

Hearing Aid Refurbishing Programs

Subjects: Rehabilitation

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Hearing aids (HAs) are the main assistance technology recommended to improve listening and communication for people with hearing loss. To improve access to HAs for people with hearing loss who cannot afford them, non-profit community organizations operate HA refurbishing programs, which consist of a bundle of services aiming at recycling used HAs and give them a second life.

Keywords: hearing loss ; hearing aids ; refurbishing ; low-income population ; rehabilitation ; audiology

1. Introduction

Hearing loss is one of the most common chronic health conditions in the world. According to the World Health Organization (WHO), around 1.5 billion people currently live with it around the world, and it is estimated that this number will be close to 2.5 billion by 2050 ^[1]. The consequences of hearing loss are important and numerous. It can lead to problems with hearing perception and communication, but also to fatigue, anxiety, social isolation, psychological distress, and depression ^{[2][3][4]}. Hearing loss is also associated with cognitive decline and a higher risk of falls in the elderly ^[5]. It can also have repercussions on significant others, who may experience frustration due to the communication difficulties caused by hearing loss and experience an increased feeling of burden associated with the support role they must assume ^{[6][7]}.

Hearing aids (HAs) are the main assistance technology recommended to improve listening and communication for people with hearing loss. Despite their effectiveness to alleviate activity limitations and participation restrictions experienced by those people and to improve quality of life ^{[8][9]}, only a small proportion of those people own HAs. Of the estimated 466 million people worldwide, who are candidates for hearing amplification, the number of which includes individuals with moderate to profound hearing loss, only 17% own HAs ^[1]. Available data suggest that this is also true in developed countries, where the proportion of people with hearing loss owning HAs ranges from 34 to 41% ^{[10][11][12]}. Therefore, there is a substantial gap between the need for HAs and the number of people who have access to them.

Many reasons may explain this discrepancy between HA needs and ownership. Among others are the importance of self-perceived hearing difficulties ^[10], the stigma associated with the use of HAs ^[11], and the high cost of acquiring and maintaining this technology. In relation to the latter, between 42 and 74% of non-owner respondents to HA surveys mentioned that HAs are too expensive or that they cannot afford them ^{[12][13][14]}. To improve access to HAs for people with hearing loss who are in that situation, non-profit community organizations operate HA refurbishing programs, which consist of a bundle of services aiming at recycling used HAs and give them a second life. These organizations collect HAs that are damaged or no longer used (for example, because the owner changed his old HAs for new ones, discontinued the use of HAs, or died). After fixing these HAs as well as cleaning and checking their functionality, organizations donate them to low-income people during humanitarian missions in developing countries or in local communities. In the Province of Québec, in Canada, the Association des Personnes avec une Déficience de l'Audition (APDA) is one of the few organizations offering those services ^[15]. Informal conversations with the APDA personnel and clinicians around the province (i.e., audiologists and hearing aid specialists) suggest that community-based HA refurbishing programs remain little known from the public and from the hearing healthcare practitioners, which do not refer many clients to those programs. No data are available about how common HA refurbishment is and the number of people using this type of device in the world. It is known that refurbished HAs circulate in many countries but there are no available data about refurbished HA sales and distribution ^[16].

2. What Are the Advantages and Disadvantages of Refurbished HAs?

Studies were carried out to determine the economic and social benefits that HA-refurbishing programs can have, both for HA recipients and for the government institutions that implant them. Tonning et al. ^[17] reviewed a system implemented in

Norway, where the National Health Insurance provided new and refurbished HAs to their citizens with hearing loss. In that system, a person with hearing loss would be provided new or refurbished HAs, depending on the availability of products at the time of provision. Those HAs were paid for entirely by the government. Repairs of provided HAs were also reimbursed. The authors compared the costs of repairing, refurbishing, and redistributing used HAs with the costs of purchasing new ones. They found that this system resulted in savings at a government level, which means that repair costs were offset by savings made using refurbished HAs instead of only using new devices. In addition, they found that the fact HA repairs were reimbursed by the government resulted in a reduction in the number of people who used faulty HAs or equipment poorly adjusted to their needs, since they would not have to personally pay for replacements and repairs.

