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Age-Related EYE DISEASES

and Recommendations for Low-Vision Aids

As the number of people older than 65 years in the United States increases, the home care population will increase as well. Many of these patients will have several chronic diseases, including those related to vision loss. Home healthcare clinicians are in a position to promote patient safety by educating these patients about the devices available for those with decreased vision. This article provides guidance on the most appropriate methods for communicating with patients who have limited vision. The 4 major causes of vision loss in this population are briefly reviewed. Low-vision aids are described and sources for these products are identified.

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Introduction

On June 30, 2014 the U.S. Census Bureau released its *65+ in the United States: 2010* report, which indicated that in 2010 the nation's population included 40.3 million people older than 65 years. This figure is predicted to grow to 83.7 million by 2050 (West et al., 2014). The 2010 U.S. census estimated that 4 million of the population older than 40 years has a visual impairment (U.S. Department of Health and Human Services, National Institutes of Health, National Eye Institute, n.d.b). The 2014 U.S. Census Bureau report also indicated that 96.4% of the 65 years and older population live in households, many of them living alone (West et al., 2014). The National Association for Home Care & Hospice (2010) reported that approximately 12 million people received home care services. With both the number of older people living at home and the number of people who are visually impaired predicted to increase, home care clinicians should expect more patients whose chronic conditions are impacted by vision problems.

The 2010 U.S. census estimated that 4 million of the population older than 40 years has a visual impairment.

The U.S. standard for legal blindness is a best-corrected visual acuity of 20/200 in the better-seeing eye (U.S. Department of Health and Human Services, National Institutes of Health, National Eye Institute, n.d.a). Kalinowski (2008) identified several tools to help nurses assess the limits in their patients' vision. The two that are most useful for the home care clinician are the Amsler grid and the National Eye Institute Visual Function Questionnaire–25 (VFQ-25). The Amsler grid is used to assess the central visual field in patients with age-related macular degeneration. It resembles graph paper with a dot in the middle. A patient with macular degeneration sees the lines as blurred or wavy instead of straight. By checking the grid regularly, the patient can determine if the disease is progressing. A copy of it can be downloaded from the Macular Degeneration Partnership Web site at http://www.amd.org/downloads/amsler.pdf.

The VFQ-25 assesses both visual acuity and functional status. The questions examine patients' emotional well-being, social functioning, and task-oriented domains as they relate to visual functioning on a daily basis. It can be downloaded at http://www.nei.nih.gov/resources/visionfunction/vfq_ia.pdf.

Age-Related Eye Diseases

The primary causes of visual impairment in the elderly are age-related macular degeneration (ARMD), cataracts, diabetic retinopathy, and glaucoma. Vision loss with all four issues can be slowed if the cause is identified early enough. The American Academy of Ophthalmology provides vision simulators for each of these diseases on its Web site at http://www.geteyesmart.org/eyesmart/diseases/

Visual impairment is a significant contributor to loss of independence in the elderly. It can lead to depression; social isolation; disorientation and fear of falling; poor nutrition because preparing meals becomes difficult; and problems with medication management related to difficulty in reading labels (Digsby-Schoellig, 2010; Reinhardt, 2014). Watkinson and Scott (2010) noted that people with ARMD have double the rate of clinical depression as those with normal vision. Watkinson (2011) stated that "self-sufficiency and self-esteem are diminished as the person mourns the loss of his or her ability to see" (p. 26). Counseling by the home care clinician can help the patients adjust to the shock of vision loss and empower them to improve their quality of life as they protect whatever vision remains (Watkinson, 2009).

Participation in a support group has been demonstrated to help patients overcome their sense of isolation (Digsby-Schoellig, 2010). The groups can provide an opportunity for members to share knowledge of the many resources available to help patients maintain their independence and provide tips for coping with the activities of daily living (ADL). Reinhardt (2014) stressed the importance of giving the patient the opportunity to support others while receiving support themselves.

People who have a loss of vision often experience visual hallucinations. According to Wilkinson (2013), as many as 38% of ARMD patients develop them. Charles Bonnet was the first to identify this eponymous phenomenon as related to vision loss rather than a mental issue (Yelf, 2009). The cause of the hallucinations is attributed to the failure of the optic nerve to adequately send visual stimulation to the brain. Sometimes the hallucinations last for less than a minute; however, they have been known to continue for up to an hour (Macular

Degeneration Partnership, 2014). Fortunately, in about 60% of the cases, they eventually cease after about 18 months (Watkinson, 2011). Unfortunately, only about a third of patients suffering with what is known as Charles Bonnet syndrome admit to having it because they are afraid that their mental state will be questioned (Watkinson, 2010). Home care clinicians should recognize the impact of this condition on their patients. Its existence should be acknowledged and advice provided on how to deal with it. Changing one's location, blinking, or doing something different may diffuse the image.

