Introduction

The needs of the visually-impaired go beyond navigation, it includes a variety of concerns such as medication handling and the lack of awareness regarding medical services. It is difficult to understand the perception of a visually impaired person, but it is also difficult to comprehend the various challenges within the person's everyday life. Unfortunately, these various challenges are not properly amended. It is important to know and understand the various challenges of the visually impaired and then offer appropriate solutions for those challenges. In order to so, background information will be explained in order to show the staggering statistics. Next, challenges of the visually impaired will be explained with sub-sections on medication handling, hospital signages, lack of technology, and lack of awareness. Then, it will transition into the section on solutions for the visually impaired with sub-sections on improvement of medication handling, improvement on hospital signages, improvement of proper technology, and awareness for the visually impaired.

Background

The number of people suffering from visual impairment in America is exponential. According to a 2010 survey from the World Health Organization, 285 million individuals suffered from visual impairments and 39 million individuals were completely blind ("Improving the Nation's Vision Health" 5). 42% of these individuals suffered from retractive error while 33% suffered from diminished vision due to cataracts. Other visual impairments within these numbers included blindness, macular degeneration, and convergence insufficiency. What is alarming is that visual impairment is becoming more of a commonality. In the United States, more than 3.4 million people (approximately 3% of Americans) are either blind or are visually

impaired by 40 years old (5). However, what is more alarming is the lack of accomodation for the visually impaired. For example, complete eye examinations for wheelchair users were provided only 20% of the time in optometrists' offices (Duffy). In addition, both braille and audible prescription bottles were only provided by 1% of all facilities while audible prescription bottles were only supported by 14% of the pharmacies (Duffy). All of the other problems -- medication handling, hospital signage, lack of technology, and lack of awareness are all manifestations of not accommodating for visually impaired patients.

Challenges for the Visually Impaired

1. Medication Handling

Many Americans, even for the visually healthy, report difficulty reading important information on drug container labels. This has caused the intake for medication to be hindered, thus causing other health challenges. The Access to Drug Labels administered an online survey asking respondents for personal experiences of reading any labels related to their medication ("Access to Drug Labels Survey Report"). It featured 4 questions centered on the degree of vision loss, difficulty of reading drug labels, negative outcomes of disparity, and any strategies used. The 100 participants of the study included people with any type of vision loss, family members of visually impaired members, and professionals in the vision field. Overall, the data showed that individuals without the capability to read or access medication instructions often took incorrect amounts of their medication. Other ramifications ranged from failing to refill doses, taking expired drugs, and becoming ill due to wrong medication ("Access to Drug Labels Survey Report"). Interestingly enough, the survey showed respondents requested for better labels so that it can be read more easily. Other participants also mentioned assistive technology --

speech devices that can help read the labels to the visually impaired. All this goes to show a need for accessible accommodation (speech devices or better labels) for the visually impaired when it comes to taking medication or drugs.

In another study, Ling Zhi-han created a questionnaire featuring 100 individuals at a public area around Kuala Lumpur. Respondents 18 and older were placed within the blindness or visual impairment category. These people used some type of medication 2 weeks preceding the experiment. The questionnaire conducted questions on self-administration, medicine storage, and health-care team management (Zhi-han et al. 23). The studies showed that most of the participants took wrong dosages when self-administering medication. For most of the visually impaired in the study, unused drugs were stored for reuse. However, this will negatively impact patients since expiration of the drugs will be likely. As for health-care team management, participants of the questionnaire mentioned some form of 'assisting device.' However, the survey also showed participants using such 'technologies' in minimal usage (23). Also, it was shown that only 55% of doctors instructing correct usage of prescribed drugs. This can be dangerous to patients as it can lead to other health problems and complications.

2. Hospital Signage

Signage is defined by attention-grabbing boards that correctly guide visitors to their desired destinations. However, signages can also negatively affect individuals' experiences towards certain buildings or places. For example, society tends to think of hospitals as morbid places where only the sick and ailing go. This is due to the stressful and uncomforting environment, but also because of the unfamiliarity in navigating a hospital. Across the United States, there are approximately 539,000 hospital patients, while each department is visited

around 1 million times per year (Rousek and Hallbeck 771). Since the number of visits can be exponential, the interaction with signage only increases as time passes. What becomes even more problematic is the differing ethnicities. Hospitals have to accomodate for universally recognizable signs in order to help patients get to their destination. Moreover, creating universally recognizable signs involve color, font, sizes, and even lighting.

