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REVIEW

A holistic model of low vision care for improving vision-related quality of life

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Vision impairment can have a significant impact on the wellbeing and quality of life of an individual. Vision rehabilitation has the potential to improve these areas; however, four in five patients with vision impairment are not being referred to the appropriate services. Barriers to on-referral include, but are not limited to: (1) misunderstandings by both practitioners and patients alike regarding which individuals with vision impairment might benefit or qualify for low vision services; (2) lack of awareness of available services; (3) unfamiliarity with practice guidelines; (4) miscommunication between practitioners and patients; (5) required patient travel or limitations in access; and (6) the perceived costs of goods and services. Further, current referral patterns do not represent a holistic patient-centric approach. Vision-related quality of life questionnaires are tools which can assist health professionals in providing optimal individualised care. This review explores current evidence regarding low vision service delivery within Australia and globally, the impact of vision impairment on activities of daily living, the instruments used for the assessment of vision-related quality of life (VRQOL), competing priorities of individual needs in low vision services and rehabilitation, and provides recommendations for a more patient-centred model of care.

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Vision impairment can result from a range of conditions, including congenital or inherited dysfunctions, such as Leber's congenital amaurosis and retinitis pigmentosa, through to trauma, age-related and systemic diseases such as age-related macular degeneration, glaucoma and diabetic retinopathy. Vision impairment can have a significant impact on the wellbeing and quality of life of an individual.[1] Vision rehabilitation has the potential to improve these areas;[2,3] however, four in five patients with vision impairment are not being referred to the appropriate services.[4,5]

Vision impairment is defined as a limitation of one or more functions of the visual system and is typically characterised by a best corrected visual acuity of less than 6/12 in either eye.[5] This includes low vision and legal blindness. Low vision is defined as having a best corrected visual acuity of less than 6/18 and equal to or better than 3/60 or visual field less than 20 degrees in diameter.[5] In contrast, legal blindness may be defined as best corrected visual acuity less than 6/60 and/or visual field restriction to within 10 degrees radius from fixation.[5] Evidently, these current definitions of vision impairment and legal blindness are based on visual acuity and, in part, peripheral vision, which form established measures of vision function performed routinely in a clinical setting (Tables S1, S2).[6]

However, these numerical definitions of vision impairment and blindness may be misleading as they do not capture all aspects of vision function such as contrast sensitivity, stereopsis, binocularity, colour vision, glare sensitivity, or light and dark adaptation. These vision functions can be significantly impaired in certain scenarios such as in low light, despite conventionally measured parameters falling within normal limits.[7–10] Consequently, a substantial proportion of the population with vision impairment (especially early vision loss) may not be adequately identified, referred appropriately or suitably managed.[11]

This highlights a need for a more holistic approach in low vision assessment and management in order to address the overall quality of life of a patient. This review will describe current trends in low vision service delivery both globally, and with a specific focus on Australia, and subsequently present evidence regarding the impact of vision impairment on activities of daily living (ADL) and the instruments used for the assessment of vision-related quality of life (VRQOL). Competing priorities of individual needs in low vision services and

rehabilitation will also be explored, followed by future recommendations for a more patient-centred model of care.

Delivery of low vision services in Australia and globally

Low vision rehabilitation and services aim to assist people with vision impairment to maximise the use of their residual vision to improve their participation in daily living and quality of life.[2,3] This may include the provision and training in the use of low vision aids or devices, developing and training techniques to improve the functionality of residual vision, as well as other sensory modalities such as tactile and auditory, psychological services, vocational counselling and training.[2,12] Programs are designed to promote independence through developing strategies to cope and perform everyday activities such as reading, writing, pouring a glass of liquid, using the telephone and so forth.