Home care clinicians can help reduce potential threats to patient safety by being alert to such signs of decreasing vision as clothing stains, spilled food, misapplied cosmetics, or bumping into things. With prompt referrals to an eye care provider, vision rehabilitation specialists, support groups, and government or private agencies for low vision, clinicians can help reduce some of low vision–related loss of independence. A list of relevant providers with links to their Web sites is provided in Box 1.

Box 1. Web Sites for Governmental Agencies, Support Groups, and Online General Information Resources for the Visually Impaired

Action for Blind People
https://www.actionforblindpeople.org.uk/

American Academy of Ophthalmology's Get EyeSmart
http://www.geteyesmart.org/eyesmart/

American Foundation for the Blind
http://www.afb.org/
http://www.visionaware.org/

American Macular Degeneration Foundation
http://www.macular.org/index.html

Bright Focus Foundation
http://www.brightfocus.org/

Lighthouse International
http://www.lighthouse.org/

Living Well with Low Vision
http://lowvision.preventblindness.org/

Macular Degeneration Partnership
http://www.amd.org/

MD Support
http://www.mdsupport.org/

National Federation for the Blind
https://nfb.org/

Royal National Institute for the Blind
http://www.rnib.org.uk/

U.S. Department of Veterans Affairs Blind Rehabilitation Services
http://www.rehab.va.gov/blindrehab/index.asp

Jensen (2012) reminded healthcare providers to identify themselves as they begin to communicate with visually impaired patients. Also be sure to announce that you are leaving the room. If administering medication, provide the patient with the name of the medication. This information has the potential to prevent a medication error and also involves the patient directly in his or her care.

Russo and Bowen (2013) provided additional useful tips for interacting with visually impaired patients. First, determine if the patient has enough vision to identify any gestures that you may automatically make. Avoid sitting or standing in front of a window, which might cause the patient to see you as a silhouette. If the patient has macular degeneration, which results in loss of central vision, sit or stand at the side so he or she can take advantage of the more functional peripheral vision. If the patient has glaucoma, which results in loss of peripheral vision, the home care clinician should stand directly in front of the patient. Remember that time of day, stress, and environmental factors like lighting and glare may cause fluctuations in vision. Finally, always describe what you are planning to do, particularly if it involves a noise related to equipment that you may be using.

Home care agencies preparing patient education materials should be cognizant of vision deficiencies when designing their publications. The American Printing House for the Blind offers guidelines for developing materials with appropriate font size and graphical layout on their Web site at http://www.aph.org/edresearch/lpguide.htm.

ARMD causes deterioration of the macula, which is the small area of the retina that controls central vision and the ability to clearly see fine details. There are two forms of the disease, dry or atrophic and wet or exudative. Dry ARMD is also known as nonneovascular macular degeneration. Dry macular degeneration is more prevalent, accounting for 90% of the cases (Boyd, 2013c). Home care clinicians should urge patients with dry ARMD to be alert to any changes in their vision as it can develop into wet ARMD, which progresses more rapidly and results in more damage to the eye. With severe macular degeneration the individual can see the numbers around the rim of a clock but not the hands. ARMD may begin in one

eye, but eventually both eyes may develop the disease. Patients with ARMD often complain that straight lines appear wavy, particularly if they are using the Amsler grid to assess their visual field.

ARMD cannot be reversed but some vision may possibly be restored with treatment. Since 2006, ophthalmologists have been using intravitreal injections of antivascular endothelial growth factors to retard the development of choroidal neovascularization (CNV). The drugs are administered every 4 to 6 weeks. Home care clinicians should be aware that there is a risk of infection after these injections, so patients receiving the treatment should be monitored carefully (Watkinson, 2010).

Photodynamic therapy is another option for retarding CNV although it is rarely used today. Verteporfin, a photosensitizer, is administered intravenously followed by a short cool laser treatment to the center of the macula (Watkinson, 2010). A third treatment option is thermal laser photocoagulation, which also can slow progression of the diseases by stopping neovascular leakage. Approximately 50% of the patients treated with thermal laser coagulation will require additional treatment within 2 to 5 years (Boyd, 2013b).

