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Early Vision Rehabilitation and Primary Care Optometry – An Ideal Match

Age-related macular degeneration and visual impairment continue to increase in prevalence

Low vision has been described as vision loss not correctable with spectacles, contact lenses or surgical intervention. Some of the leading causes of visual impairment include age-related macular degeneration (AMD), diabetic retinopathy and glaucoma.[4] Epidemiological studies indicate that the prevalence of visual impairment continues to increase, ranging from 3.3 to 13.5 million people.[1-4]

The Eye Disease Prevalence Research Group estimated the prevalence of intermediate AMD to be 23.6 percent of persons over 80 years of age.[2] Estimates of early AMD are expected to double by 2050 to 17.8 million people.[3] Consequently, optometrists are well-positioned to provide early intervention for visual impairment through primary care low vision rehabilitation.

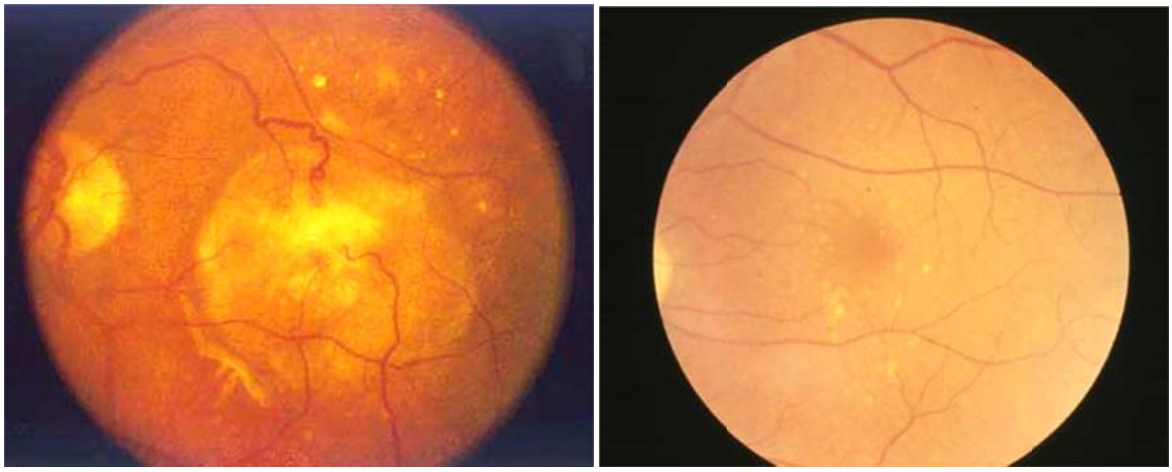

Figure 1. Fundus photo of age-related macular degeneration, advanced (left) and early stage (right).

Legal blindness, characterized by 20/200 or worse best corrected in the better seeing eye, is likely the realm for comprehensive low vision rehabilitation. However, for patients with early to intermediate AMD with best corrected visual acuity (BVA) between 20/25 to 20/100, there are a considerable number of options to help patients improve their quality of life and independence. Optometrists in a primary care setting may be best able to provide early intervention and introduce resources for later.

Primary care setting and low vision intervention

The American Optometric Association definition of vision rehabilitation is *"The process of treatment and education that helps individuals who are visually disabled attain maximum function, a sense of well-being, a personally satisfying level of independence, and optimum quality of life. Function is maximized by evaluation, diagnosis, and treatment including, but not limited to, the prescription of optical, non-optical, electronic and/or other assistive treatment options. The rehabilitation process includes the development of an individual rehabilitation plan specifying clinical therapy and/or training in compensatory approaches."*[5] In the intervening years, the Association of Schools and Colleges of Optometry's low vision educator special interest group has worked diligently on the development of entry-level low vision rehabilitation competencies in optometric education.[6] The intent is to prepare new graduates to be able to provide early intervention and recognize the appropriate steps for referral for more advanced rehabilitative care.

A good history is just the beginning of patient counseling and education

What are the expectations for these patients with mild to moderate visual impairment? "I'd be fine if you could just make these glasses just a little stronger," and "I want to see everything." Clearly, the case history is the opportune moment to set reasonable expectations, especially the difficult reality that there are no "magic glasses" to restore vision in the presence of AMD. Specific goals are more attainable, be it for reading, driving or activities of daily living.

