Telerehabilitation in Low Vision Care: Integrating Tele-Optometry and AI for Vision Rehabilitation

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Abstract

About 4.95 million people in India are blind, and 70 million people are visually impaired. Low vision significantly impacts daily activities, independence, and quality of life. Vision rehabilitation aims to maximise the use of residual vision through training, vision assistive equipment (VAE), environmental modifications, and psychosocial support. However, many individuals face barriers to accessing in-person rehabilitation services due to geographic, financial, or mobility limitations.

Telerehabilitation offers an effective alternative by delivering vision rehabilitation remotely through internet-based platforms such as video consultations and digital training tools. This approach enables clinicians to guide patients in using their remaining vision and assistive devices while monitoring improvements in vision-related quality of life. Telerehabilitation has shown its efficiency during the pandemic times of SARS-CoV-2 novel SARS-CoV-2 coronavirus.

Recent advancements in artificial intelligence (AI) and digital assistive technologies further strengthen telerehabilitation. AI-enabled tools such as object recognition systems, text-to-speech applications, smart navigation aids, and adaptive learning platforms allow personalised training and greater accessibility for people with visual impairment.

Although research on large-scale remote low vision assessment is still limited, early studies show that video-based consultations are feasible for clinicians and well accepted by patients. With the integration of AI and digital health technologies, telerehabilitation has the potential to expand access to low vision care and enhance functional outcomes and quality of life for visually impaired individuals.

Keywords: Tele-optometry, telerehabilitation, visual impairment, assistive technologies

1. Introduction:

As per World Health Organization (WHO), a person is considered to be with low vision is one who has a best-corrected visual acuity of less than 6/18 but equal to or better than 3/60 in the better eye, or a visual field of less than 10° from the point of fixation, yet still has some usable vision for planning or performing daily activities. [12]

Low vision and visual impairment are still significant challenges to public health throughout the world. According to estimates received from WHO, at least 2.2 billion individuals experience some form of the visual impairments, low vision and even blindness globally. Unfortunately, 1 billion of these cases are actually preventable and still require attention.[12] Instead of becoming completely blind, a large number of these people have low vision. Older adults, over the age of 50, have a high prevalence rate of visual impairment. This is mostly due to two factors, firstly due to growing age and secondly due to increased prevalence of chronic diseases like Age-related macular degeneration (AMD), Glaucoma, Diabetic retinopathy impacting their vision. Keep in mind that normal ageing of the eye does not lead to low vision.[2,6]

Low vision in children can be caused by some of the same conditions as in adults, but there are other possible causes of childhood low vision, like congenital diseases, for example, optic nerve hypoplasia (small optic nerves), cataract, glaucoma, inherited diseases like retinitis pigmentosa & optic atrophy and acquired diseases like glaucoma, eye injury, retinopathy of prematurity. [6]

Low vision affects an individual's ability to perform daily life activities significantly; not only that, but it also reduces overall quality of life. These people experience difficulties with activities like reading, writing, recognising faces, cooking or using electronic gadgets. As a result of these limitations, there occurs a loss of independence, decreased productivity and social isolation prominently. In many of these cases, individuals with visual impairment also experience psychological consequences like anxiety, depression and reduced self-confidence due to social isolation. Furthermore, low vision can have an economic impact on the life of an individual, particularly in students and adults of working age. This puts an economic burden on an individual with visual impairment. [7,20]

Effective low vision rehabilitation includes the use of assistive devices, environmental modifications, and training in adaptive strategies. It is therefore essential to improve functional vision and enhance the visually impaired individual's participation in daily life activities. [5,8]

Conventional rehabilitation for low vision patients mainly focuses on the use of optical devices like telescopes, magnifiers and high plus spectacles along with basic instructions on how to use them. Despite being useful, these traditional methods of rehabilitation have several disadvantages. Firstly, optical devices provide restricted magnification and reduce the field of view significantly. Thus, making activities like reading, orientation and mobility more challenging for the patients. Secondly, some individuals find these optical aids to be bulkier, inconvenient, and cosmetically unacceptable, thus reducing the use of these available aids consistently. [5,11] Conventional rehabilitation programs for individuals with low vision often concentrate mainly on improving visual function. However, this approach may overlook other important challenges that people with visual impairment frequently face, such as psychological stress, social isolation, and difficulties in maintaining employment or daily activities. In many developing regions, access to specialised low vision services and trained rehabilitation professionals is also limited. As a result, patients may not receive adequate follow-up care, which can negatively affect the success of rehabilitation. Therefore, there is a growing need for a more comprehensive and multidisciplinary approach to low vision care. Such an approach should include assistive technologies, environmental modifications, counselling support, and coordinated rehabilitation services to help individuals maximise their functional vision and improve their overall quality of life.[3,12]

