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Transitioning vision rehabilitation patients from over-the-counter magnifiers to prescribed aids

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ABSTRACT

Purpose: We determined over-the-counter magnifier usage rates by patients who newly presented for vision rehabilitation services, and sought to elucidate whether patients' ratings of over-the-counter magnifiers were associated with vision rehabilitation management strategies.

Methods: Retrospective records reviews of 274 new vision rehabilitation patients seen between 2021-2023 were completed by three optometric providers at an ophthalmic academic center, college of optometry, and private practice.

Results: Over half (58%) of patients tried an over-the-counter magnifier. Older age was significantly associated with trying over-the-counter magnifiers (OR:1.04; $p < 0.001$). Patients who tried an over-the-counter magnifier had significantly greater odds of the provider recommending and/or dispensing a prescribed hand-held optical illuminated magnifier (≤ 0.04) or recommending a CCTV electronic magnifier ($p = 0.049$). The majority indicated over-the-counter magnifiers were somewhat (46%) or not helpful (38%). There was a significantly greater odds of rating the over-the-counter magnifier as not helpful when the provider subsequently recommended a CCTV (OR:4.8; $p = 0.01$) or higher spectacle-based near add power (OR: 2.0; $p = 0.02$).

Conclusions: Since most new patients were unsatisfied with over-the-counter magnifiers, it is encouraging that previous over-the-counter magnifier use often led to upgrades with hand-held optical illuminated magnifiers prescribed by vision rehabilitation providers, or patients were transitioned to CCTV electronic magnifiers or spectacle-based high add powers for near reading. These findings support that older adults who have previously experienced that over-the-counter magnifiers were either helpful or unhelpful are ideal candidates to receive vision rehabilitation by optometric providers who can transition them to a prescribed magnification device to better support their visual functioning needs for near reading.

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Magnifier; magnification; low vision; visual impairment; vision rehabilitation

► IMPLICATIONS FOR REHABILITATION

- Over-the-counter magnifiers were deemed helpful by only a small proportion of visually-impaired patients who were newly seeking vision rehabilitation services; but there are other viable options for them, since optometric vision rehabilitation providers prescribed alternative magnification devices, such as spectacle-based high near add powers or electronic visual aids for patients.
- Patients who have previously tried an over-the-counter magnifier were often recommended and received a different magnification device from vision rehabilitation providers who should be encouraged to evaluate other aids in-office to determine if they are more acceptable and/or better suited to meet patients' needs.
- For patients and their families who have not yet pursued vision rehabilitation, our findings indicate that they should not give up on magnifiers and remain open to the possibility of using other types of magnification that could be helpful, such as a different optical magnifier, prescription for strong near reading glasses, electronic video magnification, or visual assistive apps for smartphones or tablets.

Medical aids and devices are commonly sold over-the-counter commercially to help support individuals with disabilities, e.g. hearing aids [1], wheelchairs, canes, or magnifiers, but there are other viable options for them. Individuals and/or their family members are responsible for determining which aid is most suitable, which can be difficult to ascertain if there are a wide range of options available or if the aid needs to be appropriately matched to the level of disability. This is the case for the selection

of over-the-counter magnification devices (i.e. optical magnifiers) for visually-impaired individuals. When purchasing an over-the-counter magnifier, the following are some of the important considerations: lens power, magnifier size, field of view, built-in illumination, weight of the device, and ergonomics.

With societal increases in online web-based shopping, it becomes easier to find and purchase over-the-counter magnifiers for vision impairment, but their uptake rate is unknown and

their helpfulness has not been formally elucidated in a large group of visually-impaired adults. As part of vision rehabilitation services, a clinician provider evaluates the patient's visual functioning and reading needs or interests to make recommendations for prescribed magnifiers, as well as provide support for utilizing the magnifier optimally during reading tasks using the patient's residual vision and promote independence during activities of daily living to improve quality of life. Without guidance from a vision rehabilitation provider on the magnifier that would be best suited for an individual's needs, the process of selecting an optimal magnifier might become trial and error, which could leave unsuccessful users with the impression that magnifiers are not ideal for them. Furthermore, many over-the-counter magnifiers are lower powered lenses without additional illumination to enhance contrast, which is an important feature for many visually-impaired older adults. (Yip et al. IOVS 2021;62:ARVO E-Abstract 3554) Typically, increased lens power is required to help patients with more advanced vision loss with reading, but the power of a prescribed magnifier may depend on both the patient's visual status and their goals for reading text size (e.g. large print versus fine print), as well as the patient's ability to use the magnifier's field of view that becomes smaller with increasing power. Also, there is no standardization of the reported magnification level, which leads to non-uniformity in the lens power across devices. Given these various challenges and potential limitations of over-the-counter magnifiers, we anticipated that a majority of visually-impaired people who have tried them would be unsatisfied.

