogMAR VA: 0.87 (SD: 0.33)	NR	NR
Tejeria et al.(38)	2002	NA	81.5 (NR) [Range: 66 to 90]	10 (33.3)	30 (100)	0 (0.0)	0 (0.0)	0 (0.0)	Mdn Distance LogMAR VA: 0.82 [Rng: 0.42 to 1.38] Mdn reading LogMAR VA: 0.83 [Range: 0.4 to 1.33]	NR	Median contrast sensitivity: 0.92 log CS units [Range: 0.1 to 1.5] Median color vision: D-15 score: 1.81 [Range: 1 to 3.48]
Goodrich and Kirby(30)	2001	Cross-over trial. All pts exposed to all interventions	73.3 (8.9) [Range: 53 to 87]	20 (90.1)	NR	NR	NR	NR	Snellen VA: 20/200 (SD: 8.96) Mean LogMAR VA: 0.994	NR	Pelli-Robson Contrast Sensitivity: 0.89 (0.46). [Range: 0.00 to 1.5)

Reference	Year	Study arm (n =)	Mean Age in Years (SD)	Number Male (%)	Number White (%)	Number Black (%)	Number Hispanic (%)	Number Other Race (%)	Visual acuity	Visual Field	Other Measures of Visual Function
Goodrich et al.(28)	2000	FTG	68.6 (10.5)	NR	NR	NR	NR	NR	Mean LogMAR VA: 0.99 (SD: 0.21)	NR	Mean contrast sensitivity: 0.77 (SD: 0.37) log units
		HTG	71.3 (10.2)	NR	NR	NR	NR	NR	Mean LogMAR VA: 0.95 (SD: 0.23)	NR	Mean contrast sensitivity: 0.94 (SD: 0.23) log units
		OABG	73.4 (12.3)	NR	NR	NR	NR	NR	Mean LogMAR VA: 1.01 (SD: 0.25)	NR	Mean contrast sensitivity: 0.89 (SD: 0.22) log units
		TVBG	72.7 (10.9)	NR	NR	NR	NR	NR	Mean LogMAR VA: 0.85 (SD: 0.22)	NR	Mean contrast sensitivity: 0.89 (SD: 0.33) log units
Orientation and mobility training											
Soong et al.(31)	2001	Mobility training group (n = 19)	68.9 (12.3)	NR	NR	NR	NR	NR	Snellen VA: Rng: 6/6 to 6/3000	NR	NR
		Control group (n = 18)	63.2 (16.9)	NR	NR	NR	NR	NR	Snellen VA: Rng: 6/6 to 6/75	NR	NR

Reference	Year	Study arm (n =)	Mean Age in Years (SD)	Number Male (%)	Number White (%)	Number Black (%)	Number Hispanic (%)	Number Other Race (%)	Visual acuity	Visual Field	Other Measures of Visual Function
Engel et al.(34)	2000	NA	76 (NR) [Range: 59 to 91]	18 (25.7)	64 (91.4)	6 (8.6)	NR	NR	NR	NR	Authors described best corrected visual ability of pts. 1.4% totally blind 17.1% perception of light 17.1% see shadows or large forms 40.0% see hand movements 15.7% see newspaper headlines 8.6% read large print
Adaptive training techniques											
Nilsson et al.(36)	2003	NA	77.4 (6.0) Range: 64 to 86	(20.0)	NR	NR	NR	NR	Snellen VA = 20/475 [Range: 20/250 to 20/1000]	NR	NR

