

Review Article

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Amplification and aural rehabilitation in resource-constrained environments

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Abstract

Objectives. This article attempts to highlight the challenges and possibilities for hearing healthcare through technology and aural rehabilitation in a resource-constrained setting, using South Africa as an example.

Results and conclusion. The authors argue that it is possible to enhance service delivery by using free resources and maximising the limited existing resources. In order to provide a sustainable hearing healthcare service in developing countries, it is pertinent to understand the context where the services are needed, and not just adopt an approach developed for a different context. Audiologists in such settings need to employ strategies to develop context-specific tools, and adapt existing tools to serve the needs of the local population. Some examples, although not exhaustive, are provided in the article.

Introduction

Aural rehabilitation is crucial to optimise the quality of life in a person with hearing loss. In order to customise rehabilitation, it is important to consider aspects that Schow¹ describes as: (1) ‘CORE’ – communication status, overall participation variables, related personal factors and environmental factors; and (2) ‘CARE’ – counselling and psychosocial aspects, audibility and impairment management, remediate communication activity, and environmental co-ordination and participation improvement. This article explores aural rehabilitation in resource-constrained settings, with South Africa presented as an example; the findings could be applied to similar settings elsewhere.

South Africa’s economy is considered by the World Bank to be a dual economy, with one of the highest inequality rates in the world. Poverty rates were estimated at 15.9 per cent for 2016. A high percentage of the population is not employed (27.3 per cent in 2016). In the youth population, the unemployment rate is currently at 50 per cent.²

Disabling hearing loss affects around 360 million people around the world, and it is estimated that approximately one-third of people aged over 65 years have hearing loss. The prevalence of hearing loss in this age bracket is greatest in South Asia, Asia Pacific and Sub-Saharan Africa.³

South Africa does not yet have universal newborn hearing screening, nor does it have a national healthcare system where citizens have free access to hearing health services. The healthcare system in general consists of private and public provision, with 16 per cent of the population (eight million people) using private health insurance to access healthcare services.⁴ The majority of the population have to access services in the public health sector, which suffers from the effects of under-funding, neglect and mismanagement. The combination of these socio-economic and political factors causes a dilemma in healthcare service delivery; the focus is often placed on primary healthcare and survival from life-threatening conditions such as human immunodeficiency virus and acquired immune deficiency syndrome, and tuberculosis. Hearing loss and associated quality of life may be considered less of a priority under these circumstances.

One of the main goals of the South African Ministry of Health’s ‘National Development Plan 2030’⁵ is to significantly reduce the burden of disease. This strategic guide highlights the need for national health insurance, a reduction in healthcare system inequality and general healthcare reform. This, at least in theory, would include the burden of disease associated with hearing loss. The effects of hearing loss on individuals, families and significant others has been well documented. These can include increased feelings of isolation and uncertainty, stress, anger, and anxiety.⁶ There is also increasing evidence to suggest an association between hearing loss and cognitive decline or dementia.^{7,8}

The cost of untreated hearing loss in developing countries has not been systematically reported. It is possible, however, to draw on reports from Europe and the USA, where the estimated cost of untreated hearing loss is 213 billion Euros per year. In a developing nations context, where poverty and unemployment are already prominent, hearing loss contributes further to the economic burden, as individuals with hearing loss are economically dependent.⁶

Treatment options

Treatment options for hearing loss include: medication; surgery; hearing aids; cochlear implants; other implantable technologies such as middle-ear implants, auditory brainstem implants and bone-anchored devices; and aural rehabilitation services. The type of hearing loss will determine the best course of action, but the most common treatment for acquired sensory hearing loss is the provision of hearing instruments.

Outcome measures of hearing instruments indicate a strong evidence base for their use and recommendation. Hearing aids have been shown to benefit those with hearing loss, and outcomes such as patient satisfaction and usage are favourable.⁹ In addition, hearing aids have been shown to improve adults' health-related quality of life by reducing the psychological, social and emotional effects of sensory neural hearing loss.¹⁰ Positive outcomes for aural rehabilitation as a treatment option have also been established.^{11,12}

Aural rehabilitation

Aural rehabilitation is an umbrella term used to describe a range of services that aim to reduce the impact that hearing loss can have on a person's ability to function, and their activities, participation and quality of life. These services include sensory management, instruction, perceptual training and counselling.¹³

Services for individuals with hearing impairment have in the past mostly involved techno-centric approaches, including the fitting of amplification devices such as hearing aids and cochlear implants. These treatment options have focused on the technology and advanced processing features to solve the many difficulties associated with hearing loss.