Patients vary in their adaptation to visual impairment, which does not always correlate to visual acuity. For example, a patient with BVA 20/50, right eye, and 20/70, left eye, may feel that he or she is going blind and is afraid to do anything. In fact, the patient may go so far as to "conserve" their vision for fear of "using it up" or accelerating the disease process. Oftentimes, encouragement, reassurance and support are effective mechanisms for counseling and educating about the considerable visual function still remaining. In contrast, we may also see patients presenting with "no problems" who simply would like to get their DMV form signed to renew their driver's license. Turns out that they may also have BVA 20/225, right eye, and 20/400, left eye , which necessitates a different kind of conversation.

Figure 2. Simulation of central scotoma impact on distance viewing. Note, unless very early on in the disease process, patients rarely report a positive, black, scotoma as presented here.

Typically, a near goal is reading; however, it's important to establish what specifically the patient would like to read. Usual print sizes vary considerably depending on whether he or she is doing spot reading of utility bills versus medicine labels versus *War and Peace*. Another factor to consider is their habitual

reading distance. Some patients have already realized that by bringing material closer it's easier to read despite being a bit blurry.

Table 1. Common print sizes[7]

Size	@ 40cm	M Size	Reduced Snellen Size	Point	Common Text
10 M	20/500	80	1/2" letters		
5 M	20/250	40	Newspaper headlines		
4 M	20/200	32	Newspaper subheadline		
2 M	20/100	16	Children's books, Large-print		
1.6 M	20/80	12	Children's books		
1.2 M	20/60	10	Magazine print		
1 M	20/50	8	Text books, newspaper print		
0.8 M	20/40	6	Paperback, newspaper print		
0.6 M	20/32	5	Newspaper print, stocks		
0.5 M	20/25	4	Small *Bible*, footnotes		
0.4 M	20/20	3			

Measuring near visual acuity (NVA) for a patient with early AMD may be slightly more involved, but can yield substantially better results with a bit of attention to detail. First, Jaeger notation and reduced Snellen cards are best left out of the examination. There are many options for single letter and continuous text charts using M notation that is better standardized (Figure 3). Second, unless you are really accurate at eyeballing distances, a tape measure is an invaluable tool to improve accuracy. Remember that moving from 5 to 10 cm is a difference of 10D (20D to 10D), so even small errors can be compounded.

Figure 3. Near and distance visual acuity charts from a variety of distributors provide an essential tool for primary care low vision.

Given that visual acuity is an angular measure characterized by test distance over letter size, it is easy to see why M notation letters and real distance measured are critical. For example, a 20/40 reduced Snellen letter read at 40 cm vs. 20 cm is still recorded as 20/40. However, if a patient with AMD held the chart at 20 cm to read the 20/40 line, it represents a different visual acuity since the "20/40" target subtends a larger angle. At half the distance, the 20/40 reduced Snellen is in fact 20/80. For patients without visual impairment this is not a significant issue. However, if we're trying to estimate what increase in add power will help overcome an AMD patient's trouble reading the newspaper we run into a problem. The equivalent of 20/40 in M notation is .4m/.8M, which translates to a 40 cm working distance (.4 meter) and .8M size print. If the patient has to hold the .8M letter at 20 cm to read we note that the NVA is .2m/.8M, which is equivalent to 20/80.

Low vision does not need to be "slow" vision

Low vision rehabilitation is oftentimes referred to as "slow vision" because of the perception that the task of evaluating and treating patients with visual impairment is laborious and time intensive. Common challenges which may slow us down include "What is the highest spectacle add that I can prescribe?" "How should I determine the appropriate add power?" "How much of a change in power is needed for the patient to notice an improvement?"

With patients who have mild to moderate visual impairment we can improve our efficiency if we apply a simple tool like the log scale to our add power estimate.[8-9] The approach has been championed by Dr. Ian Bailey and Dr. Robert Greer from the University of California at Berkeley School of Optometry for many years, and has proven to be a great time saver for practitioners.