Reference	Year	Study arm (n =)	Mean Age in Years (SD)	Number Male (%)	Number White (%)	Number Black (%)	Number Hispanic (%)	Number Other Race (%)	Visual acuity	Visual Field	Other Measures of Visual Function
Group intervention programs											
Brody et al.(26,131)	2002	*Group intervention*	80.73 (7.12)	25 (29.0)[c]	NR	NR	NR	NR	Mean Snellen VA = 20/537 (NR) Mean LogMAR VA: 1.08 (NR)	NR	NR
		Tape intervention	81.25 (5.25)	25 (34.0)[c]	NR	NR	NR	NR	Mean Snellen VA = 20/599 (NR) Mean LogMAR VA: 1.15 (NR)	NR	NR
		Wait list group	80.76 (5.75)	28 (39.0)[c]	NR	NR	NR	NR	Mean Snellen VA = 20/485 (NR) Mean LogMAR VA: 1.08 (NR)	NR	NR
Dahlin Ivanoff et al.(27)	2002	*Health education program*	Mdn age: 79 [Range: 66 to 94]	NR	NR	NR	NR	NR	Mdn LogMAR VA: 0.3 [Range: 0.1 to 1.0)	NR	NR
		Individual intervention program	Mdn age: 79 [Range: 65 to 91]	NR	NR	NR	NR	NR	Mdn LogMAR VA: 0.3 (Range: 0.1 to 0.9)	NR	NR

[a] Based on data from 4528 of 5067 (89.4%) enrolled individuals
[b] Based on data from 4382 of 5067 (86.5%) enrolled individuals
[c] Only baseline characteristics of completers were presented

AMD	Age-related macular degeneration
CRVO	Central retinal vein occlusion
FTG	Full training group
HTG	Half full training group
Mdn	Median
Mn	Mean
OABG	optical aid brief training group
TVBG	CCTV brief training group

Table G-7. Charactersics of Enrolled Patients III (Comorbidities)

Reference	Year	Study arm (n =)	Number With Cardiac Problems (%)	Number With Renal Problems	Number With Pulmonary Problems	Number with Cognitive or Mood Deficits (%)	Number With Diabetes	Generalizability
Comprehensive vision rehabilitation services								
De l'Aune et al.(32)	2004	NA	1782 (41.0)[a]	174 (4.0)[a]	696 (16.0)[a]	348 (8.0)[a]	1304 (30.0)[a]	Fair
Hinds et al.(35)	2002	NA	NR	NR	NR	NR	NR	Fair
Stelmack et al.(37)	2002	VICTORS	NR	NR	NR	NR	NR	Fair
		BRC	NR	NR	NR	NR	NR	Fair
Optical devices and visual aids								
Eperjesi et al.(33)	2004	NA	NR	NR	NR	NR	NR	Fair
Peterson et al.(29)	2003	Cross-over trial. All pts exposed to all interventions	NR	NR	NR	NR	NR	Fair
Tejeria et al.(38)	2002	NA	NR	NR	NR	NR	NR	Poor

Reference	Year	Study arm (n =)	Number With Cardiac Problems (%)	Number With Renal Problems	Number With Pulmonary Problems	Number with Cognitive or Mood Deficits (%)	Number With Diabetes	Generalizability
Goodrich and Kirby(30)	2001	Cross-over trial. All pts exposed to all interventions	NR	NR	NR	NR	NR	Fair
Goodrich et al.(28)	2000	FTG	NR	NR	NR	NR	NR	Fair
		HTG	NR	NR	NR	NR	NR	Fair
		OABG	NR	NR	NR	NR	NR	Fair
		TVBG	NR	NR	NR	NR	NR	Fair
Orientation and mobility training								
Soong et al.(31)	2001	Mobility training group (n = 19)	NR	NR	NR	NR	NR	Fair
		Control group (n = 18)	NR	NR	NR	NR	NR	Fair
Engel et al.(34)	2000	NA	NR	NR	NR	NR	NR	Fair