Rousek and Hallbeck created a study with 25 men and 25 women ranging from ages 18-30 (with no eye conditions, but specifically color deficiency). Three questionnaires featured 62 total pictograms: 1st -- 30, 2nd -- 12, and 3rd -- 18. The first series of patients wrote down their opinions on representations (no listings available). The pictograms for the second group of patients included a matching section of hospital names, departments, and terminologies. As for the third group, the pictograms tested to see if the patients were able to correctly identify ordinary pharmaceutical signs (772).

The objective of the study was to gauge signage understandment levels, preferences, and the ability to see the pictograms. Questionnaire 1 required patients to use past knowledge to identify pictograms -- in this case, two surgical pictures were shown. Pictogram 1 had a 0% correct rate while the second Pictogram contained a 94% correct rate. This was because Pictogram 2 was more descriptive and thus more helpful. A select number of pictograms throughout the study featured participants incorrectly understanding the pictograms because they were too simple, and did not manage to personalize with the testers. If the signs for departments either had a historical knowledge requirement or complex graphics, participants almost never understood the signs. The results showed that pictograms with a full body figure or zoomed in images had a 85% correct response rate, which was much improved compared to the other

responses. Also, text assistance played a large role in increasing the correct responses of

individuals in every pictogram (questionnaire 2) that was in questionnaire one. Radiology

pictograms were the only group to pass the 67% correct response rate, mainly because of the

experience participants had with the simpler picture designs. For the emergency department, the

red and black background was favored mostly because of past experiences and general

knowledge. Overall, the three questionnaires and the three pictogram experiences produced very

similar findings of simpler images, while prior experiences led to better recognition of

pictograms. However, limitations or drawbacks that were experienced within the study were due

to different cultural norms and subjective perceptions. This goes to show how challenging it will

be for visually impaired patients to navigate a hospital -- let alone for a normal person.

3. Lack of Technology

For the most part, health product companies have suggested canes, glasses, guide dogs,

and even robotics to help the visually impaired for public settings. However, the visually

impaired have minimal access to the products since most of these products are handmade (taking

a long time to get) and expensive. But most importantly, the proper means of technology have

been lacking. It is safely assumed that the easy access to technology has improved the lifestyle

for the visually impaired. But, studies have shown otherwise.

A study was done with blind adults testing various tech products. These products ranged

from Windows, MAC, iOS, and Android -- all are current and up-to-date devices. After the

participants handled the products with all the various applications, the numbers were staggering.

57% of English-speaking participants had accessibility issues while 65% of Canadian-speaking

participants had usability issues (Jarry et. al.). Interestingly enough, the main factor for such

issues were the constant updates on the devices. One would think that updates on tech devices would help service people with handicap, but it does the opposite. 41% of the participants described the update on technological devices as negative (Jarry et. al.). Visually impaired people are left behind as they feel lost when an update or change is implemented for tech devices. The Council for Exceptional Children (organization specializing in special education) described assistive technology as, "insufficient to meet the growing needs of blind users" (Smith et. al.). Added to this, other issues such as financial cost, low access to the Internet, and lack of feedback for applications detriment assistive technology to be pushed forward.

4. Lack of Awareness

Simply put, the main reason why the visually impaired are faced with many challenges is due to lack of awareness. The majority of the United States does not know of the aspirations, details, effectiveness, and availability of vision rehabilitation in their areas. According to a 2005 survey, "'3,180 U.S. adults ages 18 and older, 16 percent reported having heard the term 'low vision'. Of the 2 percent of surveyed adults who reported that an eye provider had diagnosed them with vision impairment, only 31 percent had been recommended to a low vision specialist"(NAP 400). Because of the poor connection between the vision healthcare providers and the general population, the multiple limitations and negative aspects (limited or no healthcare) can not be addressed to the population by the health workforce. On the other hand, in Canada, studies showed that in terms of race, African descendants were more likely to lack awareness of vision rehabilitation services compared to other races. In addition, "749 Canadian adults with vision impairment, 32.3 percent lacked information about vision rehabilitation services" (Fraser et al.). Even if these findings in Canada do not have a strong relation to the

United States, it signifies that Americans need assistance as well. Improvements in America start with maintaining that healthcare providers do their job and notify their visually impaired patients of the crucial information. Education campaigns of visual impairments would promote vision rehabilitation among individuals, which is beneficial because of its mitigation of the general high care costs.