Furthermore, we expected that the visual needs of patients who were dissatisfied with over-the-counter magnifiers could be met with other visual assistive devices that are prescribed by vision rehabilitation providers. During a new vision rehabilitation evaluation, the provider will obtain a thorough history to determine the patient's limitations and goals related to visual functioning, then will assess visual function, and evaluate visual assistive aids based on the patient's needs. Patient's needs are assessed during the history by inquiring about tasks that are of interest or important for the patient to complete but difficult due to vision impairment, as well as observations of any physical limitations while patients trial visual aids or magnifiers. In addition to optical magnifiers, vision rehabilitation providers will commonly recommend spectacle-based higher add powers to give magnification for near and/or electronic aids [2–4], such as CCTVs or visual assistive mobile applications (apps) [5–7]. All of these options are not suitable for all visually-impaired patients, and special consideration is given to patient preferences, co-morbidities, and visual functioning with the device, in addition to device training [8]. These factors collectively play an important role in the power and type of device that is recommended.

We performed a recent retrospective records review at three different optometric vision rehabilitation practices to evaluate usage rates and patient ratings for over-the-counter magnifiers, as well as management strategies in relation to use of over-the-counter magnifiers. Findings from this study that were consistent between sites could be valuable to help support referrals for vision rehabilitation services, either as self-referrals by patients or their family members, or from other physicians.

Methods

Approval for the retrospective records review by AKB for her patients seen at the University of California, Los Angeles (UCLA)

Vision Rehabilitation Center was issued by the institutional review board at UCLA that waived the requirement for informed consent and HIPAA Research Authorization for this study. The retrospective records review by PDY at the Southern California College of Optometry was deemed exempt from IRB approval by the Marshall B. Ketchum University. The same retrospective records review methods were used by JEK at his private practice, Mid-Michigan Eye Care.

A retrospective review of records was conducted for a total of 274 consecutive new patients seen for vision rehabilitation services at either an ophthalmic academic center, the UCLA Stein Eye Institute in Los Angeles, CA between January 2022 to July 2023 ($n=143$), the Southern California College of Optometry in Fullerton, CA between June 2021 to May 2023 ($n=81$), or a private practice, Mid-Michigan Eye Care in Midland, MI between January 2021 to July 2023 ($n=50$). We included any cause of visual impairment that led to a loss of visual functioning or difficulty with activities of daily living that prompted the patient to seek vision rehabilitation services. Patients' needs and interests related to reading were evaluated during the clinical evaluation during the intake history and with observations while patients trialed visual aids. As part of the intake history, the optometric clinician (AKB, JEK) or student intern (for PDY) inquired about whether the patient had previously tried or was using an over-the-counter, non-prescribed optical magnifier for near tasks. Additionally, the patients at UCLA and Mid-Michigan Eye Care asked to rate whether the over-the-counter magnifier was helpful, only somewhat helpful, or not helpful (i.e. did not work for them). At the Southern California College of Optometry, notes were often taken on the patient's comments regarding the over-the-counter magnifier but not consistently for the patients' ratings. The optometric provider at each site (AKB, JEK, PDY) manually extracted their patient data from electronic health records into a spreadsheet to create the dataset.

Patients under the age of 16 were excluded, while all other patients were included if their presenting distance best corrected visual acuity with any habitual spectacle correction was worse than 0.18 logMAR (equivalent to ~20/30) in the better eye. All patients had ocular diagnoses that caused a reduction in best-corrected visual acuity and/or visual field loss (i.e. peripheral vision or central scotomas (blindspots)). As part of the clinical examination, distance visual acuity was usually measured at UCLA and Mid-Michigan Eye Care using an electronic Snellen chart calibrated for 20 feet, while for cases of severe visual impairment, an ETDRS chart at one or two meters was used at UCLA or a Bailey Lovie chart at 10 feet was used at Mid-Michigan Eye Care. At the Southern California College of Optometry, distance visual acuity was usually measured at 10 feet with either a Bailey Lovie chart or Feinbloom Low Vision chart, and an electronic Snellen chart calibrated for 20 feet was used less frequently. For near visual acuity measurements, the Lighthouse continuous text reading card at the preferred near working distance was used at UCLA, Mid-Michigan Eye Care, and usually at the Southern California College of Optometry, in addition to the MN Read chart less frequently. The near reading tests were used to measure reading acuity, while reading speed and/or fluency were considered by the provider but not formally quantified or documented in the exam record. At UCLA and Mid-Michigan Eye Care, the clinical optometric provider completed distance and near refraction, as well as trialed visual assistive optical and electronic aids based on the patient's goals and needs, while a 4th year optometric intern under the supervision of the clinical optometric provider completed these tasks at the Southern California College of

Optometry. Vision rehabilitation services involved evaluation for visual aids and did not include other rehabilitation training, such as eye exercise, eccentric viewing, oculomotor control or perceptual learning.