Reference	Year	Study arm (n =)	Number With Cardiac Problems (%)	Number With Renal Problems	Number With Pulmonary Problems	Number with Cognitive or Mood Deficits (%)	Number With Diabetes	Generalizability
Adaptive training techniques								
Nilsson et al.(36)	2003		NR	NR	NR	NR	NR	Fair
Group intervention programs								
Brody et al.(26,131)	2002	*Group intervention*	NR	NR	NR	23.3% depressed[b]	NR	Fair
		Tape intervention	NR	NR	NR	23.6% depressed[b]	NR	Fair
		Wait list group	NR	NR	NR	26.8% depressed[b]	NR	Fair
Dahlin Ivanoff et al.(27)	2002	*Health education program*	NR	NR	NR	NR	NR	Fair
		Individual intervention program	NR	NR	NR	NR	NR	Fair

[a] Based on data from 4347 of 5067 (85.8%) enrolled individuals
[b] Only baseline characteristics of completers were presented
[c] Significant between-groups difference ($p < 0.05$)

FTG	Full training group
HTG	Half full training group
Mdn	Median
Mn	Mean
OABG	optical aid brief training group
TVBG	CCTV brief training group

Table G-8. Rehabilitation Program Details

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under *direct* supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Comprehensive vision rehabilitation programs									
De l'Aune et al.(32)	2004	*VA BRC* Interdisciplinary low vision services	Yes	No	Optometrists Psychologists Nurses Physicians Social workers Low-vision training specialists	10 VA Blind Rehabilitation Centers (Am Lake, Augusta, Birmingham, Hines, Palo Alto, San Juan, Tucson, Waco, W. Haven, W. Palm)	Intensive. Patients are admitted to a specialist inpatient vision rehabilitation center 40 minute sessions every hour, eight hours a day, five days a week	4 to 12 weeks. Mean of 140 hours of blind rehabilitation training (27 hours low-vision training; 38 hours in living skills training; 36 hours of orientation and mobility training; 39 hours in manual skills training)	VA BRC is targeted at veterans who are legally blind. Best corrected VA ≤20/200 but policy of VA is to allow pts with a best corrected VA ≤20/100 access to BRC services. Veterans participate in a number of "skill courses" (including low-vision evaluation and training, orientation and mobility training, daily living skills, and manual skills to help achieve a realistic level of independence). Veterans also receive counseling to "help them achieve a healthy attitude towards themselves, vision loss, and the future."

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Hinds et al.(35)	2002	Interdisciplinary low-vision service	Yes	Yes	Ophthalmologists Ophthalmic Nurses Optometrists Social workers Rehabilitation therapists	Two ophthalmology units	NR	NR	Patients received a range of services tailored to their needs. Services included: clinical assessment, diagnosis, referral for treatment, blind or partially sighted registration, refraction and prescription of low-vision aids, information, counseling, and support. Rehabilitation therapist and social worker shared the consultation with the ophthalmology staff at the low-vision clinic and provided domiciliary followup visits. Close links with the low-vision programs provided by local community optometrists maintained who see patients in their own locality.

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Stelmack et al.(37)	2002	*VICTORS* Interdisciplinary low vision services	Yes	Yes	Optometrists Psychologists Nurses Physicians Social workers Low-vision training specialists	VA Rehabilitation Center	3 to 4 days of services on an outpatient or inpatient basis	3 to 4 days	VICTORS is targeted at serving visually impaired veterans who are not legally blind (VA >20/200)
		VA BRC Interdisciplinary low vision services	Yes	No	Optometrists Psychologists Nurses Physicians Social workers Low-vision training specialists	VA Rehabilitation Center	Intensive. Patients are admitted to a specialist inpatient vision rehabilitation center 40 minute sessions every hour, eight hours a day, five days a week	Average stay: 42 days	VA BRC is targeted at veterans who are legally blind (Best corrected VA ≤20/200 but policy of VA is to allow pts with a best corrected VA ≤20/100 access to BRC services). Veterans participate in a number of "skill courses" (including low-vision evaluation and training, orientation and mobility training, daily living skills, and manual skills to help achieve a realistic level of independence). Veterans also receive counseling to "help them achieve a healthy attitude towards themselves, vision loss, and the future."