Approximately 85 per cent of individuals with vision impairment have effective residual vision, as found in a survey by The Royal National Institute of Blind People, and therefore could benefit from low vision rehabilitation.[13] This was demonstrated by Leat et al.[14] in a study involving 57 elderly people with vision impairment, where up to 90 per cent reported improvements following low vision rehabilitation. Similarly, Robbins[15] found that 82 per cent of patients with vision impairment benefited from the prescription of optical aids following optometric assessment. However, the delivery of low vision services in Australia is alarmingly low, where it is estimated that only 20 per cent of those with low vision receive these services.[4,5] This is despite the fact that all graduated optometrists from Australia are trained to identify patients experiencing vision impairment and are able to prescribe low vision devices.[16] There is a decline in the number of optometrists managing and delivering low vision services, particularly in private practice; however, plans and frameworks have been introduced by Optometry Australia (the peak professional body of optometrists in Australia), with the aim of increasing and promoting the delivery of low vision services.[17] Underutilised low vision service delivery is not limited to Australia and the inadequacies of service provision also exist in South East Asia,[18] Latin America,[18] United States[19] and United Kingdom.[20] Globally less than 10 per cent of people with vision impairment receive low vision services.[5,18]

As highlighted above, one of the major reasons for a lack of on-referrals for low vision assessment and rehabilitation is due to discrepancies in the definition of vision impairment, that is, functional versus score-based tests (for example, visual acuity).[21] Other barriers to on-referral for low vision services and rehabilitation may include misunderstandings by both practitioners and patients on which individuals with vision impairment qualify for or may benefit from low vision services,[20] lack of awareness of available services, referral pathways and what they offer,[20] unfamiliarity of practice guidelines,[22] miscommunication between practitioner and patients,[23] associated travel and costs and patients not identifying as someone experiencing vision impairment.[23,24] Bakkar et al.[25] found that a large proportion of a population with vision impairment had visual acuities that ranged between 6/12 to 6/60. However, support such as government welfare (for example, Disability Support Pension and National Disability Insurance Scheme) and on-referrals to low vision clinics are typically only provided to those classified as legally blind (best-corrected visual acuity worse than 6/60). Similarly, Gillespie-Gallery et al.[20] surveyed community clinical and rehabilitation staff in the United Kingdom, and reported that there is an under-provision of emotional and family support for people experiencing vision impairment.

These barriers re-emphasise the problem with current clinical testing methods of patients with vision impairment: the true experience and/or quality of life of a patient may not be adequately captured during routine eye testing or otherwise is not being appropriately matched with relevant vision function measures. Although additional tests of vision function may help, they do not capture other important aspects of visual disability such as daily functioning and wellbeing.[26]

ADL and their impact on quality of life

ADL involve the fundamental skills or activities which are required for managing basic physical needs and include tasks which can generally be grouped together under broader activities, such as personal hygiene (bathing and showering), eating (self-feeding), toileting/continence (going to the toilet), transferring/ambulating (moving from one place to another) and dressing.[27,28] A correlation exists between ADL dependence and reduced quality of life,[29] as well as increased health-care costs,[30] mortality[31] and institutionalisation[32] as a result of vision impairment or loss.[27,33] Instrumental ADL (IADL) are not necessarily required for basic living; however, they can allow an individual to live a more independent life and include more complex tasks such as managing finances, preparing meals, taking prescription medication, shopping and moving within the community.[27]

Vision impairment has a significant impact on the ability of patients to complete their everyday tasks, with patients having lower quality of life scores compared to reference groups without vision impairment.[34,35] The use of appropriate tools to capture these deficits thus becomes paramount to ensure people with eye conditions or vision impairment are getting the best possible individualised care. Clinically assessed vision impairment and their impact on daily function such as reading and mobility tasks are not well assessed to date and available information is often drawn from subjective patient surveys.[36–38] Consequently, impacted function relies on the patient actively noticing and reporting difficulties in task performance. Many validated questionnaires are currently available and are typically administered either in person or via telephone, either by themselves, by an interviewer or via proxy.[39,40] However, it is important to acknowledge that validity of these instruments can be specific for eye conditions and patient groups,[41,42] and may not be applicable in all vision impairment populations,[35] highlighting the importance of appropriate instrument selection in ensuring reproducible, reliable and valid data.[43]