2. Principles of Low Vision Rehabilitation

Low vision rehabilitation is based on several important principles that aim to help individuals with visual impairment make the best possible use of their remaining vision and live more independent and fulfilling lives. Rather than focusing only on the medical aspects of vision loss, rehabilitation emphasises practical strategies that support daily functioning and overall well-being. Key principles include setting clear rehabilitation goals, conducting functional vision assessments, involving a multidisciplinary rehabilitation team, and following a patient-centred approach. [14-17]

2.1. Goals of Low Vision Rehabilitation

The primary goal of low vision rehabilitation is to help individuals use their remaining vision as effectively as possible in their everyday lives. Rehabilitation programs are designed to improve the ability to perform routine activities such as reading, writing, moving safely, communicating, and completing work-related tasks. In addition to improving functional abilities, these programs also aim to support emotional well-being and social participation. By providing assistive devices, specialised training, and suitable environmental modifications, rehabilitation helps individuals adapt to vision

loss, regain confidence, and maintain independence, ultimately improving their overall quality of life. [8,14]

2.2. Functional Vision Assessment

Functional vision assessment is a key step in the rehabilitation process. While a standard eye examination mainly focuses on diagnosing eye diseases or measuring vision, a functional assessment looks at how well a person actually uses their vision in real-life situations. This evaluation may include tests of visual acuity, contrast sensitivity, visual fields, and refractive status, along with observing how patients carry out everyday activities such as reading, writing, or navigating their surroundings. The information gathered from these assessments helps clinicians understand the patient's specific visual challenges and develop personalised rehabilitation plans, including recommending appropriate low vision aids or adaptive techniques. [16-14]

2.3. Multidisciplinary Rehabilitation Team

Effective low vision rehabilitation often requires the support of a multidisciplinary team of professionals. This team may include ophthalmologists, optometrists, low vision therapists, occupational therapists, orientation and mobility specialists, psychologists, and social workers. Each professional contributes their expertise to address different aspects of visual impairment. For example, some focus on visual training and assistive technology, while others provide mobility training, psychological support, or guidance on social integration. Working together, this collaborative team ensures that individuals with low vision receive comprehensive care that addresses both visual and non-visual challenges.[10,14]

2.4. Patient-centred Rehabilitation Approach

A patient-centred approach is a fundamental element of successful low vision rehabilitation. Every individual experience vision loss differently, so rehabilitation strategies must be tailored to the patient's specific visual abilities, lifestyle, occupation, and personal goals. The process typically begins with a detailed discussion to understand the patient's needs, expectations, and daily challenges. Based on this understanding, rehabilitation professionals design individualised intervention plans that may include assistive devices, adaptive techniques, and skill-training programs. By involving patients actively in their own rehabilitation, this approach helps ensure better functional outcomes and a more meaningful improvement in quality of life. [10,14]

3. Concept of Telerehabilitation

Tele-rehabilitation in low vision refers to the delivery of vision rehabilitation services using modern communication technologies such as the internet, video conferencing, mobile applications, and telephone-based systems. Through these platforms, eye-care professionals and rehabilitation specialists can provide guidance, assessments, training, counselling, and follow-up support to individuals with visual impairment without requiring them to travel to a clinic. [1,9] This approach has emerged as an extension of telemedicine and plays an important role in improving access to care. Many individuals with low vision face challenges such as long travel distances, limited mobility, a lack of nearby specialised low vision clinics, and transportation difficulties.[5] Tele-rehabilitation helps overcome these barriers by allowing patients to connect with rehabilitation professionals from their homes. As a result, it makes low vision services more accessible and ensures that patients can receive continuous support and guidance for managing their visual limitations. [18,19]