Data analyses

Descriptive statistics were used to summarize the study data and findings. Multiple logistic regression analyses were used to explore whether patients had tried an over-the-counter magnifier or if their ratings of the helpfulness of the over-the-counter magnifier were significantly related to any visual or patient-related factors (i.e. age, gender, best-corrected visual acuity, or diagnosis of age-related macular degeneration), as well as recommendations for new magnification devices (i.e. optical illuminated magnifiers, electronic video magnifiers, or spectacle-based high add powers for near). We used simple linear regressions to evaluate whether there were any significant factors related to the prescribed optical magnifier power. A two-sample t-test was used to compare the dioptric equivalent power of newly prescribed optical magnifiers that were dispensed versus those that were recommended but not dispensed, as well as for comparison of the dioptric powers of near adds and newly prescribed optical magnifiers according to whether patients thought that over-the-counter magnifiers were helpful. Data were analyzed using Stata/IC version 15.1 (Stata Corp., College Station, Texas, USA).

Results

Table 1 displays the patients' demographics and visual characteristics. The 274 patients included a wide range of adult ages, but most were older adults with a mean age of 72 years; slightly more than half were women ($n=152$; 55.5%). About half of the patients ($n=138$; 50.4%) had age-related macular degeneration. Following refraction, best-corrected distance visual acuities in the better eye across all patients ranged from 0.02-1.7 logMAR (mean 0.58; SD 0.33) and near spectacle-correction enabled reading of print sizes equivalent to a range of 0-1.3 logMAR (mean 0.48; SD 0.33).

More than half ($n=160$; 58%) of all the patients had tried an over-the-counter optical magnifier. Having tried an

over-the-counter magnifier was significantly related to older age (OR: 1.04 for every 1-year increase in age; 95% CI: 1.02-1.06; $p<0.001$), but was not significantly related to female gender (95% CI: 0.69-1.97; $p=0.58$), diagnosis of age-related macular degeneration (95% CI: 0.33-1.31; $p=0.23$), or best-corrected distance visual acuity post-refraction (95% CI: 0.73-3.79; $p=0.23$). Refraction is the process to determine spectacle-based corrective lens power to achieve best-corrected visual acuity. Figure 1 displays the distribution of patients' ages according to whether they had previously tried an over-the-counter optical magnifier.

A new hand-held optical illuminated magnifier was recommended to 43% of all patients. The odds of recommending a prescribed hand-held optical illuminated magnifier were significantly greater for patients who tried an over-the-counter magnifier (OR: 3.1; 95% CI: 1.71-5.60; $p<0.001$), while the following factors were not significantly related: age (95% CI: 0.998-1.04; $p=0.08$), female gender (95% CI: 0.85-2.54; $p=0.17$), diagnosis of age-related macular degeneration (95% CI: 0.30-1.21; $p=0.16$), or post-refraction distance best-corrected visual acuity (95% CI: 0.75-4.21; $p=0.19$). The dioptric equivalent power of the newly prescribed optical magnifiers ranged from 5-36D (mean 12.5D; SD 5), and was significantly greater for patients with worse best-corrected distance visual acuity post-refraction by 7.3D on average for every 1.0 logMAR decrease (95% CI: 4.66-10.0; $p<0.001$).

A new hand-held optical illuminated magnifier was dispensed to 31% of all patients, or 72% of patients to whom it was recommended. The odds of dispensing a hand-held optical illuminated magnifier were significantly greater for patients who tried an over-the-counter magnifier (OR: 1.89; 95% CI: 1.03-3.49; $p=0.04$) and those with worse best-corrected distance visual acuity post-refraction (OR: 2.40; 95% CI: 1.02-5.62; $p=0.044$), but the following factors were not significantly related to the odds of dispensing a hand-held optical magnifier: age (95% CI: 0.99-1.03; $p=0.18$), female gender (95% CI: 0.63-1.94; $p=0.72$), or diagnosis of age-related macular degeneration (95% CI: 0.39-1.60; $p=0.50$). The dioptric equivalent power of newly prescribed optical magnifiers on average was not significantly different when comparing those that were dispensed (mean 13.1D; 95% CI: 12.0-14.3) versus magnifiers that were recommended but not dispensed (mean 11.2D; 95% CI: 9.6-12.8) ($p=0.08$).