Montano¹⁴ offered a more comprehensive definition of aural rehabilitation, where the technology is part of the service, but where aural rehabilitation is more person-centred and framed within a counselling-infused approach. The focus is on helping the person with hearing loss, their families and significant others, in their unique contexts, to live well with their hearing loss. Often the comparison to a physical therapist can be helpful to explain how aural rehabilitation can be used in this process. If a person breaks a leg, the physical therapist does much more than provide a crutch to aid mobility. They work with the individual so they can gain the strength to walk again and attempt to restore as much as possible the full range of motion of the broken leg. In a similar way, the audiologist who offers aural rehabilitation helps the person with hearing loss by prescribing the best technology, instructing the person and the communication partners on how to best use the technology, educating the person and their significant others (including role players in the work place) on the impact of hearing loss and how to manage their environment, providing perceptual training (e.g. auditory and/or audiovisual training), and offering counselling (informational and personal adjustment counselling) to deal with both the auditory and non-auditory effects of hearing loss.

Research into aural rehabilitation practices in resource-strapped areas such as Africa is lacking. Pienaar, Stearn and Swanepoel¹⁵ have reported on outcomes of aural rehabilitation in a developing South African context, while Olusanya¹⁶ has reported on outcomes from Nigeria. The focus of aural rehabilitation in both studies was on hearing aids, and did not include other components such as counselling, perceptual training, instruction, environmental management or vocational support.

A more recent survey of interest in and practice of aural rehabilitation was conducted by Makhoba and Joseph.¹⁷ Although the study only included a small number of respondents ($n = 45$), it provided some insight into current practices in South Africa. Most of those who completed the survey indicated that hearing aids were the main treatment option offered for hearing loss. Other options, such as communication strategies, frequent communication partner training, auditory training, speechreading and counselling, have been used to a lesser extent. Some of the reported challenges associated with a more comprehensive treatment approach included: lack of time and reimbursement; lack of knowledge, awareness and training; poor adherence to treatment; lack of patient time and resources to travel to appointments; language barriers; and unrealistic treatment expectations from patients.¹⁷

Although health priorities in lower income countries may be different to those in higher income nations, there are many practical solutions currently available to clinicians who work in resource-strapped areas who would like to develop their knowledge and skills in aural rehabilitation services.

Education and training

In order to equip a new generation of audiologists who are confident and competent in delivering aural rehabilitation services, training institutions need to facilitate theoretical learning and provide opportunities for practical application. Universities might consider reviewing their curriculum to: evaluate whether adequate time and resources are being allocated to aural rehabilitation, as a subject in their programmes; and consider the nature and quality of clinical and practical scenarios, to aid students' design, delivery and evaluation of aural rehabilitation services.

Often the lack of patients is sighted as a challenge for student practicums, but the use of simulation clinics may be considered in these circumstances. It might also be possible to investigate the possibility of linking up with other universities in the world who have more experience in teaching aural rehabilitation, to see how learning opportunities may further be enhanced. Resilient and motivated educators will play a key role in determining how aural rehabilitation is embedded in the future practice of audiologists.

Qualified audiologists who are interested in developing their aural rehabilitation skills need to embark on a journey of targeted professional development. This is another opportunity for universities and training institutions to play a leading role in the provision of aural rehabilitation courses offered as part of continued professional development initiatives.

Interested parties will also find many online and free resources to advance their aural rehabilitation knowledge (Appendix 1). For instance, there are courses listed on Audiology Online,¹⁸ and free tools and resources can be accessed via organisations such as the Ida Institute¹⁹ or cochlear implant company websites (e.g. Med-El, Advanced Bionics and Cochlear). Many of these organisations provide a wide range of reading materials, research, blogs, products, courses and access to training games.

Some professional organisations, such as the American Speech-Language-Hearing Association, American Academy of Audiology, and British Society of Audiology, have published guidelines and standards for aural rehabilitation practices that are available free of charge on their websites. These documents encourage good practice, and provide the interested reader with a solid foundation regarding aural rehabilitation and

Table 1. Examples of telecare in aural rehabilitation

| Area of aural rehabilitation | Services | Authors or organisation |
|------------------------------|---|---|
| Sensory management | Remote hearing aid & cochlear implant fitting | Campos & Ferarri (2012) ²³ |
| Instruction & education | Online rehabilitation & education programme | Thorén <i>et al.</i> (2011) ²⁴ |
| Perceptual training | cLEAR® – customised auditory training | Tye-Murray (2016) ²⁵ |
| Counselling | Online support groups & chat rooms | Hearing Loss Association of America |

the current best evidence in this field. For example, a practice guideline by the British Society of Audiology,²⁰ entitled *Common Principles of Rehabilitation for Adults in Audiology Services*, provides a set of guiding principles for management. It includes information on self-management, suggestions for measuring outcomes and setting joint goals, which can be helpful when building practices around aural rehabilitation.