Impacts of Refurbished HAs for People with Hearing Loss

The identified sources of evidence present experiential knowledge about the impacts, advantages, and disadvantages of refurbished HAs for people with hearing loss, mostly gained while implementing and administrating HA refurbishing services in the community. Unsurprisingly, the most important advantage of refurbished HAs is that they are less expensive than new HAs, which allow more people to access this technology. It is estimated that a refurbished HA can be sold at about 2/3 the price of a new one ^[18]. Refurbished HAs are generally sold or donated by non-profit organizations to low-income people who cannot afford to buy new devices ^{[19][20][21]}. Some authors mentioned that the use of refurbished HAs allowed clients not only to save money, but also to improve communication with coworkers and family and participation in everyday activities ^[21].

Some disadvantages of refurbished HAs were reported in the literature. Considering the relatively short life cycle of a HA, there is a risk that refurbished HAs become rapidly obsolete due to quick technological advances occurring in the field of hearing amplification ^[18]. The repair of refurbished HAs may also be an issue, as those technologies are generally repaired using parts collected in other returned HAs or spare parts donated by HA manufacturers ^[19], and so, the possibility of repairing refurbished HAs depends on the availability of appropriate spare parts. Another disadvantage which is mentioned in the literature is that the characteristics of refurbished HAs may not be appropriate to the needs of all clients with hearing loss. For example, most refurbished HAs are behind-the-ear (BTE) HAs ^[22]. Used in-the-ear (ITE) HAs can be refurbished, but the process is more expensive, and so, they are usually only used for spare parts ^{[17][19]}. Additionally, it may be difficult to find a refurbished HA appropriate for severe or profound hearing losses, as few of these models may be donated ^[22].

3. What Are the Determining Factors for the Success of a HA-Refurbishing Program?

A team of researchers studied the facilitating factors and obstacles to implementing a HA recovery-and-refurbishing system in the UK ^[18]. According to these authors, to ensure the success of such a system, it is imperative that HA suppliers save money, that an adequate cleaning of the used HAs is made to avoid cross-contamination from one client to another, and that the clients return the devices that were loaned to them when they are not in use anymore. The obstacles preventing the implementation of such a system were the lack of established protocols for the return of HAs, the lack of incentive for clients to return loaned devices, and the rapid technological evolution of HA products, which is related to obsolescence. The researchers found that the specific context of the National Health Service in the UK, which was found to focus primarily on the sale and distribution of new HAs, and where no established protocol on the return, disposal, refurbishment, and redistribution of HAs exists, is not favorable to the implementation of a sustainable HA recovery-and-refurbishing system. The list of the 25 HA refurbishing programs that were identified is presented in **Table 1**.

Table 1. Hearing aid refurbishing programs identified.

Country	Organization Location	Places Where Refurbished HAs Are Distributed	Target Population and Other Eligibility Criteria	Services Available and Price
Australia	EARS, Inc. ^[23] Templestowe, Victoria.	The Dominican Republic, Fiji, Malawi, Papua New Guinea.	Population of low- and middle-income countries.	Audiological equipment and training, hearing assessment, HAs, assistive listening devices (ALDs), fitting, earmolds.