Boyd (2013b) reported that presently there is not a proven treatment for dry ARMD. However, she described the age-related eye disease study in which patients who took Vitamins C and E, lutein, zeaxanthin and zinc oxide, and cupric oxide lowered the risk of their dry ARMD progressing to wet ARMD by 25%. These antioxidants continue to be studied for their long-term effects in reducing the progression of ARMD.

The U.S. Food and Drug Administration has approved the trial of a miniature telescope that is implanted behind the iris and projects an enlarged image onto the retinal area around the site of the macular degeneration. Early recipients have been positive about the results. However, patients do need vision rehabilitation therapy afterwards to help them reprogram the brain to use the eye with the device instead of the one that continues to have impaired central vision (Craft, 2012). This treatment is used only for distance vision and at this time very few people meet the criteria for implantation of this device.

ARMD affects central vision so many patients are able to use their peripheral vision to participate in most of their usual activities. However, central vision loss came impede the patient's ability to see the markings on an insulin syringe, to pour a glass of orange juice, or complete many routine ADL.

The primary causes of visual impairment in the elderly are age-related macular degeneration, cataracts, diabetic retinopathy, and glaucoma.

Cloudy, blurred, or dim vision is an indicator of the presence of a cataract. The patient may also complain that items they see appear to have diminished color. A cataract is a clouding of the lens of the eye that develops slowly as people age (Boyd, 2014). Surgery to replace the lens with an artificial intraocular lens is the only treatment. It is usually done on an outpatient basis and patients are sent home with various eye drops, few restrictions, and typically a quick recovery.

Medicare spends $3.4 billion annually on cataract surgery (Wing, 2014). Given that a significant percentage of people over the age of 65 remain in their homes, many of them living alone, home healthcare clinicians should verify that patients know the proper method for eye drop instillation. The need for appropriate hand washing before and after the treatment should also be emphasized (Watkinson, 2009).

The Federal Interagency Forum on Aging-Related Statistics (2012) reported that diabetes, which often causes visual impairment, is one of the seven most prevalent chronic health conditions in people older than 65 years. Nearly 21% of this population group reported having diabetes.

According to Boyd (2013e), 84% of patients with Type 2 diabetes over the age of 19 will incur changes in their retinas. In addition, glaucoma is more prevalent among people with diabetes than those without the disease and people with diabetes also have a higher incidence of cataracts (Sokol-McKay, 2010).

Because chronic elevation of blood glucose can lead to diabetic retinopathy, nutrition counseling on the part of the home care clinician is important. Control of blood pressure is also important as it can reduce the progression of diabetic retinopathy and hypertensive retinopathy. Patients should be asked if their vision fluctuates over the course of the day. Variations can occur as one's blood glucose levels rise or drop.

An assessment of the patient's usual environment should be done to confirm that the patients can safely manage their diabetes. Visual teaching aids such as flip charts and videos should be supplemented with focused explanations of how to monitor blood glucose levels and how to self-inject insulin. Creative use of analogies, such as comparing an insulin pen to the size and function of a ballpoint pen, can build on the patient's past experience and visual memory (Sokol-McKay, 2010). A patient who is legally blind qualifies for a talking glucose monitor. Nonvisual measurement devices are available to assist with insulin injections. Safe Shot and Unite Calibration Aide provide fixed doses. Syringe Support and Count-a-Dose provide assistance with varying sizes of dosage.

Glaucoma is a group of eye diseases in which the flow of fluid in the eye is impaired, which can lead to damage of the optic nerve and, if untreated, blindness. Flow of fluid in and out of the anterior chamber of the eye provides nourishment to nearby tissues. In patients without glaucoma, the fluid exits through the trabecular meshwork, which acts like a drain, at the angle where the cornea meets the iris. According to Boyd (2013d), 3 million Americans have glaucoma, but only about 50% of them are aware that they have the disease because the initial progression is slow and typically asymptomatic. Loss of peripheral vision leading to blind spots or tunnel vision is an indication that the patient is developing glaucoma. The disease is usually present in both eyes. Because it is asymptomatic, it is almost always found with routine eye exams.

According to Boyd, 3 million Americans have glaucoma, but only about 50% of them are aware that they have the disease because the initial progression is slow and typically asymptomatic.