Table 1. Lists patients' demographics, visual characteristics, and vision rehabilitation management in relation to whether they had tried an over-the-counter (OTC) magnifier.

	Tried OTC magnifier	Had Not Tried OTC magnifier	Total
Age (years)	78.4 (23-102)	64.0 (16-96)	72.4 (16-102)
Female gender	58.75% (94)	50.88% (58)	55.47% (152)
Distance VA	0.58 (0.02-1.48)	0.57 (0.02-1.7)	0.58 (0.02-1.7)
Post-Refraction (logMAR)			
Near VA Post-Refraction (logMAR)	0.50 (0.0-1.3)	0.46 (0.0-1.3)	0.48 (0.0-1.3)
Age-related Macular Degeneration	57.5% (92)	40.35% (46)	50.36% (138)
Recommended New Optical Illum. HHM	55.62% (89)	25.44% (29)	43.07% (118)
Dispensed New Optical Illum. HHM	37.74% (60)	21.05% (24)	30.77% (84)
Recommended New CCTV Elec. Magnifier	20.62% (33)	14.91% (17)	18.25% (50)

Illum. HHM: Illuminated Hand-Held Magnifier; Elec.: Electronic; VA: visual acuity.

The mean (and range) are provided for continuous variables and proportions (and counts) are provided for dichotomous variables.

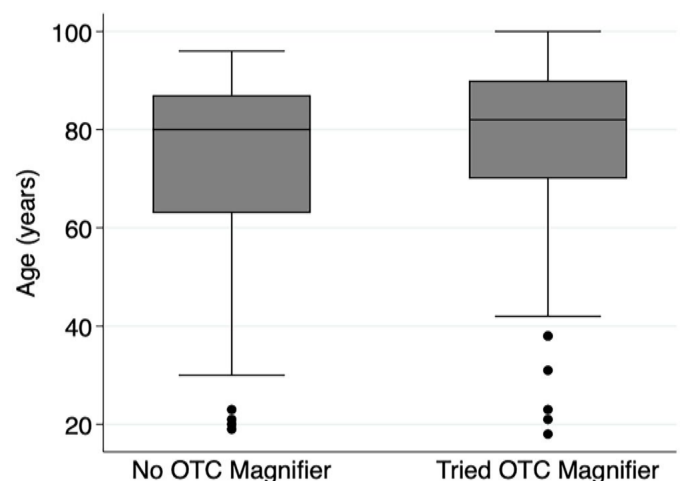


Figure 1. Box plot displaying the distribution of patients' ages according to whether or not they had previously tried an over-the-counter (OTC) optical magnifier. In the box plot, the bottom and top of the box are the 25th and 75th percentile (i.e. the upper and lower quartiles, respectively), and the band near the Middle of the box is the 50th percentile (i.e. the median). The individual dots represent outlier data from individual participants.

A new CCTV electronic magnifier was recommended to 18% of all patients. The odds of recommending a CCTV were significantly reduced for patients of older age (OR: 0.97; 95% CI: 0.95-0.996; $p=0.02$) and significantly greater for worse best-corrected distance visual acuity post-refraction (OR: 5.12; 95% CI: 1.91-13.7; $p=0.001$) or patients who tried an over-the-counter magnifier (OR: 2.13; 95% CI: 1.005-4.50; $p=0.049$), while the odds of recommending a CCTV were marginally significantly greater for those with age-related macular degeneration (OR: 2.44; 95% CI: 0.96-6.21; $p=0.06$), but were not significantly related to female gender (95% CI: 0.74-2.78; $p=0.29$).