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under *direct* supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Optical devices and visual aids									
Eperjesi et al.(33)	2004	Optical filters	Yes	Yes	Optometrists plus PhD level investigators	Optometry school	NR.	Single session	This study looked at the effects of different filters (a potential visual aid) on reading performance. No training was required.
Peterson et al.(29)	2003	Optical Magnifier	Yes	Yes	NR	Ophthalmology unit	Demonstration of device + single 2 minute training session	NA	The subject's optimal conventional optical magnifier for near task. This was a hand magnifier for 24 subjects (34.3%), stand-mounted magnifier for 45 subjects (64.3%), high powered glasses for on subject (1.5%).
		Mouse-based EVES. Image viewed at 40 cm on 14" monitor	Yes	Yes	NR	Ophthalmology unit	Demonstration of device + single 2 minute training session	NA	EVES device: TVi Zoom, Concept Systems, Nottingham, U.K. Field of view 36 by 28 degrees
		Mouse-based EVES. Image viewed on HMD unit	Yes	Yes	NR	Ophthalmology unit	Demonstration of device + single 2 minute training session	NA	EVES device: As above HMD device: Virtual I/O, Escom, Heppenheim, Germany. This is a binocular unit with a fixed magnification of 10× and a field of view of 37 by 27 degrees

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
		Stand-based EVES. Image viewed at 40 cm on 14" monitor	Yes	Yes	NR	Ophthalmology unit	Demonstration of device + single 2 minute training session	NA	EVES device: Spectrum, Clearview, Tieman, Nottingham, U.K.)
Tejeria et al.(38)	2002	Patients ability to recognize faces evaluated prior to and following prescription of a bioptic device	Yes	Yes	Ophthalmologists Optometrists	Low-vision Clinic of Eye Hospital	NR	Single session	
Goodrich and Kirby(30)	2001	Optical devices	Yes	Yes[c]	Optical aids prescribed by optometrist Training provided by low-vision therapists	Residential blind rehabilitation center	One training session per day (length of session unclear)	5 days	
		Handheld CCTV	Yes	Yes[c]	As above	As above	As above	As above	
		Stand-mounted CCTV	Yes	Yes[c]	As above	As above	As above	As above	

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Goodrich et al.(28)	2000	FTG	Yes	Yes [c]	Optical aids prescribed by optometrist Training provided by low-vision therapists	Residential blind rehabilitation center	10 training sessions 40 minutes each Number of sessions per week was not reported	Outcomes measured during each session	Training sessions provided instruction to patient in appropriate working distances, tracking strategies and skills, lighting, use of reading stands, or other postural devices, and reading strategies based on the layout of the material to be read as part of study. Feedback provided to pts on reading tasks, as well as feedback on reading performance.
		HTA	Yes	Yes[c]	As above	As above	5 training sessions 5 practice sessions 40 minutes each Number of sessions per week was not reported	As above	Training sessions identical to those described above. Practice sessions performed by pt alone in a practice room. Practice sessions were monitored to ensure that patient arrived in practice room. No training or feedback was provided by instructor.

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
		OABG	Yes	Yes[c]	As above	As above	1 training session followed by 4 sessions of independent practice 40 minutes each Number of sessions per week was not reported	As above	As above
		TVBG	Yes	Yes	As above	As above	2 training sessions followed by 4 sessions of independent practice 40 minutes each Number of sessions per week was not reported	As above	As above

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Orientation and mobility training									
Soong et al.(31)	2001	Orientation and Mobility Training	Yes	Yes	Optometrists, PhD level investigators, and orientation and mobility trainers from the GDBAQ (some pts only-see *specific details*)	Optometry department and 10 pts prescribed with long canes received training at a GDBAQ residential center.	Variable	Variable	Sixteen of the 19 individuals enrolled in the study of Soong et al. who received mobility and orientation training prescribed with mobility devices; 10 long canes, 6 identity canes or support canes. Subjects who were prescribed a long cane underwent a "standard" program of training at the GDBAQ that required them to live at the mobility rehabilitation center.
Engel et al.(34)	2000	The effectiveness of three vision rehabilitation services that provide O&M services were assessed. Data from three services combined together.	NR	NR	NR	NR	NR	NR Authors state that results are short-term	Details of the orientation and mobility training sessions patients underwent as part of the vision rehabilitation services they received were not reported.