Addressing each and every ADL and IADL is a difficult and arduous task and demonstrates the broad scope of low vision management. At this stage, there is no gold standard for quality of life and low vision questionnaires and these questionnaires do not address whether those with vision impairment would be interested, qualify or potentially benefit from low vision assessment or rehabilitation. However, recently Deverell et al.[44] validated two new measures of functional performance in orientation and mobility settings, namely the vision-related outcomes in orientation and mobility (VROOM) and orientation and mobility outcomes (OMO) tools (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5770903/bin/bmjopen-2017-018140supp001.pdf).[44] These tools were designed for a number of purposes

including baseline measurements, measurements of daily fluctuations in various environments such as different daylight settings, deterioration with age and health conditions, evaluation of new assistive technologies and pre- and post-intervention skills comparison.[44] They allow for effective scoring pre- and post-intervention and hence are valuable tools in assessing the effectiveness of rehabilitation of the three manifestations of functional vision, namely near tasks, watching and reading and, orientation and mobility. Scores are collected for both functional vision and functional orientation and mobility. The scores are calculated via a combination of observed behaviours (out of 30) and self-reported wellbeing (out of 20) with an aggregate score of 50 for vision and 50 for mobility. It can also be applied in various environments such as different daylight settings, allowing for versatility in assessments. VROOM and OMO tools are assessed after taking into consideration the patient's environment and lifestyle. They are influenced by both the patient and the assessor through discussion to create a more individualised evaluation.[44] These tools are therefore tailored toward the patient's needs rather than a standardised assessment. VROOM and OMO are also assessed immediately at the time of ADL and hence provide immediate feedback to both the patient and assessor.[44] By contrast, this does not necessarily occur with other standardised questionnaires, which measure only self-reported perceived visual function, and forms more of a reflective exercise.[45] Responses to self-reported questionnaires may be influenced by insufficient time and privacy for patient reflection, depression, psychological adjustment to vision impairment, and individual patient expectations and experiences.[45–47] Furthermore VRQOL questionnaires are designed to be uninfluenced by the assessor and are standardised and hence may have questions which are unrelated to the patient, creating a less meaningful snapshot of the patient's current state.[48] These factors highlight the difficulty in reconciling perceived function and actual performance in ADLs due to the complexity of patient individuality and subjectivity and hence discrepancies may occur in the outcomes measured.[49–51]

Another method of addressing the concerns of those with vision impairment while mitigating respondent burden of patient-reported outcome measures can be adaptive goal or activity based. Computer-adaptive testing is a form of computer-based testing designed to adjust based on the patients' responses or reported outcomes.[52] It allows for individualised assessment whereby items from an item bank are presented in a guided manner to capture the patient's current condition.[52] One such example, by Massof et al.,[53] called the Activity Inventory, looks at the patient's current state, their goals and the difficulty associated with completing the tasks to achieve these goals. By nature of computer-adaptive testing, this visual function questionnaire provides a quantitative measure of functional ability. Bruijning et al.[54] subsequently expanded the approach following focus group discussions with both experts in the field and those with vision impairment. By assessing areas which are more relevant to patients with vision impairment, health professionals are able to potentially shorten testing time, provide improved efficient assessments, earlier intervention and develop more appropriate rehabilitation plans in a patient-centric model of care.[53,54]

Questionnaires and instruments for assessing VRQOL

To tackle some of the discussed issues with the assessment of functional vision, there has been a recent shift toward assessing visual function or VRQOL in addition to traditional measures. Many different questionnaires, otherwise known as instruments or patient-reported outcome measures (PROMs), have become available.[40] Unfortunately, there is still an overall lack of consensus regarding the best approach for assessing the extent of the impact of vision impairment on quality of life. Aaronson[39,55] defined four conceptual dimensions of quality of life, namely: physical (disease symptoms and their treatment), function (self-care, mobility, activity level and ADL), social (social contact and interpersonal relationships) and psychological (cognitive function, emotional status, wellbeing, satisfaction and happiness). A holistic approach which addresses all dimensions of quality of life allows for health professionals to understand the full impact of vision impairment and low vision services. This allows health professionals to appropriately manage the concerns of patients with vision impairment and provide a more meaningful and impactful low vision service. For example, historically depression is strongly associated with functional vision loss, rather than the objective measures of vision function such as visual acuity.[49,56,57]

Other key considerations (Figure 1) should be made when assessing and selecting an appropriate instrument for the assessment of quality of life, including its design, content and applicability. Instruments should be thoroughly deconstructed with respect to the target population to ensure that the information gained is relevant to the individual with vision impairment. The number of items, response categories, mode of administration, available languages and accessibility of the instrument to ensure ease of administration are pertinent, as are the psychometric properties of the instrument to ensure that the data collected is both valid and appropriate. Psychometric properties such as content validity (item selection, item reduction, subscales and internal consistency), reproducibility (reliability and agreement), construct validity, responsiveness, interpretability, respondent burden and true linear or interval scaling should be considered.[39,43]