Subgroup with ratings of OTC magnifiers

For patients at UCLA and Mid-Michigan Eye Care ($n=121$) who rated the helpfulness of their over-the-counter magnifier, over a third ($n=46$; 38%) did not think it was helpful, while slightly less than half found it somewhat helpful ($n=55$; 45.5%) and only a small proportion indicated the over-the-counter magnifier was helpful ($n=20$; 16.5%). There was a significantly greater odds of rating the over-the-counter magnifier as not helpful when the provider subsequently recommended a CCTV (OR: 4.80; 95% CI: 1.43-16.1; $p=0.01$) or spectacle-based higher near add power (OR: 1.99; 95% CI: 1.11-3.58; $p=0.02$), while the odds of the OTC magnifier being unhelpful were unrelated to age (95% CI: 0.98-1.09; $p=0.19$), female gender (95% CI: 0.35-2.36; $p=0.84$), diagnosis of age-related macular degeneration (95% CI: 0.35-3.0; $p=0.97$), or best-corrected distance visual acuity post-refraction (95% CI: 0.10-2.66; $p=0.42$). When a spectacle-based near add was prescribed by the vision rehabilitation provider, the add power was significantly greater by nearly a half diopter (0.42D) on average for patients who did not think the over-the-counter magnifier was helpful (mean add 4.31D; 95% CI: 3.98-4.64D; $p=0.02$) when compared to those who thought an over-the-counter magnifier was at least somewhat helpful. When a prescribed optical illuminated hand-held magnifier was recommended by the vision rehabilitation provider, its dioptric equivalent power was marginally significantly greater by 2D on average for patients who did not think the over-the-counter magnifier was helpful (95% CI: -0.06, 4.0D; $p=0.057$) when compared to those who thought it was at least somewhat helpful. Figure 2 shows the distributions for the prescribed near add powers and the dioptric equivalent powers of the prescribed optical illuminated hand-held

magnifiers according to patients' ratings of the helpfulness of the over-the-counter optical magnifier.

Discussion

Our findings support that many visually impaired adults obtain various over-the-counter magnifiers prior to presenting for vision rehabilitation services; however, the majority do not end up with an optimal tool for their visual functioning and needs since they indicated that it was only 'somewhat' or 'not helpful'. Thus, it appears that the available options and shopping process for over-the-counter magnifiers is less than effective for most people who subsequently seek vision rehabilitation services since only a small proportion (16.5%) reported that an over-the-counter optical aid was helpful. Fortunately, there are other viable options for those who are not successful with over-the-counter magnifiers, since our optometric vision rehabilitation providers prescribed other magnification devices, such as spectacle-based high near add powers or CCTVs, which are alternative optical or electronic visual aids for patients. Interestingly, those who had tried an over-the-counter magnifier had significantly greater odds of receiving a recommendation from the vision rehabilitation provider for either a new optical hand-held magnifier or CCTV, or having the new optical hand-held magnifier dispensed to them. This indicates that it is possible for vision rehabilitation providers to transition patients who had tried over-the-counter magnifiers to prescribed visual aids that are better suited to meet their needs.

Based on our findings, we hypothesize that people who tried over-the-counter magnifiers were motivated and took the initiative to find a solution to help with their reading difficulty, which may be related to their receptiveness to other similar interventions. Our findings reveal that having tried an over-the-counter magnifier does not preclude a vision rehabilitation from recommending a different magnifier. This information should be encouraging to vision rehabilitation providers to demonstrate and evaluate other magnification devices in-office to determine if there is another aid that would be more acceptable to the patient. This study also supports that vision rehabilitation providers should attempt to mitigate any bias toward patients' acceptance of new magnification devices based on their previous experience with over-the-counter magnifiers; i.e. new magnification devices should be demonstrated regardless of the patients' past history, which was the case for our practitioners. The decision