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Adaptive training techniques									
Nilsson et al.(36)	2003	Eccentric viewing	Yes	Yes	Low-vision therapists	Ophthalmology unit	One hour sessions Weekly Pts expected to practice techniques between sessions	Variable	Patients receive training until they are able to maintain steady eccentric fixation and can maintain fluent reading or it becomes obvious that patient will not be able to learn technique.

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
Group intervention programs									
Brody et al.(26,131)	2002	Group intervention	Yes	Yes	Presentations and formal lectures by ophthalmologists, rehabilitation experts, nutritionists, exercise physiologists, low-vision optometrists	Ophthalmology Department	Groups of 8 to 10 patients 1 session per weeks 2 hours per session	6 weeks	Sessions incorporated 2 elements. Didactic presentations and group problem-solving with guided practice. Didactic component comprised of brief presentations and formal lectures from professionals in several related fields. Group problem-solving component consisted of guiding participants through a hierarchy of behavioral challenges to improve problem-solving skills with the support of group. Pts provided with information on AMD, strategies for increasing activity levels, and information on available visual aids. Patients instructed in re-evaluation of their perceived barriers to independence. Behavioral components of service included behavioral skills training in communicating with others about visual disability, handling a variety of challenges associated with AMD, and requesting assistance when needed.

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
		Tape intervention	Yes	Yes	Pts provided with 12 hours of audiotapes of health lectures that had been presented to the general public on AMD and healthy aging	Home	Individual Variable	6 weeks	Tapes listened to whenever and for however long pt desired provided complete 12 hours were listened to by the end of 6 weeks.
		Wait list	NA	NA	None	Home	None	6 weeks	Pts re-assessed 6 weeks after baseline interviews
Dahlin Ivanoff et al.(27)	2002	Health Education Program	Yes	Yes	Groups led by occupational therapists An ophthalmologist, an optometrist, a low-vision therapist, and a lighting expert also provided information	Ophthalmology Department	Groups of 4 to 6 patients 1 session per week 2 hours per session	8 weeks	Pts receive information on visual aids, underlying disease, lighting, self-care, meals, communication, orientation and mobility, shopping, financial management, cleaning. Information presented within the framework of a problem-solving model and patients were taught to use the model as a way of thinking when performing daily activities (for more information see Dahlin Ivanoff et al.).(188)

Reference	Year	Program	Overall Care Directed by Medicare Physician? [a]	Services under ***direct*** supervision of Medicare physician?	Staffing Model	Setting	Intensity	Length of program	Specific Details
		Individual intervention program	Yes	Yes	Occupational therapist with special training in low vision	Ophthalmology Department	Individual 1 or 2 sessions 1 hour per session Telephone followup	4 weeks	This is the current standard of care at the clinic where this study was performed. Patients are provided with optical aids with the aim of optimizing visual performance and improving reading skills. Participants were provided with information about the underlying cause of their low vision, only if requested

EVES Electronic visual enhancement system
GDBAQ Guide Dogs for the Blind Association of Queensland (personnel not described)
HMD head-mounted display

[a] A physician is defined as an MD or an OD as per Medicare definition.

[b] The authors did not report on what constitutes a "low-vision therapist." Whether a low-vision therapist in Sweden is equivalent to a low-vision therapist, a rehabilitation teacher, or an orientation and mobility specialist in the U.S. could not be determined.

[c] Although services provided in a VA BRC institution and training was provided by low-vision therapists, these services were provided within the framework of a laboratory based study which was supervised by an optometrist.