<div align="center">Solutions for the Visually Impaired</div>

<div align="center">1. Improvement of Medication Handling</div>

What is first needed is a proper assistive device. As mentioned earlier, visually impaired patients have asked for assistive device when taking medication. Patients were so distracted by dosage factors that they failed to comprehend expirations and names of the drug. This proves that assistive devices such as Braille's label will play massive roles in helping individuals (updated lists lessen errors) (Zhi-han et. al). Braille labels are a basic necessity for helping blind people to read. If blind patients are not able to read their own medication labels, then taking the wrong dosage is highly probable. Currently, there is no Braille on medication labels, and thus should be implemented for blind patients.

Also, proper means of help and funds should be provided by the government and national health department. The American Foundation for the Blind (AFB) created Rx Label Enable, which wants to create a better accessibility to the drug labels for the visually impaired. They plan to complete this deal with help from consumers, federal government, and individuals from all around the medical field. One of the main implements the AFB plans on pushing for is the proper providence of reliable sources and professionals. A constant problem for the visually impaired is the accidental intake of wrong medication. It is important to have doctors and pharmacists

properly trained in somehow preventing the visually impaired to take the wrong prescription drugs. Properly trained doctors are crucial for patients since it can also prevent self-medication, which can lead to overdose and health complications.

<div align="center">2. Improvement of Hospital Signages</div>

Although seemingly insignificant, improving hospital signages can drastically help the daily challenges for the visually impaired. Studies have shown that quality signages improve navigating behavior, and are also considered as mandatory for building configuration (Garling et. al.). Proper color, lighting, and fonts create quality signages. For warning, the color red should be used, while the color green is used for safety. Fonts should be fairly large, well-spaced, and also concise. Lighting should be used with LED lights for brightness and energy conservation. Surprisingly, these suggestions are the basic guidelines enforced by the Americans with Disabilities Act (ADA). The ADA has specific guidelines for technical requirements which are mandatory for hospitals to implement. It is required by law according to the document known as ADAAG (Rousek and Hallbeck 772). However, these guidelines in regards to hospital signages are not followed most of the time. Rousek and Hallbeck states that studies show convincing evidence of proper signages not being enforced (772). In order to fix this problem, the United States government must strictly regulate the document of ADAAG and ensure hospitals follow the basic guidelines for the right signages.

It is important to note that financial cost will not be a problem for hospital signages. According to Rousek and Hallbeck, "In 2004, the Robert Wood Johnson Foundation reported that through 2014, an estimated $200 billion will be spent on new hospital construction and renovation across the U.S." (773). Ever since the year 2000, private funding and charity towards

hospital renovations have been increasing. Therefore, there is no excuse for hospital signages to worsen. With the constant increase of funding towards hospital renovation, the improvement of hospital signages must be enforced. This is necessary so that visually impaired patients can find their right destination in a hospital.

3. Implementation of Proper Technology

Technology has had a major impact on the world, especially in communications. However, visual displays present difficulties for the visually impaired. In order for the visually impaired population to benefit from technology, alternatives such as speech, Braille, and visual presentation adjustments (font, colors, and contrast) must be provided. Another booming problem for the visually impaired includes the lack of accessibility to commercial websites. AbilityNet surveyed, "A study in 2008 found that five of the most popular social networking sites were not accessible to people with visual impairment" ("Social Networking Websites"). One of the most relevant ICT policies to the visually impaired is the requirement of technological improvement to all kinds of communication. This has produced audio descriptions, emergency alerts through sounds, and radio programming -- especially in recent years. This policy has also led to the creation of different solutions to access barriers, as choice plays a large role in measuring success. For instance, "'Voiceover', a screen reader that 'speaks' whatever appears on the display of the 'iPhone' mobile device, lets visually impaired users make calls, read email, browse web pages, play music, and run applications'"(Robitaille). With these features, the visually impaired population has been provided with a necessary technological foundation that should only improve in the future. It should also be noted that accessibility often relies on the role of nongovernmental organizations. The most significant model for the visually

impaired started with material developed for Braille, audio, electronic, and other formats in order for easier use. These materials were later produced as, "Braille transcription software, search engines, and text-to-speech software in Hindi. Visually impaired students became trainees at the computer company sponsoring the center" (Lazar 276).

