

Review Article

Nurses: a guide towards assistive devices and technologies for the visually impaired individuals

Nisha Yadav¹, Bhim S. Rawat^{1*}, Sushma K. Saini¹, Surinder S. Pandav²,
Srishti Raj², Mona Duggal²

¹National Institute of Nursing Education, PGIMER, Chandigarh, India

²Department of Ophthalmology, Advance Eye Centre, PGIMER, Chandigarh, India

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*Correspondence:

Dr. Bhim S. Rawat,

E-mail: Nisha.march97@gmail.com

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ABSTRACT

Assistive devices for people with visual disability is growing rapidly over the past few years around the world. These devices enhance the functioning and performance of daily living skills, thereby improves the independent living and quality of life of these individuals. These innovations range from low to high cost and it includes devices which assist the visually impaired individual in mobility, reading, writing, daily living, and communication technologies. Children primarily need these devices for education whereas adults use these devices for doing daily routine tasks. It is expected that the need and demand of these devices and technologies will increase over time due to the exceptional growth in the proportion of population with visual impairment, specifically in low middle-income countries like India. Therefore, the first and forefront strategy is to introduce assistive devices to the visually impaired individuals and create awareness, sensitize eye care professionals, potential beneficiaries, caregivers, and their families. The present paper will highlight some of the assistive devices and technologies which will increase the independence in doing activities of daily living as well as increase the quality of life of individuals suffering from visual impairment.

Keywords: Visual impairment, Assistive devices/ technologies, Quality of life, Activities of daily living

INTRODUCTION

A world report prepared by WHO (World health organization) and the world bank indicates that more than a billion people in the world experience disability. Of these people, approximately 285 million people are having visual impairment, in which 39 million are blind and 246 million are those people who are having low vision. It is estimated that 90% of those affected by visual impairment live in developing countries. Apart from this approximately 360 million people are suffering from hearing impairment. Both visually and hearing-impaired individuals confront many challenges and difficulties in society which includes educational problems, employment related problems and those problems related to general comfort.¹

Unfortunately, visual impairment inevitably leads to impaired ability to access information and perform everyday tasks. In today's knowledge-intensive society, gain information access is increasingly crucial, not just for performing daily activities, but also for engaging in education and employment. As such, for a visually impaired person, a key function of many assistive devices is to provide access to information.^{2,3}

Assistive devices are an interdisciplinary field of studies that encompasses products, resources, methods, strategies, practices, and services to enhance the functional capability concomitant with the activity and participation of individuals with paucity, disabilities, or truncate mobility to improve their autonomy, independence, quality of life, and social inclusion.

Assistive devices have the ability to enhance visually impaired people's quality of life through increased autonomy and protection. In addition, these innovations may reduce their fear of social isolation by allowing them to move beyond their normal environment and to engage socially.^{2,4}

Assistive devices are becoming an important part of the rehabilitation programme for visually impaired persons. It not only improves the body functioning but also improves the quality of life of individuals as well as increase their participation in daily life activities and thus helps in the independent living of these individuals. There are a variety of assistive devices accessible to people which ranges from cost-effective devices like large print books to very high-priced devices like refreshable Braille display.⁴

Assistive devices are potentially beneficial for schoolchildren with low vision and are classified as optical, non-optical, electronic, or computer-based. There are many computer-based resources which are specifically designed for blind individuals which include refreshable Braille displays and software replacing images with voice (voice synthesizers). These devices help in performance among individuals with visual loss. Few examples include large print books, which are specifically used in individuals with low vision who are having difficulty in reading small and usual print size text. These types of books come with large size printed text of font size 16 to 18 which helps in reading. Other devices include typoscope, which can be used as reading guide (one window) or writing guide (multiple windows). Single window typoscope is helpful for albinism. Optical magnifiers which include hand held magnifiers, stand and pocket magnifiers and these are basically task specific optical aids that enlarge the image. There are different types of canes available like walking cane or long cane, guide cane, green cane, which are designed primarily to spot objects within the path of the users, to scan for kerbs and steps by individual with some residual visual functioning, to identify the user as low vision respectively while the white cane user is identified as blind.⁴⁻⁶

METHODS

This study explores use of assistive devices among visually impaired individuals. Literature search were conducted to identify prevalence of visual impairment, quality of life of visually impaired individuals and assistive devices which help these individuals to perform better in daily life routines. Secondary sources have been used to collect the data, which includes the study of books, journals, articles, published research papers, thesis and dissertations.