Table G-9. Study Findings

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Comprehensive vision rehabilitation services					
De l'Aune et al.(32)	2004	Significant improvements in activities of daily living from baseline as measured using the VA-13 ($p < 0.001$). Significant improvements from baseline across all VA-13 subscales were observed (low vision, living skills, manual skills, and orientation and mobility skills: all $p < 0.001$)	Not evaluated by study.	Not evaluated by study.	Not evaluated by study.

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Hinds et al.(35)	2002	*Reading Activity* 93% of enrolled patients prescribed a low-vision aid. 75% of these attempted to use prescribed aid. Approximately 50% of users reported that low-vision aid was "helpful." Significant increases from baseline at 6-month followup in number of patients who had read or attempted to read the following: "ordinary" print (p = 0.049), large print books (p = 0.015), and shop prices, labels, tickets, etc. (p = 0.001). No significant differences from baseline at 6-month followup for the following activities: reading bank statements, reading of own writing, reading instructions on packets, reading of markings on dials, reading the telephone directory, reading time on a watch, completing forms, signing name, writing own letters, identification of money, sewing, participation in a hobby, home repairs, watching TV, reading street signs, etc., number of day trips.	Not evaluated by study.	Not evaluated by study.	Significant improvements in QoL from baseline as measured using the VCM 1 score were seen at 6-months followup (p = 0.0061). Significant improvements in the following specific areas were seen: fear of deterioration of vision (p = 0.0004); safety at home (p <0.0005); fear of coping with daily life (p = 0.0095).

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Stelmack et al.(37)	2002	Not evaluated by study	Not evaluated by study	Not evaluated by study	Significant improvements in QoL from baseline as measured using NEI VFQ-25 following BRC services of 0.51 logits observed ($p < 0.001$). Improvements are equivalent to a 0.425 LogMAR (four lines) improvement in VA. Significant improvements in QoL from baseline following VICTORS services of 0.35 logits observed ($p < 0.001$). Improvements are equivalent to a 0.300 LogMAR (three lines) improvement in VA.
Optical devices and visual aids					
Eperjesi et al.(33)	2004	*Reading Speed* The average patient demonstrated a significant improvement (approx. 5%) in reading speed with a CPF450 filter when compared to other filters ($p \leq 0.05$).	Not evaluated by study.	Not evaluated by study.	Not evaluated by study.

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Peterson et al.(29)	2003	*Reading performance* At all text sizes, mouse EVES and HMD resulted in significantly lower reading speed than stand mounted EVES and monitor viewing ($p < 0.001$). Reading with optical magnifier slower than with mouse or stand EVES and monitor viewing at smaller print sizes ($p < 0.05$). Reading performance improved with increasing print size with all devices. *Near-task completion times* Column location task significantly faster with optical magnifier than with mouse EVES with HMD ($p < 0.001$) or stand or mouse EVES and monitor viewing ($p < 0.01$). Map tracking task significantly slower with mouse EVES and HMD viewing than with optical magnifier ($p < 0.001$) or stand EVES and monitor viewing ($p < 0.01$) Medicine label identification task significantly slower with mouse EVES and HMD viewing than with optical magnifier ($p < 0.01$), the stand EVES and monitor viewing ($p < 0.01$), or the mouse EVES and monitor viewing ($p < 0.05$)	Not evaluated by study	Not evaluated by study	Not evaluated by study

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Tejeria et al.(38)	2002	Significant improvement in FFR ($p < 0.001$) and FED ($p < 0.01$) task performance observed following use of telescopic device.	Not evaluated by study	Not evaluated by study	Not evaluated by study
Goodrich and Kirby(30)	2001	*Reading speed* Patients read significantly faster when using the stand-mounted CCTV device than when using their prescribed optical aid ($p = 0.040$). Patients read significantly faster when using the handheld CCTV device than when using their prescribed optical aid ($p = 0.010$) No significant differences in reading speed were observed between the hand-held and stand-mounted CCTV devices. *Reading Duration* Patients read for significantly longer when using the stand-mounted CCTV device than when using their prescribed optical aid ($p < 0.001$). Patients read for significantly longer when using the handheld CCTV device than when using their prescribed optical aid ($p < 0.001$) No significant differences in reading duration were observed between the handheld and stand-mounted CCTV devices.	Not evaluated by study	Not evaluated by study	Not evaluated by study