In a nutshell, if we are using a logMAR reading chart we can quickly estimate what add power is required for our patient to read the newspaper. A patient with AMD is having trouble reading the newspaper (.8M print), and you measure their NVA with their +2.50 add as .4m/2M. You could take out your iPhone and cross-multiply to come up with the distance and convert to diopters, but that would be slow and cumbersome. Alternatively, you could use the scale on a near card to do a quick count to get the answer you need (Table 2).

Table 2. LogMAR scale for near visual acuity card with reduced Snellen equivalent when reading at 40 cm. The units in the third column may be substituted.

logMAR	Reduced Snellen	Units (M, cm, or Diopter)
0.0	20/20	.40
0.1	20/25	.50
0.2	20/32	.60
0.3	20/40	.80
0.4	20/50	1.0
0.5	20/63	1.25
0.6	20/80	1.60
0.7	20/100	2.00
0.8	20/125	2.50
0.9	20/160	3.25
1.0	20/200	4.00

1.1	20/250	5.00
1.2	20/320	6.00
1.3	20/400	8.00
1.4	20/500	10.0
1.5	20/630	12.5
1.6	20/800	16.0
1.7	20/1000	20.0
1.8	20/1250	25.0
1.9	20/1600	32.5
2.0	20/2000	40.0

Looking at Table 2, third column, we can start at the number 2 which corresponds to the 2M print size the patient read. If the patient wants to read 0.8M, we recognize that we can count the number of steps from 2M to 0.8M. In this example, we count four steps "up" towards the smaller print size. The beauty of the log system is that in order to read the smaller print, the power has to increase by the same number of steps, i.e., four. We begin at 2.50 in the third column and change units to diopters (D) since the add power was +2.50D. The increment stays the same for each step regardless of units used. If we increase the add power by four steps we go from 2.5D to 3.25 to 4 to 5 to 6D. In other words, after our refraction, we'd trial a +6D add and expect that the patient would immediately be able to read .8M print. Contrast this with the "guess and by golly" method where we try lenses of varying powers like 0.5 or 1D that may make sense, and then asking the patient to read each time. It's not surprising that both the patient and the doctor get tired and discouraged.

Using the log scale tool, we could estimate the reading distance, too. We have established that it took four steps to go from 2M to 0.8M size print. For reading distance, we begin at 40 cm in the third column since the reading distance was 40 cm and corresponded with an add power of +2.50D, i.e., 1/.4m = +2.50D. If we decrease the reading distance by four steps we go from 40 cm to 32.5 to 25 to 16 cm. In other words, after our refraction, we'd expect that the patient would hold the reading material at 16 cm and require a +6D add (1/.16m= +6D). Again, we expect that the patient would be able to read .8M print without any additional trial lenses or trials.

Remember acuity reserve to increase reading speed

Importantly, we recognize that we have established the minimum amount of add power necessary to just be able to make out the newspaper size print. However, people are accustomed to having an acuity reserve in order to read quickly and comfortably. So, if the patient indicates that they can see it but it's a bit of a struggle, what should be the next step up in power? Again, referencing our log scale we recognize that we were able to read .16m/0.8M with a +6D add. When we reference Table 2, we see that the next step higher in power is +8D. In other words, anything less than an increase of 2D would not be noticeable to the patient. We replace the +6D add from the trial frame, insert the +8D in the back lens well, and the patient should now be able to read .6M print if she or he holds the material closer, too. At the same distance, the patient should be able to read the larger print with some acuity reserve and thus read more quickly as well.

Since reading at threshold is not comfortable, it's important to aim for a 2-5x acuity reserve in order to maximize reading speed and endurance.[10] The average reading speed varies by grade level from around 150 words per minute (wpm) for a 3rd grade student to a college student at around 450 wpm.[11-12]

Table 3. Average reading speed in words per minute with varying levels of education.[11-12]

Level of Reader	Average Reading Speed (wpm)
3rd grade student	150
8th grade	250
College student	450
"High level exec"	575
College Professor	675
Speed reader	1,500

Legge et al. conducted numerous psychophysical studies relating to reading performance and visual impairment. The clinical application of their research resulted in the MNRead card that enabled practitioners and researchers to plot the relationship between reading speed and print size.[13]