Navigation is most likely the highest obstacle for visually impaired people. However, there are noteworthy assistive devices that are worth mentioning: ETA, EOA, and PLD. ETAs are devices made to support the visually impaired in avoiding obstacles. More specifically, the depth camera (general camera is self-explanatory) provides depth images that give the user an increased amount of information pertaining to obstacles with the application of Microsoft Kinect analyzing the surroundings (Lin et al.). EOAs are created to help the visually impaired navigate through in an unfamiliar environment. The combination of cameras and other sensors allow for the drawing of shapes of passages as well as obstacles standing in one's way. PLDs involve GPS and GIS technologies working together to alert the visually impaired of their location and destination. Overall, ETAs, EOAs, and PLDs work independently, but the visually impaired will experience the most success if all three technologies are used in cohesion. Applications such as Microsoft 3D Soundscape, TrAVEl, and ViaOpta Nav should also be pushed and promoted. Microsoft 3D Soundscape and ViaOpta Nav gives users directions in their routes with location information, while TrAVEl assists individuals with bus routes. And then there is a new system called ENVISION. The ENVISION system offers top of the line technology and provides users with speech recognition, pathfinding, obstacle detection, and a merging phase (decision making). So far, the data featured 80% of participants agreeing on the easy learning and applying capabilities, as well as 100% of individuals admired the abilities of ENVISION (Khenkar et. al.).

Therefore, new systems like ENVISION should be pushed, supported, and promoted in order to benefit the lives of the visually impaired.

4. Awareness for the Visually Impaired

Lack of communication contributed to the unawareness of rehabilitation services for the visually impaired. According to studies in Australia and Canada, patient counseling from healthcare officials massively benefit the visually impaired in their awareness of vision rehabilitation services. For instance, one study demonstrated, "Among Australian patients with vision impairment who followed up on a referral to vision rehabilitation services, 85.4 percent cited receiving a referral to and/or information about vision rehabilitation services as a facilitating factor in the decision to attend vision rehabilitation"(O'Connor et al.). This clearly shows that this process has been successful, mostly in part because of the connection between healthcare providers and patients. Furthermore, this only exemplifies that communication is the largest barrier to effective usage of vision rehabilitation services all around the world. Recently, there have been potential strategies to promote vision rehabilitation to the visually impaired. One example features the possibility of modules in vision rehabilitation services (in-person and online) to be implemented into the education of optometrists, ophthalmologists, and other healthcare workers. Another idea considers medical groups creating guidelines that outline the best practices for the treatment of visual impairment patients. Overall, all of these practices symbolize a collective effort in the healthcare field that has not taken effect, but soon will hopefully. To ensure that individuals are provided appropriate care, the current healthcare system must aim to attain effectiveness, patient-centeredness, efficiency, and equity in its practices.

Another problem however was that most of these impairments were able to be avoided through appropriate means. In order to counteract this issue, the World Health Organization (WHO) has created a global action plan for 2014 to 2019. The goal of the action plan is to eventually eliminate avoidable visual impairments -- especially for those with unavoidable impairments to reach maximum success, and universal healthcare for eye care services. This would occur with expansive efforts by states, the secretariat, as well as Member States who desire to decrease visual impairment. The proposed actions for them include gathering evidence, integrating multiple health policies, and creating partnerships for eye care and health. Three indicators to track progress are causes of visual impairment, amount of staff, and cataract surgery. Understandment of visual impairment is crucial for resource allocation and organization, which apply to better eye care personnel as well. For the cataract surgical service delivery, more knowledge is required for monitoring surgical activities, which will allow for data, calculations, and provisions. Overall, the global target for the action plan stands at a 25% reduction in avoidable visual impairment by 2019 (WHO 7). It is truly crucial for WHO to implement this plan, but it is also crucial for the government to spread awareness about this plan to the public and to the ones in need -- the visually impaired.