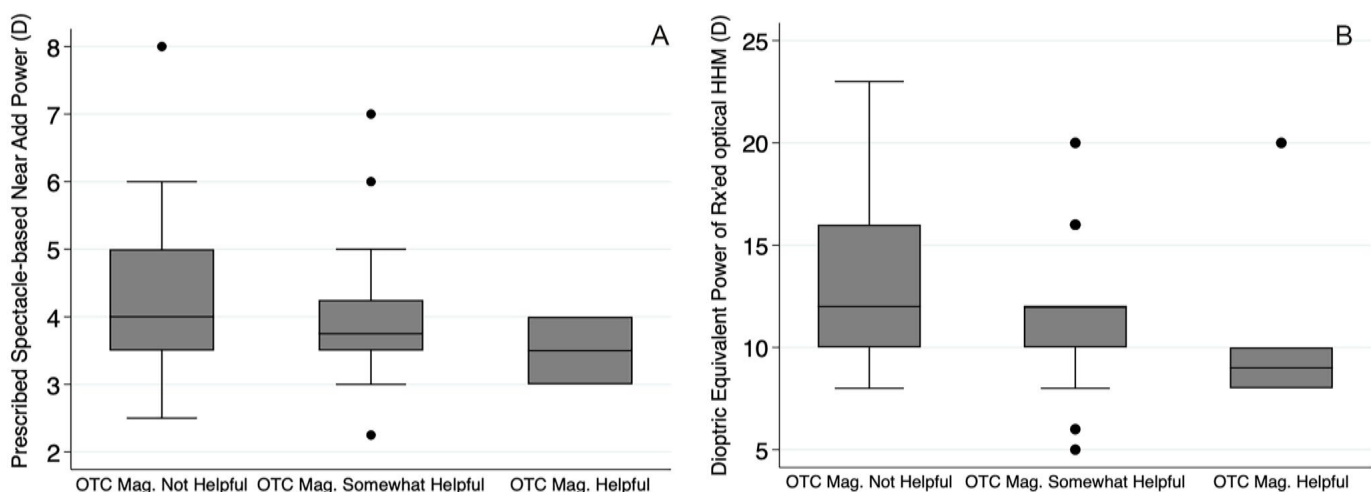


Figure 2. Box plots displaying the distributions for the prescribed spectacle-based near add powers (panel A) and the dioptric equivalent power of the prescribed (rx'ed) optical illuminated hand-held magnifier (HMM) (panel B) according to categories for patients' ratings of the helpfulness of the over-the-counter (OTC) optical magnifier (mag.).

to prescribe and dispense a magnification device should be supported by the patient's discretion that it would be beneficial and incorporated into their daily activities. As for patients and their families who have not yet pursued vision rehabilitation, our findings indicate that they should not give up on magnifiers and remain open to the possibility of using other types of magnification that could be helpful, such as a different optical magnifier, prescription for strong near reading glasses, or in the form of electronic video magnification or smartphone-based app.

In our study, 38% of patients reported that their over-the-counter magnifier was not helpful, which we anticipate could be related to various factors, such as level and type of vision loss, level of acceptance, ease of use, physical or cognitive barriers, need for training, the power of the over-the-counter magnifier, and/or the types of tasks for which the magnifier is used. Another study reported that over-the-counter magnifiers self-selected by low vision patients were not sufficient to meet patients' goals, primarily since the optical magnifier power was too low and many did not have a light to enhance contrast. (Yip et al. IOVS 2021;62:ARVO E-Abstract 3554) In another previous study, hand-held optical magnifiers were the most commonly prescribed type of visual aid to 72% of low vision patients, and 45% found them to be useful. (Wong EY, et al. IOVS 2008;49:ARVO E-Abstract 3148) Another study reported that 80% of participants who used a prescribed hand-held magnifier rated it as moderate to extremely useful after 3 months, while 59% with a spectacle-based high near add power rated it as moderate to extremely useful [9]. However, these two previous studies did not explore or did not identify any significant predictive factors for the types of prescribed magnification devices or the usefulness ratings for the magnifiers by patients. Usefulness of the magnifier will likely be influenced by whether the patient is utilizing it in an optimal and ergonomic manner, as well as applying it to appropriate tasks, all of which can be facilitated and supported *via* training from the vision rehabilitation provider to the patient. (Bittner AK, et al. OVS 2022;99:E-Abstract 220079) The current retrospective study represents preliminary work to explore patient characteristics and tendencies toward use of over-the-counter magnifiers and subsequent management plans for patients who were new to vision rehabilitation services. Future work could systematically elucidate the reasons for patient satisfaction ratings of over-the-counter magnifiers and how those ratings compare to characteristics and future ratings of the magnification device that was prescribed and dispensed during the vision rehabilitation exam.

Accounting for the site during our analyses did not change the significant findings despite the inclusion of three distinctly different practice types from two different regions of the United States. Across vision rehabilitation practices, there will be some inherent differences in prescribing patterns for visual aids and patient characteristics. The evolving, evidence-based approach of using hand-held electronic magnification, such as portable CCTVs [10] (including smartphone and tablet apps for this purpose) [11] is likely changing the patterns of magnifier selection, as the degree to which practitioners incorporate this newer device class into the management plan varies. (Fletcher DC, et al. IOVS 2019;60:ARVO E-Abstract 4032) [8] Most patients (recently estimated as ~90%) [12] have a smartphone, and magnification apps or built-in accessibility features are free of cost for mobile devices, but it is important for vision rehabilitation providers to give extensive training on their use for older adult patients to become proficient [13]. Our finding that use of over-the-counter magnifiers by older patients is not surprising given that younger adults are increasingly using their smartphones for visual assistance prior to receiving vision rehabilitation. Following vision rehabilitation services, some patients will opt for the use of magnification *via* their smartphone or tablet

devices, while others are only interested in traditional optical aids, or others embrace both options depending on the task or location. Future studies could explore these patient preferences and outcomes dependent on the type of magnification device. Evidence suggests that prescribing habits of vision rehabilitation providers change over time with more complex devices prescribed with increasing experience [14]; thus with evolving technology options, it is important for providers to support a range of patient needs and interests for the type of magnification devices [15].