Taking presented points into account, three quality of life questionnaires have most frequently been used with the low vision population:[39] the Impact of Vision Impairment Profile (IVI) (https://www.cera.org.au/pro-questionnaires/),[58] National Eye Institute Visual Functioning Questionnaire-25 (NEI VFQ-25) (https://www.rand.org/content/dam/rand/www/external/health/surveys_tools/vfq/vfq25survey_selfadmin.pdf)[59] and Low Vision Quality of Life Questionnaire (LVQOL) (https://www.sciencedirect.com/science/article/pii/S0002939400006103).[60] The first two have been compared in at least two systematic reviews and validated by Rasch analysis.[39,40] Several of the quality of life instruments above also elicit patient judgements about the difficulty they have while performing specific activities. Although they all share similar questions, subtleties exist between questionnaires including differing response scales (for example, dichotomous versus polytomous category ratings), the number of questions and their descriptions, dimensions of quality of life (functional, social, psychological, physical) addressed, and the group in which they were validated.[39,40] For the same reasons mentioned above, it is important that the items, or questions, in the instruments adequately address the needs of the patient in order to guide low vision service providers in providing relevant management and rehabilitation.

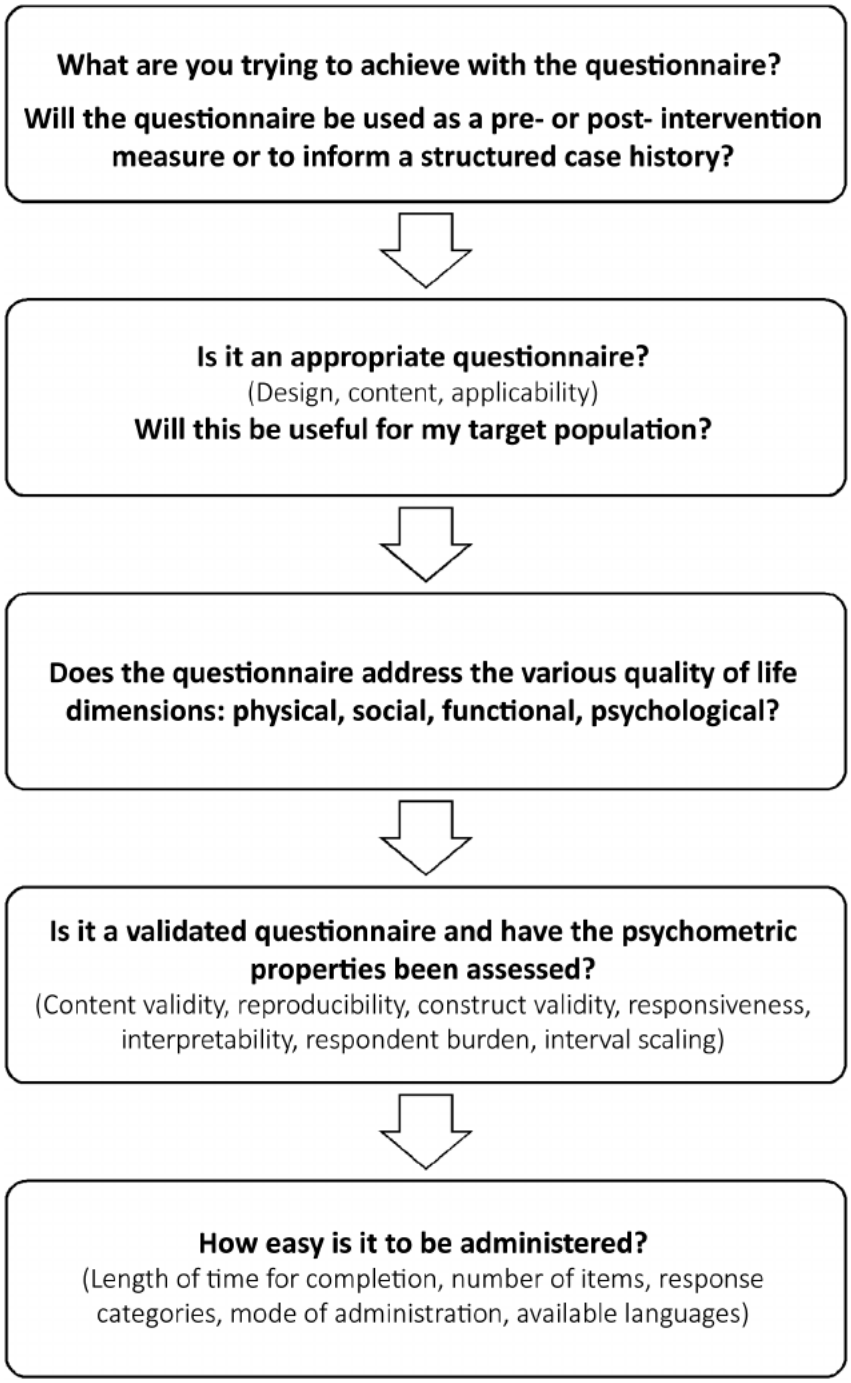

Figure 1. Key clinical considerations of health-care professionals when determining and selecting an appropriate questionnaire

Each of these questionnaires have different benefits and shortcomings (Table 1), such as the ability of the scoring method to generate valid measurement scales. A major limitation of traditional scoring methods in these questionnaires is that all of the items are given equal weighting which may not necessarily reflect real world scenarios. They also feature a limited ability to measure the impact of low vision rehabilitation services and can be potentially confounded by other variables, such as the psychological state of the patient. Item lists may be similar among instruments but may differ on the subscale and item numbers. Massof and Fletcher used a modified or polytomous Rasch model,[74] derived by Andrich,[75] to estimate interval measurement scales from raw scores (with more than two possible scores) of psychometric instruments and found that only 17 items of the NEI VFQ with scores in the form of difficulty ratings, that is, part 2 of the NEI VFQ, produced valid interval scales for patients with vision impairment.[74] These points highlight the fact that there are no perfect questionnaires available and that this is still an active area requiring improvement. Unless patient responses can be transformed to an interval scale,[76] psychometric visual function assessment instruments provide little more than structured descriptive histories.

Competing priorities: implementing low vision services and rehabilitation

Independence plays a significant role in the wellbeing and quality of life of a patient and is dependent on their ability to perform ADL.[77] Those with unilateral vision impairment were almost seven times more likely to be dependent on a carer or support services compared with someone with normal vision.[78] This jumped to 9.5 times more likely with bilateral vision impairment.[78]