In tele-rehabilitation programs, a variety of rehabilitation professionals—including optometrists, low vision therapists, occupational therapists, and rehabilitation counsellors—work together to support individuals with visual impairment through digital platforms. Using tools such as video calls, mobile applications, and online communication systems, these professionals can assess how patients use their remaining vision in daily life and guide them in the proper use of assistive devices. They also provide training to help patients make the most of their residual vision. [27,28] The services offered through tele-rehabilitation can cover many aspects of daily functioning. These may include orientation and mobility training, guidance in using assistive and digital technologies, support for developing reading and computer skills, psychological counselling, and access to educational resources. Communication typically takes place through video consultations, telephone calls, or online messaging, making it possible for professionals to stay connected with patients regularly. This flexible approach allows rehabilitation plans to be adjusted according to the individual needs, abilities, and personal goals of each patient.[18-20]

The importance of tele-rehabilitation became particularly evident during the COVID-19 pandemic, when many rehabilitation centres were either closed or difficult to access. During this period, tele-rehabilitation provided an effective alternative, allowing individuals with visual impairment to continue receiving essential support and guidance from rehabilitation professionals.[4,13] By using digital communication tools, patients were able to stay connected with specialists without needing to travel to healthcare facilities. Studies have shown that tele-rehabilitation plays an important role in maintaining continuity of care for people with visual impairment. It also helps extend rehabilitation services to individuals living in remote or underserved areas where specialised low vision

clinics may not be easily available.[15] Through remote consultations, training sessions, and follow-up care, tele-rehabilitation can help individuals improve their functional abilities, maintain independence, and enhance their overall quality of life. At the same time, it reduces travel-related costs and makes specialised rehabilitation services more accessible to a wider population.

4. AI-assisted Technologies used in Tele-rehabilitation

Telerehabilitation combines a variety of technologies. to provide rehabilitation treatments in a flexible and patient-friendly way from a distance. At its simplest, text-based tools such as emails and messaging allow easy sharing of information, reminders, and ongoing communication between clinicians and patients. Audio-based methods, including telephone calls and internet-based voice systems, make it possible to conduct real-time consultations or provide recorded instructions and education with minimal technical requirements. Visual technologies, notably videoconferencing and image sharing, are essential because they allow healthcare professionals to monitor, evaluate, and assist patients at a distance in a manner that is very similar to interactions with patients in person.[10]

More innovative methods, including virtual reality (VR), produce immersive settings where patients can safely and entertainingly practice physical, cognitive, or social abilities. An immersive environment refers to an experience that fully engages an individual's senses and attention, creating a sense of presence within a simulated or virtual environment rather than merely observing it. Observing the activities and behaviour of the patient in the stimulated scenarios can help the healthcare workers identify the difficulties in daily life. Web-based platforms enhance this experience by incorporating text, audio, and video into interactive programs that support education, self-management, and remote exams. Simultaneously, wireless technology such as GPS, smartphones, and handheld gadgets enables navigation, monitoring, and communication while on the road, extending rehabilitation into real-life settings. In order to deliver more thorough and individualised treatment, these separate technologies are increasingly being combined into cohesive systems, frequently combining robots and artificial intelligence. When combined, these advancements improve the effectiveness, accessibility, and flexibility of telerehabilitation, assisting in bridging the distance between patients and healthcare professionals.

By utilising machine learning and data analytics, artificial intelligence (AI) improves telerehabilitation by providing individualised, adaptive care with immediate feedback. It improves accessibility and convenience, especially for patients who are remote or have limited mobility, by enabling automated

monitoring and therapeutic modifications, which lessens the need for continuous professional supervision. [10]

4.1. Telecommunication Platforms

Real-time remote evaluations for low vision rehabilitation are made possible by video consultation systems, which use internet-based tools to provide services like visual aid training without requiring in-person visits. These technologies provide synchronous interactions, including live video for optometry advice, triage, and eye exams. For contact lens follow-ups and visual function assessments, remote consultation platforms such as Optonet's Virtual Eye Clinic combine video chats with external eye imaging.[10]

4.2. Video consultation systems

Electronic magnifiers enhance contrast and zoom for conditions like macular degeneration, glaucoma, and diabetic retinopathy, aiding reading and navigation. Screen readers are assistive software that converts on-screen text to speech, enabling access for visually impaired users on computers. Smartphone apps like Seeing AI provide scene descriptions, photo analysis, and document chatting, while Be My Eyes connects users to volunteers or AI for real-time visual help via camera.