A limitation of this study was that we focused on people who presented for vision rehabilitation services and therefore were unable to determine satisfaction rates for the over-the-counter magnifiers among people who do not seek vision rehabilitation, which we would expect to be greater than in our sample. We anticipate that there are probably many patients with mild visual impairment who do well with over-the-counter magnifiers initially and therefore might not seek vision rehabilitation services until more progressive vision loss occurs. It is important to educate eye care providers, patients and their families that level of visual acuity loss is not necessarily an important factor for vision rehabilitation services, but other aspects of vision loss (e.g. contrast sensitivity, scotomas and/or peripheral visual field) can also play important roles in visual functioning. The visual aids and other strategies that are provided during vision rehabilitation can help to enhance visual functioning when spectacle-based correction and/or over-the-counter magnifiers are insufficient. It was possible for our vision rehabilitation providers to significantly improve near reading acuity with a newly prescribed high add power that was judiciously selected to help patients who reported that an over-the-counter magnifier did not work well to meet their needs. Determining the most appropriate near spectacle power requires consideration of the patient's vision and distance refraction, as well as guidance for the patient to utilize the correct working distance to focus with the add power. Vision rehabilitation providers also consider the patient's willingness and ability to hold the reading materials at the closer distance required for high adds. Not everyone will be receptive to read at 8-10 inches, and some will require follow-up reinforcement training to become successful at using a high add power with a working distance that is closer than the one to which they were previously accustomed to using. Future research should explore the need for and potential benefits of follow-up training to support patients who are newly prescribed a high add power.

The findings of the current study are applicable to the provision of vision rehabilitation services in the United States, or other high-income countries with similar models of care and access to over-the-counter or prescribed visual aids for low vision. This study's findings reveal the importance of vision rehabilitation services to prescribe various types of magnification devices for visually impaired individuals who are unsuccessful with over-the-counter magnifiers. Specifically, spectacle-based high add powers or CCTVs were often prescribed for these patients, which are not as readily found as over-the-counter aids. This study also highlights the need to promote the potential benefits of vision rehabilitation services and refer patients who report difficulty with visual functioning, even after they have tried an over-the-counter magnifier.

Disclosure statement

The authors report there are no competing interests to declare.

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Notes on contributors

Ava K. Bittner, OD, PhD received her Optometry degree from the Pennsylvania College of Optometry with clinical honors in pediatrics and low vision. She earned a PhD in clinical investigation from the Johns Hopkins School of Public Health. Dr. Bittner is currently a Professor of Ophthalmology at the UCLA Stein Eye Institute and her primary clinical interest is low vision rehabilitation. She is the Smotrich Family Optometric Clinician-Scientist Chair, and serves as the Director of the UCLA Vision Rehabilitation Center and Chief of Optometric Services at the Stein Eye Institute. Dr. Bittner designs and leads the conduct of clinical trials to evaluate interventions to help improve visual functioning in patients with low vision. Dr. Bittner has received NIH funding (K23, R21, and R01 awards) from the National Eye Institute, and has served as a co-investigator or consultant for multi-center clinical trials of devices or treatments for patients with retinal degenerations. She serves on several professional research committees and as an editorial board member for vision science journals. She travels regularly both nationally and internationally to speak on topics related to her research in vision rehabilitation and is the author of more than 50 peer-reviewed scientific publications.

Patrick D. Yoshinaga, OD, MPH has worked in private practice, as Director of Contact Lens Services at the University of Southern California Doheny Eye Institute, and as coordinator of the State of Nevada Bureau of Services to the Blind and Visually Impaired Las Vegas Low Vision Clinic. Currently he is a Professor at the Southern California College of Optometry at Marshall B. Ketchum University and Chief of the Low Vision Service and teaches in the areas of public health, low vision, and ophthalmic optics. He is a Fellow of the American Academy of Optometry and is a Diplomate in the Academy's Section on Public Health and Environmental Vision.