Country	Organization Location	Places Where Refurbished HAS Are Distributed	Target Population and Other Eligibility Criteria	Services Available and Price
Canada	Association des personnes avec une déficience de l'audition ^[15] Québec City, Québec.	Québec, Canada.	Low-income adults and seniors living in Québec, members of the association, not covered by private or public insurance, hearing loss and HA needs assessed by an audiologist.	HAS, ALDs, fitting, earmolds, all free. Membership: 10 CND.
	Dalhousie Hearing Aid Assistance Program ^[24] Halifax, Nova Scotia.	Nova Scotia, Canada.	Low-income seniors living in Nova Scotia, low income.	Hearing assessment, HAS, fitting, earmolds, follow-up, all free.
	Hearing Solutions ^[25] Toronto, Ontario.	Peru.	Population of developing countries.	HAS.
	H.E.A.R. Worldwide ^[26] Ottawa, Ontario.	Canada, developing countries.	Low-income people living in Canada or in a developing country, not covered by private or public insurance.	HAS.
	Robillard Hearing Centres ^[27] Eastern Ontario.	El Salvador, Peru, Honduras, Palestine, Philippines, China.	Population of developing countries.	HAS.
	Salus Hearing Centre ^[28] Vaughan, Ontario.	Ontario, Canada.	NA.	HAS.
France	Team Canada Healing Hands ^[29] Montréal, Québec.	Haiti.	Population of Haiti with low income.	Audiological equipment and training, hearing assessment, HAS, fitting, earmolds.
	Audition Solidarité ^[30] Yzosse.	France, Dominican Republic, Morocco, Tunisia, Cameroon, Burkina-Faso, Madagascar, Guinea, Vietnam.	France: People with low income, not covered by private or public insurance (Aide Médicale d'État accepted), ENT assessment and HA prescription required. Abroad: underprivileged children only.	France: Hearing assessment, fitting, earmolds, all free. Abroad: Audiological equipment and training, hearing assessment, HAS, fitting, earmolds.
	Idéal Audition ^[31] Many locations in France.	France, International.	Low-income people living in France or in a developing country.	HAS.
UK	DeafKidz International ^[32] Brighton.	UK, Gambia, India, Jordan, Malawi, Pakistan, Rwanda, Sierra Leone, South Africa, Zambia, Zimbabwe.	Deaf children, young people, and adults living in UK or in a developing country, low income.	Audiological equipment and training, hearing assessment, HAS, fitting, earmolds, Sign Language training.
	Hearing Care Centre ^[33] Suffolk, Norfolk.	International.	Population of developing countries.	HAS.

Country	Organization Location	Places Where Refurbished HAs Are Distributed	Target Population and Other Eligibility Criteria	Services Available and Price
USA	Hearing and Speech Foundation ^[34] Maryville, Tennessee.	USA, Jamaica.	Residents of East Tennessee (children and adults), gross household income does not exceed 100% above the federal poverty level.	Hearing assessment, HAs, accessories, ALDs, fitting, earmolds. HAs are free. Sliding scale fee system for services based on household income, from 145 to 350 USD.
	Rotary ^[35] Many locations in USA.	Argentina, Philippines, Dominican Republic	Low-income population in developing countries.	Supports projects to provide affordable HAs and services in underserved areas.
	Olive Osmond Hearing Fund ^[36] St. George, Utah.	USA.	Low-income people (children and adults) who cannot afford HAs and have no resources available to obtain amplification devices.	HAs, other devices, or audiology services on a case-by-case basis.
	Grace Hearing Center ^[37] Tucson, Arizona.	USA.	Residents of the greater Tucson area (children and adults), household income does not exceed 250% above the federal poverty level, willingness to do community volunteering.	Hearing assessment, HAs, accessories, fitting, earmolds. Sliding scale fee system for HAs (including services) based on household income, from 80 to 450 USD, plus a designated amount of volunteer hours in the community.
	GiveHear ^[38] Fort Wayne, Indiana.	USA.	Residents of northeast Indiana (children and adults), household income does not exceed 250% above the federal poverty level, willingness to do community volunteering.	Hearing assessment, HAs, accessories, fitting, earmolds. Sliding scale fee system for HAs and services based on household income, plus patients are asked to do volunteer hours in the community.
	Hearing Charities of America ^[39] Kansas City, Missouri.	USA.	Residents of the USA (children and adults), hearing loss diagnosed and HA recommendation by an audiologist, low income without health insurance or coverage for HAs.	Hearing assessment, HAs.
	Pacific Neuroscience Institute Foundation ^[40] California.	USA.	Hearing loss diagnosed by an audiologist, low income without health insurance or coverage for HAs.	HAs.
	Southern Arizona hearing aid bank ^[41] Tucson, Arizona.	USA.	Low-income adults unable to afford hearing care.	Services and HAs, 95 USD.
	The UWSHC Hearing Aid Recycling Program ^[42] Madison, Wisconsin.	USA.	Low-income residents of Dane County and surrounding area. People with significant hearing loss in both ears are prioritized. Reasonable benefit from the HAs expected by the audiologist.	Hearing assessment, HAs, fitting, earmolds, initial follow-up, all free. Other audiology services, programming, and repair provided on a case-by-case basis.
	Hearing the Call ^[43] Fort Wayne, Indiana.	USA, Jordan, Palestine, Mexico, Mozambique, Zambia, South Africa, India, Brazil, Guatemala, Ecuador.	Population of developing countries. Residents of the USA (children and adults), household income does not exceed 250% above the federal poverty level, willingness to participate in community volunteering.	Hearing assessment, HAs, accessories, fitting, earmolds. Sliding scale fee system for HAs and services based on household income, plus patients are asked to perform volunteer hours in the community.