4.3. Remote consultation platforms

Home-based visual function assessments use web or app tools for self-measuring acuity, showing good agreement with clinic tests (e.g., mean difference 0.02 log MAR). Digital vision testing tools include apps like Peek Acuity for distance vision and OdySight for visual fields and Amsler grids, supporting glaucoma monitoring. Devices like Melbourne Rapid Fields enable unsupervised perimetry on tablets or PCs, with high concordance to standard tests. The iCare HOME tonometer is a rebound tonometer designed for patient self-monitoring of intraocular pressure. The device does not require topical anaesthesia, thereby enhancing ease of use in home settings. Accurate measurements are obtained with the patient in an upright position, while integrated audio cues and a positioning light guide ensure proper alignment and reliable readings. [10]

4.4. Digital Assistive Technologies and Tools

For those with visual impairment, Seeing AI employs artificial intelligence (AI), specifically computer vision and machine learning, to translate visual data into meaningful audio feedback. It can read structured documents and brief text, scan products using barcodes, and provide real-time descriptions of scenes and photos. In addition, the software can read handwritten text (in supported languages), identify people, and identify colours and currencies. AI makes it

possible for the app to understand its surroundings and improve accessibility and independence in day-to-day tasks by evaluating visual data and producing context-aware explanations.

The Be My Eyes application uses artificial intelligence (AI) and human support to assist individuals with visual impairment. Its AI feature provides instant descriptions of images, text, and surroundings using computer vision, while live video calls connect users to sighted volunteers for real-time help with daily tasks. This combination ensures quick, flexible, and reliable assistance, improving accessibility and independence.

Smartphone-based assistive applications have significantly improved accessibility and independence for individuals with visual impairment by transforming everyday devices into multifunctional assistive tools. These applications commonly incorporate features such as text-to-speech, speech recognition, computer vision, and navigation support, enabling users to read text, access digital content, communicate effectively, and navigate their surroundings with greater ease. Studies have shown that such technologies enhance daily functioning and participation by reducing reliance on others and promoting self-management. [10]

Further enhancing safety and mobility are additional features like object detection, scene description, and real-time environmental feedback made possible by the incorporation of artificial intelligence into these apps. These apps provide a workable and scalable solution in vision rehabilitation, bridging the gap between people with visual impairment and their surroundings while promoting a more independent lifestyle because smartphones are widely accessible and reasonably priced.

Electronic magnifiers and screen readers are essential in telerehabilitation for individuals with visual impairment, as they enable access to digital content and support independent participation in remote care. Electronic magnifiers enhance vision by enlarging text and images, improving contrast, and allowing display customisation, helping users engage with educational materials and virtual consultations. With the integration of artificial intelligence (AI), these devices offer real-time image enhancement, optical character recognition (OCR) for text-to-speech conversion, and object or scene recognition for added context.

Screen readers, such as JAWS and NVDA, convert on-screen text into speech or braille, enabling independent navigation of digital platforms used in telerehabilitation. AI further enhances these tools through natural language processing and contextual understanding, improving speech quality, interface navigation, and enabling features like image description. Together, these AI-enabled technologies enhance accessibility, promote independence, and strengthen the effectiveness of remote rehabilitation services.

5. Clinical Applications of Tele-Rehabilitation

5.1. Remote Low Vision Assessment

By allowing physicians to examine patients remotely via video conferencing and digital assessment tools, telerehabilitation has greatly broadened the scope of poor vision testing. Standardised charts and remote-use programs can be used to evaluate visual acuity, contrast sensitivity, reading comprehension, and functional vision. In order to gain a more ecologically valid picture of patients' visual difficulties, clinicians might also watch patients carry out practical visual tasks in their homes. This method enables better follow-up, timely adjustments to treatment programs, and ongoing monitoring, especially for patients in underserved or rural areas. [1,16]

5.2. Training with Optical Low Vision Devices

Telerehabilitation platforms are an excellent way to provide training in the use of optical low vision devices, such as telescopes, magnifiers, and speciality glasses. Through live or recorded sessions, clinicians can show appropriate handling, focusing strategies, adjusting working distance, and task-specific usage. Patients can improve skill acquisition and device acceptability by practising in their own settings and getting instant feedback. In order to promote adherence and long-term use, caregivers can also participate in the training process.