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References

- [1] Manchaiah V, Taylor B, Dockens AL, et al. Applications of direct-to-consumer hearing devices for adults with hearing loss: a review. *Clin Interv Aging*. 2017;12:859–871. doi: [10.2147/CIA.S135390](https://doi.org/10.2147/CIA.S135390).
- [2] Goldstein JE, Massof RW, Deremeik JT, Low Vision Research Network Study Group, et al. Baseline traits of low vision patients served by private outpatient clinical centers in the United States. *Arch Ophthalmol*. 2012;130(8):1028–1037. doi: [10.1001/archophthalmol.2012.1197](https://doi.org/10.1001/archophthalmol.2012.1197).
- [3] Virgili G, Acosta R, Bentley SA, et al. Reading aids for adults with low vision. *Cochrane Database Syst Rev*. 2018;4(4):CD003303. doi: [10.1002/14651858.CD003303.pub4](https://doi.org/10.1002/14651858.CD003303.pub4).
- [4] Wong EY, O'Connor PM, Keeffe JE. Establishing the service potential of secondary level low vision clinics. *Optom Vis Sci*. 2011;88(7):823–829. doi: [10.1097/OPX.0b013e318218a0a2](https://doi.org/10.1097/OPX.0b013e318218a0a2).
- [5] Luo G. How 16,000 people used a smartphone magnifier app in their daily lives. *Clin Exp Optom*. 2020;103(6):847–852. doi: [10.1111/cxo.12996](https://doi.org/10.1111/cxo.12996).
- [6] Granquist C, Sun S, Montezuma S, et al. Evaluation and comparison of artificial intelligence vision aids: orcam MyEye1 and seeing AI. *J Visual Impair Blin*. 2021;115(4):277–285. doi: [10.1177/0145482X211027492](https://doi.org/10.1177/0145482X211027492).
- [7] Nguyen BJ, Kim Y, Park K, et al. Improvement in patient-reported quality of life outcomes in severely visually impaired individuals using the aira assistive technology system. *Transl Vis Sci Technol*. 2018;7(5):30. doi: [10.1167/tvst.7.5.30](https://doi.org/10.1167/tvst.7.5.30).
- [8] Smallfield S, Kaldenberg J. Occupational therapy interventions to improve reading performance of older adults with low vision: a systematic review. *Am J Occup Ther*. 2020;74(1):7401185030p1–7401185030p18. doi: [10.5014/ajot.2020.038380](https://doi.org/10.5014/ajot.2020.038380).
- [9] DeCarlo DK, McGwin G, Jr, Searcey K, et al. Use of prescribed optical devices in age-related macular degeneration. *Optom Vis Sci*. 2012;89(9):1336–1342. doi: [10.1097/OPX.0b013e3182678db5](https://doi.org/10.1097/OPX.0b013e3182678db5).
- [10] Taylor JJ, Bambrick R, Brand A, et al. Effectiveness of portable electronic and optical magnifiers for near vision activities in low vision: a randomised crossover trial. *Ophthalmic Physiol Opt*. 2017;37(4):370–384. doi: [10.1111/opo.12379](https://doi.org/10.1111/opo.12379).
- [11] Martiniello N, Eisenbarth W, Lehane C, et al. Exploring the use of smartphones and tablets among people with visual impairments: are mainstream devices replacing the use of traditional visual aids? *Assist Technol*. 2022;34(1):34–45. doi: [10.1080/10400435.2019.1682084](https://doi.org/10.1080/10400435.2019.1682084).
- [12] Malkin AG, Ross NC, Chun MW, et al. Why are visual assistive mobile apps underutilized by low vision patients? *Optom Vis Sci*. 2022;99(4):333–334. doi: [10.1097/OPX.0000000000001893](https://doi.org/10.1097/OPX.0000000000001893).
- [13] Malkin AG, Bittner AK, Ho J, et al. Factors related to training time and achieving proficiency with visual-assistive mobile applications in visually impaired older adults. *Optom Vis Sci*. 2024;101(6):351–357. doi: [10.1097/OPX.0000000000002135](https://doi.org/10.1097/OPX.0000000000002135).
- [14] Crossland MD, Silver JH. Thirty years in an urban low vision clinic: changes in prescribing habits of low vision practitioners. *Optom Vis Sci*. 2005;82(7):617–622. doi: [10.1097/01.opx.0000171336.40273.3f](https://doi.org/10.1097/01.opx.0000171336.40273.3f).
- [15] Nguyen J, Tan SM, Azenkot S, et al. Longitudinal trends in case histories and rehabilitative device assessments at low vision examinations. *Optom Vis Sci*. 2022;99(11):817–829. doi: [10.1097/OPX.0000000000001953](https://doi.org/10.1097/OPX.0000000000001953).