The top three priorities for maintaining a level of independence in patients seeking outpatient low vision services were for reading, driving and mobility.[79] Improving reading function has been suggested to be considered the foundation of low vision rehabilitation, as not only is reading difficulty the most common complaint, it covers a broad range of activities.[79] Activities include sustained reading of a near object such as a book, magazine or computer, as well as spot reading for reading medicine bottles, foods labels and bills. Other examples of when spot reading can prove useful include looking at bus numbers or train timetables at the concourse or platform when catching public transport.

Brown et al.[79] noted that one in four individuals in the United States reported difficulties with driving. They estimated that just over a quarter of participants who sought low vision services actively drove.[79] Most of these individuals self-restricted their driving to familiar environments, daytime and reduced time and distance for trips. Driving concerns should be identified early in the

Instrument	Benefits	Shortcomings
IVI	Deals with functional, social and psychological dimensions of quality of life[39]	Low quality rating for internal consistency and construct validity[39]
	High quality rating for selecting items, item reduction, subscales, reliability, agreement[39]	May be suboptimal for patients with peripheral field loss and/or glaucoma but with relatively good visual acuity[61]
	Available in English, Chinese,[62] German,[63] Melanesian,[64] Telugu,[65] Hindi[65] and Thai[66]	
	Can be used to measure outcomes pre- and post-rehabilitation[67]	
	Medium quality rating for interpretability and respondent burden[39]	
	Validated using Rasch analysis[68]	
NEI VFQ-25	Deals with functional, social, psychological and physical dimensions of quality of life[39]	Native subscale structure is psychometrically suboptimal (multidimensionality in subscale)[69]
	Available in English, Italian, French, German, Spanish, Turkish, Chinese, Japanese, Greek, Portuguese, Arabic, and Serbian[69]	Low quality rating for internal consistency[39]
	High quality rating for selecting items, item reduction, reliability, respondent burden[39]	
	Medium quality rating for construct validity and interpretability[39]	
	Ready-to-use conversion from raw score to Rasch measurements[70]	
	Has good psychometric performance when split into visual functioning and socio-emotional subscales[71]	
	Can be used to measure outcomes pre- and post-rehabilitation[67]	
LVQOL	Deals with functional, psychological and social dimensions of quality of life[39]	Low quality rating for selecting items, construct validity[39]
	High quality rating for item reduction, check subscales, internal consistency[39]	Only available in English[39]
	Medium quality rating for reliability, interpretability, respondent burden[39]	
	Validated with item response theory and differential item functioning analyses[72] and has been rescored with Rasch analysis[73]	