Assistive devices for visually impaired persons

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large print books to very high-priced devices like refreshable Braille display. Assistive devices are potentially beneficial for schoolchildren with low vision and are classified as optical, non-optical, electronic, or computer-based. Computer-based resources which are used for blind persons include refreshable Braille displays and software replacing images with voice (voice synthesizers). These devices help in performance among individuals with visual loss.⁷

Common assistive devices

Portable video magnifier: They are handy and portable electronic devices using a camera and a display screen to carry out digital magnification of videos and pictures. They are available in two different types with varying sizes i.e., HD portable video magnifier and non-HD portable video magnifier with sizes 12", 7" and 5" and 4.3" respectively.

Max TV Spectacle: These are special spectacles designed both hands-free and head-mounted that yields 2.1x magnification which can be calibrated to individual each eye lenses to be focused independently [± 3 diopters], making the system adaptable to most patients. This increases TV screens size.

Binocular telescope for distance: They help the visually impaired see more clearly. Single or both eyes can be aided by attaching a binocular telescope with a regular eye wear of the patient, making images larger, thereby making easy to see. Patients with reduced visual acuity between 20/60 to 20/300 (6/18 to 6/90) and with disorders like macular degeneration, albinism, stargardt's disease, optic atrophy, nystagmus and many other visual conditions may find this device useful.

Monocular Bifocal: a monocular bifocal is mainly prescribed for use in the classroom and at home when studying. the distance portion of the lens permits orientation in the surrounding area, while the magnifying portion allows reading and work in close range.

Bar reader: a portable, lightweight, all-in-one device that acts an "eye" for visually impaired and allows live video/image streaming.

A4 sheet magnifier: A4 Sheet magnifier is the most innovative magnifying sheet. It not only enlarges an entire page at once for easier reading but also helps to reduce eyestrain and squinting. It makes the letters stand out far better than regular clear magnifiers. People can read the smallest print in newspaper, maps, and telephone books. This magnifier is huge, measuring A4 size.

Paper weight magnifier: paper weight map magnifying glass and reading aid use easy for old people, nice balanced weight to it. This comes in handy to read small print. This dual use paperweight and magnifying glass slides smoothly over maps, blueprints, newspapers and

other materials. Easy and pleasurable to use because you don't need to hold over your materials, you can simply glide it right over your materials, leaving your hands free.

Hand held magnifier: Hand held magnifiers are easy to handle, offers flexibility in magnification, individuals can change both the distance between the magnifier and the object or text, and the distance between the eye and the magnifier. The greater the distance between the magnifier and the object or text, higher the magnification will be. Decreasing the distance between the eye and magnifier also increases the magnification power. The availability of strong magnification powers and built-in illumination makes hand held magnifiers a good choice. Its use requires steady hands and good eye-hand coordination, especially for high-power lenses which also limits the usefulness of these devices for young children and those with upper limb disabilities.⁸

Stand magnifier: Stand magnifiers offer the most stable image compared to single- vision spectacle magnifiers and hand- held magnifiers; this makes them a good choice for beginners, especially those who require high magnification. Built-in illumination, usually provided by means of a relatively bulky battery handle, is also available. Stand magnifiers are comparatively more expensive and bulkier than hand-held or single-vision spectacle magnifiers; they also require smooth surface on which to rest the stand.