There are a variety of treatments available for glaucoma that will not improve sight that has been lost, but may preserve the vision that remains. The first course of treatment is pharmacotherapy in which eye drops either aid in fluid drainage or reduce the amount of fluid generated in the eye. The drops may have adverse effects that discourage adherence to the regimen. If patients are complaining about these side effects, home care clinicians should urge them to see their eye care provider for a change in medication. Discomfort is the primary complaint. Other adverse effects include a darkening of the iris, thickening and increased growth of the eyelashes, and altered taste. Nonadherence is a critical problem. As many as 59% of patients prescribed eye drops do not use them as prescribed (Sharts-Hopko & Glynn-Milley, 2009). The cost of eye drops is a common reason for noncompliance. Failure to continue treatment will cause the disease to progress. Patients need to be encouraged to remain compliant with the eye drops and see their eye care provider regularly, even if they do not experience symptoms.

If drug therapy fails, there are several forms of laser treatment for glaucoma. There are also two conventional surgery methods to relieve intraocular pressure. The U.S. Department of Health and Human Services, National Institutes of Health, National Eye Institute (n.d.a) reported that conventional surgery is successful about 60% to 80% of the time. The use of marijuana to control glaucoma is a subject of debate. The American Academy of Ophthalmology does not support this therapy. The position is based on the fact that marijuana only reduces intraocular pressure for a period of 3 to 4 hours (Boyd, 2013a). Glaucoma needs to be treated 24 hours per day to prevent its progression.

Low-Vision Aids

Vision loss does not have to seriously reduce a patient's sense of independence. A large variety of products are available to make changes to ADLs. These aids include various computer technologies available for the desktop as well as handheld devices; large print books, newspapers, and magazines; and telephones, remote control devices, clocks, and watches with enlarged numbers. Talking versions of watches, scales, calculators, and glucose monitors are also available.

Rehabilitation, according to Morse (2012) aims to "facilitate functional independence and minimize the handicapping effects of disability" (p. 235). Well-informed home care clinicians are in a position to improve rehabilitation outcomes by educating their patients about the available resources and reinforcing the convenience and safety of using low-vision aids. Clinicians should ask patients what they can and cannot do to maintain a level of independence. With this knowledge, appropriate recommendations for services and aids can be made. Because Medicare provides coverage for occupational therapy services, patients should be reminded to ask their eye care provider for a referral.

Appropriate lighting and glare control are particularly important for maximizing use of the remaining vision. Glare from windows and light sources should be minimized, especially on floors, stairs, and kitchen counters. Adequate, glare-free lighting in places like stairs, thresholds between rooms, closets, and kitchens will help patients safely complete their ADLs. Marking the edges of stairs and thresholds with contrasting tape or paint is also recommended (Weisser-Pike & Kaldenberg, 2010). The Macular Degeneration Partnership's Better Lighting Web page (http://www.amd.org/better-lighting/) describes various kinds of light bulbs and their most beneficial use. For example, a shop-style lamp with a swing arm and a full spectrum bulb can be positioned over an ironing board so that it enhances contrast sensitivity enough for someone with limited vision to press his or her clothing.

Other household chores can be made easier and safer with attention to color contrast. For example, a dark colored chopping board will make slicing potatoes easier, but chopping carrots or tomatoes would be safer on a light colored chopping board. Pouring drinks into a glass on a solid colored tablecloth is easier than on a heavily patterned one. Remind patients to also select glasses that are a contrasting color to the liquid they are pouring. Liquid level indicators are available through many of the vendors listed in Box 2. Switch plates that contrast with the wall color are also helpful.

Magnifying devices have traditionally been helpful to those with vision impairment. Many styles of hand magnifiers are available in various strengths. Some include a built-in light. Stand magnifiers, which also have illumination options, are placed over the reading material and can be especially useful for patients with arthritis or tremors. Telescopic magnifiers can be attached to a patient's spectacles, although their weight and cosmetic appearance may be a detriment to their

Box 2. Sources of Low-Vision Aids for the Home

AssistTech offers talking items, electronic devices, mobility aids, and more
http://www.assistech.com/low_vision/index.htm

Beyond Sight offers talking clocks, health and beauty aids, kitchen aids
http://www.beyondsight.com

EnableMart offers giant calculators, talking devices, color identification products, and electronic devices
http://www.enablemart.com/vision

Eschenbach offers magnifiers of all types and sizes
http://www.eschenbach.com/

Independent Living offers assistive technology, medical supplies, lamps, magnifiers, and reading aids
http://www.independentliving.com/

LS&S offers daily living products, games and crafts, lighting, electronics, and talking products, including Spanish speaking
http://www.lssproducts.com/

Lighting Resources offers several portable lights and a natural alarm lamp that simulates daybreak
http://www.verilux.com

Low Vision Gateway includes links to vendors of reading aids, emerging technology, talking appliances and personal data assistants and task lighting
http://www.lowvision.org/

Maxiaids offers daily living products, magnifiers, talking devices, games, and sewing aids
http://www.maxiaids.com/store/ProdIndex.asp?idstore=1

ShopLowVision has sections for electronics, daily living solutions, home and office, recreation, and leisure
http://www.shoplowvision.com

Talking Products is a source for talking telephones and useful health aids such as blood pressure and blood glucose monitors and forehead thermometers
http://speaktomecatalog.com

use. Magnification ranges from 2× to 10×, which is especially useful for face recognition.