5.3. Training in Electronic and Digital Devices

Screen readers, magnification software, and smartphone-based applications are just a few examples of the electronic and digital assistive equipment that telerehabilitation makes it easier to learn how to utilise. Patients learn how to use accessibility features, access online resources, and navigate digital interfaces through guided sessions. Screen sharing, remote troubleshooting, and step-by-step instructions boost user competence and confidence. In the contemporary digital era, where access to information, communication, and services is increasingly dependent on technology, this is especially crucial.

5.4. Activities of Daily Living (ADL) Training

The capacity of telerehabilitation to provide instruction for everyday living activities in the patient's natural setting is one of its main advantages. Using adaptive techniques and assistive technology, clinicians can help patients with activities including cooking, managing medications, personal grooming, and organising the home. Safety and functional independence are enhanced by contextual training and real-time feedback. Furthermore, follow-up sessions and recorded modules enable steady growth according to patient needs and reinforcement of acquired abilities.

5.5. Orientation and Mobility Training

By utilising digital technologies like GPS-based navigation systems, smartphone applications, and virtual mapping platforms, telerehabilitation can successfully enhance orientation and mobility (O&M) training. It is possible to teach patients safe navigation techniques, trip planning, and spatial orientation in their immediate surroundings. Remote guidance boosts confidence and lowers the chance of falls or confusion when paired with recorded demonstrations and in-the-moment supervision. The potential of remote O&M training is further expanded by emerging technologies such as augmented reality and sensor-based navigation.

5.6. Psychological Support and Counselling

Vision loss significantly impacts psychological health, often leading to depression, anxiety, and social isolation. These effects stem from loss of independence, fear of further decline, and reduced ability to engage in daily activities. Telerehabilitation provides accessible platforms for delivering psychological support and counselling through virtual sessions. Patients can receive guidance on coping strategies, adjustment to vision loss, and stress management from the comfort of their homes. Group sessions and peer support networks can also be facilitated online, fostering social interaction and emotional support. This holistic approach addresses not only functional limitations but also the emotional well-being of individuals with visual impairment.[20]

6. Tele-rehabilitations in Specific Low Vision Conditions

Rehabilitation for low vision is not a "one-size-fits-all" strategy. Distinct visual Impairments, such as central scotoma, peripheral field loss, decreased contrast sensitivity, or night blindness, are present in various ocular pathologies. Telerehabilitation offers a versatile platform for providing individualised, condition-specific interventions in the patient's home setting.

By using telerehabilitation for specific low vision conditions (Table 1), clinicians can overcome the challenges of traditional in-person care and customise strategies based on functional deficits.

Categories	Specific Conditions	Visual Deficits	Telerehabilitation Strategies	Role of AI	Clinical Advantages
Central Vision Loss	Age-related Macular Degeneration, Stargardt Disease, Diabetic Maculopathy	Central scotoma, reduced acuity, poor reading	Eccentric Viewing training, PRL training, reading Rehabilitation, Contrast enhancement	Eye-tracking, adaptive reading apps	Real-world reading training improves functional outcomes
Peripheral Vision Loss	Glaucoma, Retinitis Pigmentosa	Tunnel vision, mobility issues, navigation difficulty	Orientation & mobility training, scanning exercises, environmental modification	AI navigation apps, wearable obstacle detection	Enables real-life mobility assessment
Contrast Sensitivity Loss	Cataract, Optic Atrophy, Multiple Sclerosis	Poor contrast, glare sensitivity, low-light difficulty	Lighting optimization, contrast enhancement, glare control	Smart lighting systems, image enhancement tools	Home-based lighting adjustments improve vision
Pediatric Low Vision	Amblyopia, Cerebral Visual Impairment	Developmental visual deficits, attention limitations	Gamified therapy, parental training, school integration	Interactive adaptive apps	Improves compliance and engagement
Multiple Disabilities	Visual impairment with hearing/cognitive/ motor issues	Complex functional limitations	Multidisciplinary telecare, caregiver-assisted training	Voice-assisted tech, accessibility AI	Holistic and inclusive rehabilitation
Neurological Visual Impairment	Stroke, Traumatic Brain Injury	Field defects, neglect, oculomotor dysfunction	Scanning therapy, saccadic training, and cognitive-visual tasks	Eye-tracking rehab systems	Allows repeated, structured training at home
Progressive Low Vision	Retinitis Pigmentosa, Glaucoma	Gradual vision loss, functional decline	Periodic tele-follow-up, adaptive rehab strategies	Predictive analytics, monitoring tools	Enables long-term continuous care