IVI: Impact of Vision Impairment, LVQOL: Low Vision Quality of Life Questionnaire; NEI VFQ-25, National Eye Institute Visual Functioning Questionnaire-25.

Table 1. Vision-related quality of life instrument comparison and considerations

low vision assessment to ensure both individual and public safety. Furthermore, self-reported concerns can be influenced by gender, whereby males, particularly those younger, were often found to report difficulties with driving and with lighting (glare, sensitivity to light, or reduced lighting, night difficulties and dark adaptation) in comparison with females.[79] However, females showed a preference in reporting difficulties in domestic and in-home activities, social interactions and/or facial recognition.[79] Interestingly, the prevalence of complaints with respect to walking and mobility was greatest when the primary diagnosis was categorised as glaucoma, diabetic retinopathy or optic neuritis. However, there was no relationship between age, gender and visual acuity with difficulties in mobility.[79] It is evident that patient complaints and needs can vary among different individuals. Providing individualised support and rehabilitation to address functional complaints is therefore paramount for positive outcomes and is only achievable by asking the appropriate questions through standardised ADL and quality of life questionnaires.

Despite the potential benefits of incorporating quality of life assessments into low vision management, the current evidence indicates that patient improvements post-rehabilitation are mostly limited to reading ability and near function.[80] One possible reason is that current low vision services may only be focusing on improving specific skills or chief complaints, such as reading. Another is the fact that quality of life is highly subjective and relies heavily on patient experience. The instrumentation and quality of life items may also not be appropriately matched with the patient and hence the low vision services may not appear as effective in addressing VRQOL.[39] Furthermore, it should be noted that outcome measures may be linked to specific items or subscales in the quality of life instruments and hence may have selective sensitivity to the effects of interventions.[81] This highlights that some instruments may outperform others in providing relevant data on changes to quality of life in people