New technology has broadened the magnification options available. The eSight system, for example, involves prescription glasses; a small camera; a controller that can adjust zoom, contrast, and color settings; and an light-emitting diode (LED) screen placed in front of the glasses. The camera sends live video stream to the controller, which then sends the video signal to the LED screen (Pedersen, 2013).

Advances in computer technology have greatly expanded the options for patients with low vision. Conventional closed circuit television for video magnification is commonly used, although the assistive software standard in today's computers is becoming more common. Standard operating systems provide the ability to enlarge fonts as well as the cursor. Takeshita (2014) provided extensive instructions for customizing both Microsoft Windows and Macintosh computers. Speech synthesizer software is available to read the onscreen text in many languages and voice styles. Keyboards with enlarged keys make inputting text easier. Box 3 identifies sources for electronic devices and software.

The VictorReader Stream (Humanware, Drummondville, Quebec, Canada), listed in Box 3, allows users to download books and other printed material to a handheld device on which it will convert the text to voice. Standard electronic readers provide options for enlarging the font and adjusting the print setting to white type on a black background for a higher level of contrast. Many tablets and smartphones come with cameras. The user is thus able to point the camera at a street sign or menu and magnify the object with the zoom function. Zoom apps are available for smartphones and tablets. Recently, Massachusetts Institute of Technology researchers developed an audio reader device that is worn as a ring (Associated Press, 2014).

Global positioning systems provide verbal directions to travelers. Roentgen et al. (2011) recommended users listen to their directions before setting out to get an overall impression of the route and become familiar with street names. Handheld bar code readers are available to assist with reading labels when shopping or cooking. Talking color readers facilitate clothes shopping and dressing. Many older patients with fixed incomes may feel that the cost of new technology is too prohibitive. Lighthouse International has information about sources of financial assistance for vision care on its Web site at http://www.lighthouse.org/downloads/resources/financial.pdf.

There are many simple suggestions that the home healthcare clinician can make for tactile identification that will facilitate patient safety. For example, rubber bands could be applied to day time medication containers and raised dots to evening medications. Tactile measuring cups are available to assist with determining portion size. There are templates available to facilitate placement of food on dinner plates. Safety pins can be used to help distinguish between right and left foot slippers.

Several devices are available to help with writing tasks. Black ink gel or felt tip pens used on heavily lined white paper can facilitate making lists or writing directions. Sharpies, however, should

Box 3. Sources for Speech Recognition Systems, Magnifiers, and Computer Software and Hardware

A. T. Kratter & Company
http://www.atkratter.com

Ai Squared
http://www.aisquared.com/

Apple Accessibility
http://www.apple.com/accessibility/

Appszoom (has search function to identify apps for magnification, mirrors, and flashlights)
http://www.apps.zoom.com

Beyond Sight
http://www.beyondsight.com

Enhanced Vision
https://www.enhancedvision.com/

Freedom Scientific
http://www.freedomscientific.com

Freedom Vision
http://www.freedomvision.net

Humanware
http://www.humanware.com/en-usa/home

J. Bliss Low Vision Systems
http://www.jbliss.com

Microsoft Accessibility
http://www.microsoft.com/enable/products/default.aspx

Perkins Products
http://www.perkinsproducts.org/store/en/

VideoEye!
http://www.videoeye.com/products.asp

not be used because they bleed through the paper. Templates provide guidance with writing checks. Box 3 identifies sources for writing aids as well as large print and talking products to assist with ADL.

Conclusion

Low vision does not mean loss of independence. It does, however, mean that patients need to learn new ways of engaging in their ADLs. Although most patients receive home care services for diagnoses unrelated to their vision problems, the home healthcare clinician has the opportunity to provide these patients and their families or caregivers with information about resources that can help them improve their quality of life. An improved quality of life will help relieve depression and social isolation as well as provide the patient with a safer home environment.

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