Table: 1 Details of various low vision conditions and their management with the help of telerehabilitation

7. Advantages of telerehabilitation

With several benefits over traditional in-person rehabilitation, telerehabilitation has become a potent modality for providing low vision services. These advantages cover patient satisfaction, clinical results, accessibility, and healthcare effectiveness.

a) Improved Accessibility to Vision Rehabilitation services: It is the most important advantage of telerehabilitation, where the patients are able to

overcome geographical and physical barriers by availing services directly from home. Evidence suggests that traditional in-person care can be inaccessible to a large proportion of visually impaired individuals, particularly older adults and those from socioeconomically disadvantaged backgrounds.

b) Reduction in Travel Burden and Cost: Telerehabilitation reduces the travel cost, time, and physical strain by removing the need for frequent hospital visits. Geriatric patients and those in need of long-term rehabilitation will especially benefit from this.

c) High patient satisfaction and acceptance: Research shows that patients are highly satisfied with telerehabilitation services. In the Bitter et al. (2022) study, 91 % of participants said they were comfortable with telerehabilitation, and 83% said they would be willing to participate in future sessions. Additionally, 68% of participants thought telerehabilitation was as accurate as in-person care, indicating a high level of acceptance of this modality.

d) Comparable clinical effectiveness: Telerehabilitation has been shown to produce comparable results to traditional in-office rehabilitation. Improvements in device usage were reported by approximately 79% of participants undergoing telerehabilitation training for magnification devices. This suggests that remote training can effectively replicate the benefits of in-person rehabilitation when appropriate support systems are in place.

e) Real-world functional Assessment: The ability to evaluate patients in their natural surroundings is a special benefit of telerehabilitation. In their own homes, clinicians can watch how patients carry out everyday activities like reading, moving around, and using electronics.
Because interventions can be adapted to real-life problems rather than simulated clinical settings, this ecological validity increases the relevance and efficacy of rehabilitation strategies.

f) Enhanced Continuity of Care: In case of chronic and progressive low vision conditions, telerehabilitation facilitates regular follow-up and monitoring, which allows timely modification of rehabilitation plans.

g) Integration with Assistive Technologies and AI: Telerehabilitation platforms can be integrated with digital tools and AI-based systems like Be My Eyes, Seeing AI, Aira, OrCam MyEye, and Envision AI to enhance assessment and intervention. These technologies enable personalised rehabilitation, real-time feedback, and adaptive training programs. AI-driven tools can further optimise patient outcomes by analysing performance data and tailoring interventions accordingly.

h) Reduced Healthcare System burden: By limiting in-person care, telerehabilitation reduces the burden on healthcare facilities and allows

better allocation of resources. It allows clinicians to reach a larger population without the need for physical infrastructure expansion.

i) Potential for Multidisciplinary Collaboration: Healthcare professionals such as optometrists, ophthalmologists, occupational therapists, and rehabilitation specialists can work together in a coordinated manner, ensuring thorough management of patients with low vision.

j) Adaptability with support systems: According to the study by Bittner et al. (2022), the usability and efficacy of telerehabilitation are greatly enhanced by the provision of technological support, such as remote access control or assistance from qualified personnel.

This shows that obstacles to technology can be successfully removed, improving the patient experience in general.

8. Where does India stand in telerehabilitation services?

India is currently in a developing yet progressive phase of telerehabilitation in low vision care, driven largely by the high burden of visual impairment and limited accessibility to conventional rehabilitation services. According to the studies conducted on the Indian population, telerehabilitation is both a practical and successful modality in terms of continuity of care in pandemic situations like COVID-19. A study conducted at a tertiary eye care centre in India found that over 300 people with visual impairment benefited from telerehabilitation services, which were mainly provided through accessible platforms like telephone and messaging applications. These services included low vision care, assistive technology training, counselling, and pediatric interventions.