Country	Organization Location	Places Where Refurbished HAs Are Distributed	Target Population and Other Eligibility Criteria	Services Available and Price
International	Hope for Hearing ^[44] Ann Arbor, Michigan.	USA.	Low-income residents of Washtenaw County.	HAs.
	Tulsa Speech and Hearing Association ^[45] Tulsa, Oklahoma.	USA.	Low-income residents of Oklahoma. Hearing test by an audiologist (no older than 6 months), 30 dB hearing loss in the better ear.	1 HA, 75 USD.
	Lions Clubs International ^[46] Many locations in the world.	International, Local.	NA.	HAs.

Note. Specific information about each identified HA refurbishing program was added when available online. ENT: ear, nose, and throat doctor. NA: not available.

Another determining factor that emerged from Tønning et al.'s ^[17] study was the importance of the cooperation of hearing healthcare professionals and their attitudes towards the use of refurbished HAs. Particularly, it appears crucial that professionals actively participate in the program by making clients aware of the importance of the collection of HAs that are no longer in use.

When a used HA is returned to the distributor, it is not necessarily easy for the professional to know when it is advantageous to refurbish it, or to send it for recycling or disposal. To help professionals make this choice, Rudi et al. ^[47] developed a software which takes many factors into consideration (i.e., the age of the technical aid, its life cycle, price, cost of disposal, expected time to refurbish the aid, etc.), and which makes it possible to support the decision to refurbish a technical aid or not. This software was created for the Norwegian National Health Insurance program, which, at that time, lent out technical aids, from wheelchairs to HAs, or even adapted cars. The use of the software was tested in various lending centers in Norway and professionals found plenty of advantages in its use. They mentioned that it helped them to consider several factors in their decisions that they previously overlooked, and that it changed the way they determined what aid could be refurbished. As many factors were considered, therefore allowing professionals to obtain an objective proof of the possible advantages, they noticed that they would refurbish much more aids than before, avoiding ending their life in the landfill. The software made it possible to highlight the economic advantages that the refurbishing of technical aids can generate, while making professionals aware of its possible benefits, which made the decision-making process easier and more objective.

Finally, it is not sufficient to simply distribute refurbished HAs to people in need freely or at a low cost. Accessible and affordable follow-up services, repairs, and batteries are essential for the sustainable use of refurbished HAs ^{[19][20][48][49]}.

4. What Are the Existing Programs Which Distribute Refurbished HAs to People with Hearing Loss around the World?

The 25 HA refurbishing programs that were identified were all based in developed countries. They distributed refurbished HAs (mostly BTE HAs) in developing countries ($n = 6$), in local communities ($n = 12$), or both ($n = 7$). All programs targeted low-income patients without other resources available to obtain amplification devices. This implies that patients must qualify to receive refurbished HAs from most programs by filling an application form and sending personal data such as tax slips, an audiogram, and a HA recommendation. Little information is available online about the other characteristics of identified HA refurbishing programs (e.g., specific eligibility criteria, number of HAs allotted per patient, if other hearing assistance technologies are refurbished by the organization, and price). Some programs were found to have minimum audiometric eligibility criteria ^[45], require that the patient's hearing loss was diagnosed and documented by a licensed audiologist ^{[15][39][40][42][45]}, or only accepted patients living in a specific geographic area ^{[15][24][34][37][38][42][44][45]}. One organization mentioned that only one refurbished HA was distributed to each eligible patient ^[45]. Another organization also refurbished assistive-listening devices ^{[15][23][34]}. When mentioned, the cost of one refurbished HA for eligible patients was variable. Some programs used a fixed rate of 0 USD ^{[15][24][42]} or less than 100 USD ^{[41][45]}, while other programs used a sliding scale fee system based on household income with a maximum price of less than 500 USD per HA ^{[34][37]}. One program required the patient to pay a one-year membership of 10 CND to the association running the program ^[15], and three others asked the patient to perform volunteer work in the community in exchange for the HA ^{[37][38][43]}.

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