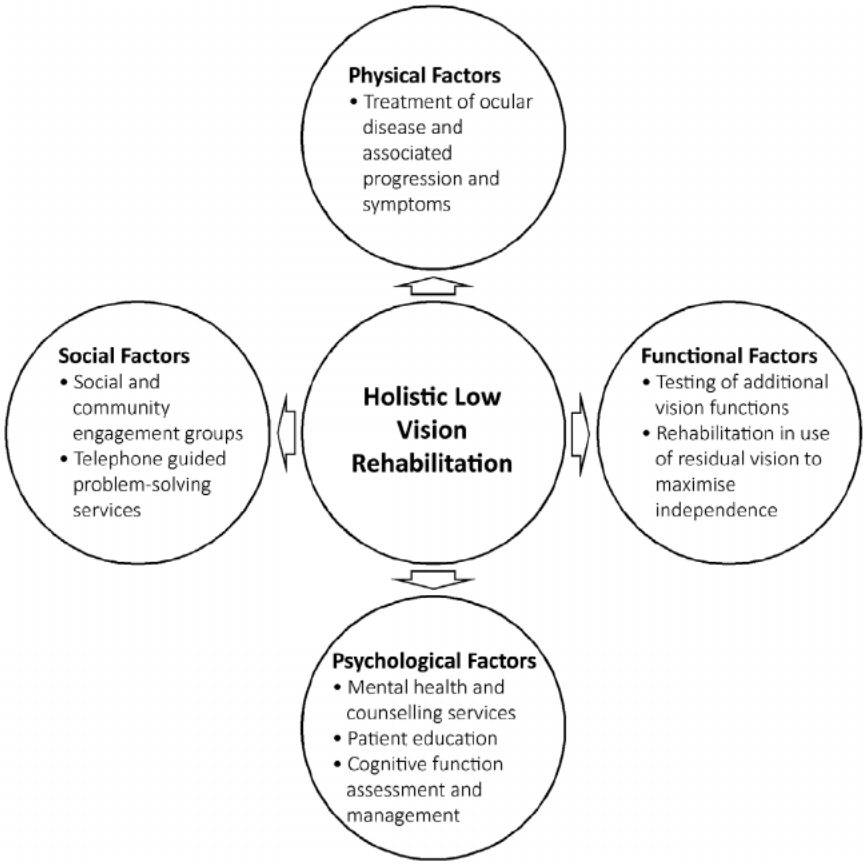

Figure 2. Model for holistic low vision rehabilitation

with vision impairment. Therefore, there is a need to develop a gold-standard assessment and rehabilitation care model that addresses all dimensions of vision impairment (Figure 2).

The benefits of low vision rehabilitation have been demonstrated in numerous clinical trials and studies; however, the magnitude and clinical significance of the improvements range and tend to be modest.[2,12,17,80,82] Reeves et al.[83] conducted a randomised controlled clinical trial assessing outcomes following enhanced low vision rehabilitation compared with conventional in-office paradigms. Their enhanced program involved a home visit from a rehabilitation officer, focused on ensuring accurate use of low vision aids by utilising additional in-home training and vision enhancing strategies such as with contrast and lighting and was found to confer no additional benefit. In contrast, Deemer et al.[84] found that in-home occupational therapy low vision rehabilitation combined with behavioural activation therapy following conventional optometric low vision services demonstrated better functional outcomes than conventional rehabilitation alone. This randomised controlled trial encompassed goal-oriented rehabilitation that addressed both functional vision and psychosocial needs of the patient.

As highlighted previously, this further speaks to the importance for low vision services to not address vision in isolation but include other factors such as emotional wellbeing, co-morbidities and cognitive difficulties influencing the quality of life of a patient. For example, Horowitz[85] found that older adults with vision impairment were two to five times more likely to experience depression than those without vision impairment, with approximately seven per cent of those experiencing vision impairment meeting the criteria for major depressive disorder. Rovner and Ganguli[56] found that those with impaired vision were almost five times as likely to have depressive symptoms and almost 10 times as likely to have functional impairment with IADL compared to someone with intact vision. Addressing each dimension provides a better understanding of how clinicians, researchers, or health professionals can provide individualised health care. Rovner and Ganguli[56] noted that treating depression may reduce disability associated with impaired vision, highlighting the importance of a holistic approach in the administration of health care, whereby taking into consideration the patient as a whole. Low vision rehabilitation or interventions which are designed to also address depression and anxiety have been demonstrated to provide higher activity engagement, greater improvements in self-efficacy and adjustments to vision loss and hence provide better patient outcomes.[57]

Recommendations for a more patient-centred model of low vision care

Addressing the four quality of life dimensions in low vision rehabilitation programs may potentially enhance the effectiveness of these services and provide patients with better experiences and outcomes (Figure 2). This is only achievable by including an extensive multidisciplinary range of service or health providers including but not limited to optometrists, orthoptists, ophthalmologists, psychologists, counsellors, occupational therapists, social workers and many other rehabilitation specialists such as orientation and mobility and vocational rehabilitation specialists.

Understanding the disease process, providing current available treatments and ensuring that the physical factors are being managed well, where possible, is paramount in halting or slowing disease progression, and hence vision loss. Macnaughton et al.[86] recommend that service referral should not wait until completion of treatment but rather should occur earlier in the management process to address rehabilitative needs. In order to provide a more patient-centred model of low vision care, the discrepancies in the definition of vision impairment also need to be reconciled. Tables S3–S5 outline additional vision function assessments such as contrast sensitivity and light or dark adaptation, which can be included in low vision assessments to provide a more comprehensive model of care. This may clear any misunderstandings by both practitioners and patients alike regarding which individuals with vision impairment

might benefit or qualify for low vision services. This can also provide further information regarding residual vision as well as guidance in more directed low vision rehabilitation in order to maximise independence. Considerations should also be made for those experiencing vision impairment or blindness in one rather than both eyes. Although they may not be considered as having vision impairment as per the current definition, VRQOL as well as length of life has been shown to inversely correlate with the level of unilateral vision impairment.[87]