Despite advancements in rehabilitation, India faces key challenges, including a lack of standardised guidelines, variability in service delivery, and a persistent digital divide, especially in rural and elderly populations. Nevertheless, India shows strong potential in delivering cost-effective telerehabilitation, with future growth dependent on improved standardisation, technological integration, and accessibility.

9. Challenges and Limitations

Telerehabilitation, while offering significant advantages, is associated with several challenges that may affect its effectiveness. Internet connectivity issues can disrupt virtual consultations, leading to poor communication and reduced quality of care. Additionally, digital literacy barriers among patients, particularly the elderly or those from underserved populations, can limit their ability to effectively use telehealth platforms. A related concern is the difficulty in providing device training remotely, as patients may struggle to learn the use of assistive devices or technologies without hands-on guidance.

Furthermore, data privacy and security concerns remain critical, as sensitive health information is transmitted over digital platforms and requires robust protection. Another major limitation is the restricted scope of remote clinical examination, as certain assessments require direct interaction, specialised equipment, or precise measurements that cannot be fully replicated virtually. Together, these challenges highlight the need for improved infrastructure, training, and secure systems to optimise the delivery of telerehabilitation services.

10. Ethical and Legal Considerations in Low Vision Rehabilitation

Ethical and legal principles are essential in the delivery of low vision care and rehabilitation services. These guidelines help protect patient rights while ensuring that healthcare professionals maintain appropriate standards of clinical practice and professional conduct. [18,19]

10.1. Patient Confidentiality

Protecting patient confidentiality is a key ethical responsibility in low vision care. Eye-care practitioners must ensure that all personal, clinical, and visual assessment information is securely stored and disclosed only to authorised members of the healthcare team involved in the patient's treatment. With the growing use of electronic medical records and telehealth services, safeguarding digital health information has become increasingly important. Maintaining confidentiality strengthens trust between patients and healthcare providers and is strongly emphasised in international clinical practice guidelines. [18]

10.2. Telehealth Regulations

The implementation of telehealth and tele-rehabilitation services in low vision care must follow established legal and regulatory frameworks. These regulations address issues such as patient identification, protection of medical data, professional licensing, and the use of secure communication systems. Compliance with these regulations ensures that remote healthcare services are delivered safely and ethically. In countries such as India, telemedicine practices follow national regulatory recommendations together with global health guidance.[19]

10.3. Informed Consent

Obtaining informed consent is an important ethical requirement before conducting low vision assessments or rehabilitation procedures. Patients should receive clear information regarding the nature of the evaluation, the rehabilitation process, expected benefits, possible limitations, and any risks related to the use of assistive devices or telehealth services. After understanding this information, patients can voluntarily agree to the proposed

care. This process respects patient autonomy and promotes ethical clinical practice in vision rehabilitation.[1,19]

10.4. Professional Responsibility

Healthcare professionals involved in low vision rehabilitation have the duty to provide competent and evidence-based care. This includes maintaining professional knowledge and skills, following clinical guidelines, respecting patient dignity, and referring patients to other specialists when required. Practitioners must also ensure proper training in the use of low vision devices and rehabilitation techniques. Ethical professional practice focuses on improving patient independence, functional ability, and overall quality of life while ensuring fair access to vision rehabilitation services. [1-3]

11. Future Directions

Future advancements in telerehabilitation are expected to include the integration of wearable assistive technologies, augmented and virtual reality-based interventions, and advanced AI-driven systems, along with the expansion of services to underserved and remote populations.

Conclusion

In a summarised form, telerehabilitation has become a viable and efficient method of providing low vision cares, increasing the accessibility, convenience, and continuity of services for people with visual impairment. It has greatly increased access to rehabilitation by removing logistical and geographic obstacles, particularly for people living in underserved and distant locations. Telerehabilitation is expected to have an even bigger impact on eye health worldwide as technology and artificial intelligence develop. Its increasing incorporation into standard practice can facilitate earlier intervention, more efficient use of resources, and a patient-centred, inclusive approach to care.

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