Stand magnifiers provide a pre-focused mounting, allowing stability for patients with tremors to rest the magnifier directly on the material to be seen. The power of these magnifiers can be as great as 60 D and some have illumination incorporated within their design. A reading stand used with a stand magnifier can reduce postural fatigue. Some patients using a stand magnifier may need a reading aid to maximize the effect of the magnifier and make it easier to use. Some patients use the stand magnifier to assist in writing by placing the pen or pencil under the magnifier between the legs of the stand. For older adults with tremors, and for younger children trying to maintain their place while reading, a stand magnifier may be the best device.⁹

IrisVision VR wearing device: It is an easy-to-use headset that helps people with low vision to regain their sight. IrisVision provides a 70-degree field of view. It leverages a user's still-functional part of the retina to remap a complete picture.

Acesight wearable e-glass: Acesight wearable e-glasses enable people with low vision to see the clearest image ever. Acesight VR delivers an amazing image, even in poor light conditions. It offers vivid color, lag-free move, sharp display, fast focus, distortion free view of the images as well as it helps in watching TV with an incredible smooth and bright image, but without lag.

These assistive devices have the ability to enhance visually impaired people's quality of life through increased autonomy and protection. In addition, these innovations may reduce their fear of social isolation by allowing them to move beyond their normal environment and to engage socially.⁹

DISCUSSION

Several studies have shown that in persons with visual impairment, the use of assistive devices increases their success in everyday tasks, improves social contact, independent living, self-esteem, determination and quality of life. Todis et al and Huting et al indicated that with the use of augmented assistive devices, children with visual disabilities have been able to make decisions and guide their own care. In children using assistive devices, studies have also shown a substantial increase in skills such as handwriting, motor skills, reading, arithmetic, science skills and other cognitive functions.^{9,10}

Assistive devices are beneficial but utilization among the population of visually impaired is less. It has been seen that the usage of assistive devices is more in individuals with other disabilities than individuals with visual impairment. There are many barriers in utilization of these assistive devices among visually impaired persons. These barriers are mostly faced by the individuals who are not able to buy these assistive devices because of their high cost and maintenance.¹⁰ Apart from this, understanding of the assistive devices is also poses a major barrier which causes problem in utilization of these devices. The current challenge is to provide appropriate access to and instructions on blindness and low vision specific assistive devices through individualized assessment of assistive technology needs, appropriate instructions in the use of assistive devices as tools, and equitable distribution of assistive devices.¹¹ According to Hussin in Malaysia, class VI students experienced some technical difficulties while using digital talking textbooks (DTTs) and these problems has led to the discontinuation of the use of assistive devices. A consistent conclusion was resulted in another study by Holcombe, which concluded that innovation with higher features and less complexity is more adopted and better result is found. Lack of knowledge, awareness among people with disabilities, reluctance to use the devices, poor device performance, feelings of stigmatization and understanding of the assistive devices are the main barriers.⁸⁻¹¹

CONCLUSION

Globally, the need of assistive technology continues to increase along with rise in the population with visual disability. India, a home of highest number of blind populations in the world certainly need to improve the awareness as well as accessing of assistive technology. The eye care professionals and other allied disciplines in the country are needed to be sensitized about various

types of assistive technology and its application for the welfare of people with visual impairment. For a country with limited resources like India, it is vital to have a low cost and affordable assistive technologies.

Although there are trainers, optometrists are available to train these patients but due to limited number of these people in the healthcare setting, it is not possible to train each and every patient individually and periodically doing the follow ups. Nurses can help these individuals as they are available in hospital as well as in community.

Recommendations

To bridge the gap which is present between availability, knowledge and utilization of assistive devices among visually impaired individuals, nurses can help and assist the patients in understanding of the assistive devices as well as they can counsel and motivate the individuals and explain them the benefits of using assistive devices. Being easily accessible and available the nurses actively participate in the process of selecting assistive devices, these individuals feel more secured and satisfied and it will be easier for them to understand the total functionality of the devices as well as it gives more confidence and clear their doubts regarding the utilization of assistive devices.

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