As discussed earlier, addressing VRQOL by selecting an appropriate instrument ensures those experiencing vision impairment receive timely on-referral to appropriate low vision services. Rovner et al.[88] assessed the efficacy of a depression-focused low vision rehabilitation program for those diagnosed with age-related macular degeneration and found better improved depressive symptoms, social engagement and activity in the active treatment group in comparison with placebo. Consequently, improving one quality of life dimension can have positive impacts on the other quality of life dimensions. In addition to this, Nollett et al.[89] found a high prevalence of mental health concerns, in particular depression, in the population with vision impairment, indicating 43 per cent have significant symptoms of depression (measured using GDS-15 score), of which 74.8 per cent are not being treated for their depression. Nollett et al.[89] also found that 42 per cent of those between ages 65 and 74, and 37 per cent of those aged 75 years and older in this population with vision impairment had significant depressive symptoms. Vision loss also had a substantial effect on the prevalence of anxiety.[33] Furthermore, just under 19 per cent of individuals referred to an outpatient low vision rehabilitation centre also screened positive for cognitive impairment using a battery of cognitive assessments.[90]

As highlighted above, a further challenge to health-care professionals exists with patients experiencing difficulties in verbal fluency and memory, where the success of low vision rehabilitation interventions may be compromised. A more patient-centric model of low vision care could include using additional instruments such as the Centre for Epidemiologic Studies Depression Scale (CES-D) (http://www.drcarnazzo.com/uploads/1/3/4/3/13437686/ces-d_depression_scale.pdf)[91] or Hospital Anxiety and Depression Scale (HADS) (https://www.svri.org/sites/default/files/attachments/2016-01-13/HADS.pdf) for emotional wellbeing,[92] Medical Outcomes Survey Short Form-12 (MOS SF-12) (https://www.hoagorthopedicinstitute.com/documents/SF12form.pdf)[93] for understanding comorbidities, and the Montreal Cognitive Assessment (MoCA) (https://www.parkinsons.va.gov/resources/MOCA-Test-English.pdf) for cognitive assessment.[94] For example, an optometrist may screen suitable patients using the MoCA, and if appropriate, refer to their general practitioner for further assessment.

Furthermore, Holloway et al.[95] explored the effectiveness of social engagement and telephone-guided problem-solving treatment in low vision rehabilitation and found that at least half of the participants improved in their depressive symptoms, and a quarter having improved health-related quality of life, highlighting the positive outcomes as a result of low vision rehabilitation which address the immediate concerns of patients such as their ADL. These points highlight that a multiple disciplinary approach (for example, multidisciplinary, transdisciplinary and interdisciplinary) is needed for optimal patient-centric care.[96]

Conclusion

It is imperative that low vision rehabilitation service providers adopt a holistic approach when providing services to patients, that address the various quality of life dimensions as discussed above. Despite the fact that vision-related activity assessments were rare before 1980, there has been a recent drive toward assessing the functional impact of vision impairment over traditional measures in those with vision impairment. Although there may not currently be a gold standard instrument in understanding VRQOL, there are many instruments available for health professionals to select from. A vital part in ensuring individuals are getting the appropriate care is that the right instrument is selected when assessing VRQOL. Standardising care and ensuring that appropriate questions are asked during the initial consultation can address the low rate of on-referral for low vision rehabilitation for patients experiencing vision impairment. There is still room for improvement in understanding the needs of those experiencing vision impairment, particularly to ensure a stronger evidence base and a consensus for the best approach in measuring the outcomes in low vision service and rehabilitation delivery. Unless subject responses can be transformed to an interval scale, psychometric visual function assessment instruments provide little more than descriptive or structured histories. With advancements in instrumentation, we are hopefully closer to being able to provide a gold standard in measuring VRQOL and hence providing optimal individualised care for those experiencing vision impairment.

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Supporting information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Current conventional optometric assessment (visual acuity) used for identifying low vision and expected population norms.

Table S2. Current conventional optometric assessment (perimetry) used for identifying low vision and expected population norms.

Table S3. Additional proposed vision function assessments for a holistic patient-centric approach to low vision management and expected population norms.

Table S4. Additional proposed vision function assessments (stereoacuity) for a holistic patient-centric approach to low vision management and expected population norms.

Table S5. Additional proposed vision function assessments (colour vision) for a holistic patient-centric approach to low vision management and expected population norms adapted from the National Research Council (US) Committee on Vision.