Conclusion

In conclusion, it is important to know and understand the various challenges of the visually impaired and then offer appropriate solutions for those challenges. It is important to know the various challenges of unimproved medication handling, hospital signages, technology, and awareness. It is also important to know the appropriate solutions in order to improve medication handling, hospital signages, technology, and awareness. If the current conditions are

substandard, then they must be fixed. If there are necessary means that can brighten the future, then they must be pushed. Understanding and implementing these aspects will move the world forward to helping those that struggle with visual ailments.

Work Cited

AFB. "Access to Drug Labels Survey Report." *AFB*, 2018,
   http://www.afb.org/info/programs-and-services/public-policy-center/health-and-safety/rx-label-enable-campaign/access-to-drug-labels-survey-report/12345

CDC. "Improving the Nation's Vision Health: A Coordinated Public Health Approach."
   CDC, 2010,
   www.cdc.gov/visionhealth/pdf/improving_nations_vision_health_508_final.pdf.

Duffy, Maureen. "Accessibility Barriers in Medical and Health Care for People with Vision
Loss:
   Real Issues, Real Problems." *Continue Painting with Vision Loss - VisionAware*, 14 Aug.
   2013,
   www.visionaware.org/blog/visionaware-blog/accessibility-barriers-in-medical-and-health
   -care-for-people-with-vision-loss-real-issues-real-problems/12.

Fraser S.A., et.al. "Critical Success Factors in Awareness of and Choice Towards Low Vision
   Rehabilitation." *Ophthalmic Physiological Optics*. 2015, pp. 81–89.

Garling, T., et al. "Spatial Orientation and Wayfinding in the Designed Environment: A
   Conceptual Analysis and some Suggestions for Post Occupancy Evaluation." *Journal of
   Architecture, Plans and Resources*, 1986, pp. 55-64.

Jarry, Anne, et al. "Blind Adults' Perspectives on Technical Problems and Solutions When Using
   Technology." *Journal of Blindness and Innovative Research*, 2017,
   https://nfb.org/images/nfb/publications/jbir/jbir17/jbir070102.html

Khenkar, Shoroog, et al. "ENVISION: Assisted Navigation of Visually Impaired Smartphone
   Users." *Procedia Computer Science*, vol. 100, 7 Oct. 2016, pp. 128–135.

Lazar, Jonathan, and Michael Ashley Stein, editors. *Disability, Human Rights, and Information
   Technology*. University of Pennsylvania Press, 2017.

Lin, Bor-Shing, et al. "Simple Smartphone-Based Guiding System for Visually Impaired
   People." *Sensors*, vol. 17, no. 6, 13 June 2017, pp. 1371.

O'Connor P.M., et al. "Access and Utilization of a New Low-vision Rehabilitation Service."
   Clinical and Experimental Ophthalmology. 2008, pp. 547–552.

Robitaille, Suzanne. "Assistive Technology." *The Illustrated Guide to Assistive Technology and*

Devices: Tools and Gadgets for Independent Living. Springer Publishing Company, 2009.

Rousek, J.B., and M.S. Hallbeck. "Improving and Analyzing Signage within a Healthcare Setting." *Applied Ergonomics*, vol. 42, no. 6, 1 Nov. 2011, pp. 771–784.

Smith, D. W., et al. "Assistive Technology for Students with Visual Impairments: A Position Paper of the Division on Visual Impairments." *Council of Exceptional Children*, 2011, http://community.cec.sped.org/dvi/resourcesportal/positionpapers

State of the eNation. "Social Networking Websites." *State of the eNation*, Jan. 2008, https://www.abilitynet.org.uk/docs/enation/2008SocialNetworkingSites.pdf

Teutsch, Steven M., et al., editors. *Making Eye Health a Population Health Imperative*. The National Academies Press, 2016.

World Health Organization. "Universal Eye Health: A Global Action Plan 2014-2019." *WHO*, 2013, www.who.int/blindness/AP2014_19_English.pdf.

Zhi-han, Ling, et al. "Medication Handling Challenges Among Visually-Impaired." *Archives of Pharmacy Practice*, 14 Aug. 2017, https://doaj.org/article/486a409c56a345988c42cd8fcc9d8b83