The MNRead acuity chart is a reading performance test, which can measure threshold visual acuity, critical print size and maximum reading speed. Arranged in a log steps the card may be held at various distances with predictable changes in print size read. Maximum reading speed may be estimated from superthreshold targets. As the print gets closer to threshold, reading speed drops off. The inflection point is referred to as the critical print size – the size at which reading speed first drops off. At threshold acuity, the smallest print is read but usually at the slowest speed. A correction factor for mistaken words is included as part of the scoring.[14]

Sometimes the easiest treatment is the best

The practical application of acuity reserve is to keep in mind the patient's goal, reading comfort and efficiency. Treatment options vary depending on the task. For example, spot reading is quick as in reading price labels or menus. Depending on the level of magnification required, an illuminated hand-held magnifier may be sufficient. The power of the magnifier corresponds to your power estimate from using the log scale tool. However, for longer periods of reading, such as books and magazines, a pair of reading spectacles may be more comfortable and practical. Again, single vision readers may be sufficient to enable your patient with AMD to now see more clearly at the closer reading distance that they had already adopted.

Figure 4. 5x doublet microscope for reading (left) and illuminated hand-held magnifier .

Summary

As the prevalence of age-related eye disease leads to corresponding increases in visual impairment, optometrists will be well-positioned to provide early intervention to help patients achieve their visual goals. Defining entry-level competencies will assist practitioners in helping patients with mild to moderate visual impairment. Simple charts with M notation, a log scale and a tape measure are the basic tools to get started. With a trial lens set and a few low power illuminated magnifiers, many patients may be able to continue their activities of daily living more easily and more independently. As the disease process progresses, optometrists are also able to help counsel, educate and refer to other providers who have sub-specialty experience in more comprehensive low vision rehabilitation.

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Early Vision Rehabilitation and Primary Care Optometry – An Ideal Match (OTHER)

CE@Home July/August

Deadline: September 15, 2016

Name_____ License_____

1. Low vision has been described as vision loss not correctable with spectacles, contact lenses, or surgical intervention.
a. True
b. False

2. The Eye Disease Prevalence Research Group estimated the prevalence of intermediate AMD to be ____% of persons over 80 years of age
a. .2
b. 2
c. 23
d. 230

3. Mistakenly, you record a reduced Snellen acuity for measurement of near visual acuity with your low vision patient. If you observe that they read the 20/200 line at 20 cm, what would be the correct notation of their near visual acuity?
a. 20/200
b. 0.2m/4.0 M
c. 0.2m/10.0 M
d. 0.4m/5.0 M

4. A patient with macular degeneration wants to read the newspaper (goal = 0.8M). Entering near acuity with a +2.50 add measures .4/3.2M (continuous text). At what distance would this person need to hold the newspaper in order to read?
a. 15 cm
b. 10 cm
c. 7 cm
d. 5 cm

5. Reading with an acuity reserves of at least 2x should increase reading speed.
a. TRUE
b. FALSE

6. Which of the following patients would be classified as legally blind?
a. Diagnosed with glaucoma with best-corrected VA 20/70 OD, OS
b. Diagnosed with optic nerve hypoplasia with best-corrected VA 20/40 OD, OS
c. Diagnosed with AMD with best-corrected VA of 20/200 OD, 20/320 OS
d. None of the above

7. Which of the following would be useful for a low vision examination in a primary care setting.
a. Tape measure
b. Trail frame
c. M notation near acuity card
d. All of the above

8. Treatment options for mild visual impairment in a primary care setting would include all of the following EXCEPT:
a. Text to speech software
b. Single vision readers
c. Illuminated hand-held magnifier
d. Counseling and education

9. Which of the following charts enables plotting of reading speed and print size on a logarithmic scale?
a. Lighthouse chart
b. Newspaper
c. MNRead card
d. None of the above

10. For patients with more advanced vision loss referral for advanced vision rehabilitation may be beneficial:
a. True
b. False

To be included for the examination: LogMAR scale for near visual acuity card with reduced Snellen equivalent when reading at 40 cm. The units in the third column may be substituted.

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0.2	20/32	.60
0.3	20/40	.80
0.4	20/50	1.0
0.5	20/63	1.25
0.6	20/80	1.60
0.7	20/100	2.00
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1.4	20/500	10.0
1.5	20/630	12.5
1.6	20/800	16.0
1.7	20/1000	20.0
1.8	20/1250	25.0
1.9	20/1600	32.5
2.0	20/2000	40.0