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Goodrich et al.(28)	2000	*FTG vs. HTG (Phase 1)* Both groups demonstrated an increase in reading speed over ten sessions (FTG grp: p <0.017; HTG grp: p <0.001). Reading speeds similar in both groups during first five sessions. After 6th session, FTG group showed little improvement but significant improvement seen in HTG grp (p <0.017). Data suggest that 5 training sessions followed by independent practice sessions are sufficient. *Brief training (OABG plus TVBG) vs. first five sessions of training from all pts in Phase 1 (Phase 2)* No significant improvements in brief training group seen. Reading speed for all 90 subjects from Phase 1 increased significantly over 5 sessions (p <0.011). No between-groups comparisons performed.	Not evaluated by study	Not evaluated by study	Not evaluated by study

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Orientation and mobility training					
Soong et al.(31)	2001	No significant differences in O&M observed in individuals with low vision who received O&M training when compared to controls.	Not evaluated by study	Not evaluated by study	Not evaluated by study
Engel et al.(34)	2000	One of seven areas assessed was significantly improved from baseline (using public transport: p = 0.015). No significant changes from baseline in the remaining six areas (using the phone, preparing meals, paying bills, walking inside the home, walking outside the home, and taking medication) were observed	No significant changes in mood from baseline were observed (p = NR).	Five of the nine areas assessed were significantly improved from baseline (sees relatives: p = 0.016; sees friends: p = 0.007; attends club-related activities: p = 0.013; engages in hobbies; p = 0.007; moderates physical activity: p = 0.009). No significant changes from baseline in the remaining four areas (visits on phone, attends senior center activities, feels isolated, and satisfaction with activity) were observed	Not evaluated by study

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Adaptive training techniques					
Nilsson et al.(36)	2003	*Reading Speed* 18 of 20 pts enrolled learned to use eccentric viewing. In those who were successfully trained, reading speed increased significantly from baseline values (p <0.001). Reading speed after training was positively correlated with reading speed before training (r = 0.71, p <0.001) and mental alertness (r = 0.90, p <0.001). Reading speed after training negatively correlated with the degree of magnification (r = -0.49, p <0.02) and the number of training sessions (r = -0.51, p <0.05).	Not evaluated by study.	Not evaluated by study.	Not evaluated by study.
Group intervention programs					
Brody et al.(26,131)	2002	Not evaluated by study	Borderline improvement in mood from baseline (as measured using POMS) among self-management grp (p = 0.06) No significant improvement from baseline in control grp (p = 0.18) Significant improvement in mood following self-management when compared to control grp (p= 0.02) Greatest gains seen among pts who were depressed at baseline.	Not evaluated by study	Significant improvement in vision-related quality of life from baseline (as measured using NEI VFQ) among self-management grp (p = 0.04) No significant improvement in vision-related quality of life from baseline in control grp (p = 0.48) No significant improvement in vision-related quality of life following self-management when compared to control grp (p = NR)

Reference	Year	Activities of Daily Living	Mood	Psychosocial Status	Quality of Life
Dahlin Ivanoff et al.(27)	2002	*Security in daily occupations* Significant improvements in patient's perceived security in performing a number of activities of daily life were observed (13/29 activities) were seen in the health education group when compared to the individual intervention group. Significant improvements from baseline were seen in the health education group in 22/29 activities. No significant reductions in perceived security from baseline observed. Significant improvements from baseline in the individual intervention group seen in 5/29 activities. Significant reductions in perceived security observed for 2/29 activities.	Not evaluated by study	Not evaluated by study	Not evaluated by study

FFR Familiar face recognition
FED Face expression difference
NR Not reported
QoL Quality of life