Telecare

There has been an increasing trend for telecare service delivery in hearing healthcare over the last decade. Telecare may offer unique solutions in resource-strapped areas; it alleviates the burden of travelling to clinics and addresses the shortage of audiologists in remote areas.

Within an African context, the market penetration of mobile phones has brought the concept of mobile health ('mhealth') forward as a viable option to deliver hearing healthcare in areas where services and resources are severely limited. Data from the World Bank indicate that within the 20 per cent of poorest households, 7 out of 10 people have a mobile phone, and these poorest households are more likely to have a mobile phone than clean water, electricity or toilets.² The mobile phone market penetration in Sub-Saharan Africa is 73 per cent, compared to 98 per cent in higher income countries.² A review by Fiordelli *et al.*²¹ revealed that there were 15 000 health applications available from mobile phone application stores, further indicating the potential of mobile health to revolutionise hearing care services in resource-strapped settings.

There are examples of telecare practice in all areas of aural rehabilitation, as outlined by Saunders and Chisolm.²² Table 1 provides an example of tele-aural rehabilitation services that are already available and taking place around the world.^{23–25} It is important to note that these are single examples and many more currently exist. The interested reader is referred to papers by Saunders and Chisolm,²² and Pichora-Fuller and Levitt,²⁶ for more comprehensive reviews.

Telehealth also enables those with hearing loss to receive and send required information before their first appointment with a hearing care professional. This enables patients to obtain quality information before seeing a clinician for the first time, it helps them to think about questions they may want to ask, and prepares them for the clinical encounter in terms of what to expect. Furthermore, the health professional is able to send questionnaires ahead of time, obtain information about the patient's hopes and expectations, and include the views of the communication partners. By sending case history forms and questionnaires ahead of the appointment, the clinician can spend more time discussing different treatment options with the patient and spend less time collecting this information during the appointment session.

The Ida Telecare Toolkit contains easy-to-use resources for the three main phases in a client's journey to hearing health:

preparation for the first appointment, preparation for the follow-up appointments and everyday life with hearing loss. Within each phase, there are online tools that those with hearing loss can use to prepare for appointments or use to live with their hearing loss. The Ida Institute Telecare Overview is one example of these resources (Table 2).

Rehabilitation groups

Aural rehabilitation services in the form of groups offer another way of delivering services to a greater number of individuals with hearing loss. Aural rehabilitation groups can focus on a variety of topics, depending on the needs of the group. Online support groups, communities and chat rooms may offer peer support to those living with hearing loss, cochlear implant and tinnitus. The benefit of peer support is that participants have an opportunity to relate with individuals who have had similar experiences and they may learn from each other's experiences.

The role of the hearing profession in resource-strapped areas may be to initiate and facilitate such groups initially, and subsequently allow the group to become self-sustainable. The professional may be brought in from time to time to deliver a talk or consult on a topic of interest, but it is important the group is able to function independently from the professional.

Groups may also opt to meet once a term or once a year, and conduct the rest of their activities online via social media groups such as Facebook or WhatsApp. Organisations including the Hearing Loss Association of America, and cochlear implant companies, offer access to online support communities, where patients are able to connect with others from around the world. The role of the professional here is to help patients slot in with a support group if this is of interest to them and to familiarise themselves with what is currently available, and/or help start such programmes if there is a need in a particular community.

Cultural differences may influence the groups and how they function. Certain groups may find it difficult to share face to face, or share with someone of a different gender. Cultural sensitivity, tolerance and a mantra of mutual respect in a safe space are all pre-requisites for running a successful group.

The Active Communication Education programme, proposed by Hickson *et al.*,²⁷ is a freely available programme intended for use in group aural rehabilitation. The programme focuses on communication strategies, but has several other topics that can be included in an aural rehabilitation programme, depending on the needs of the group. The programme has been used in Australia and has been proven to be an effective means of improving outcomes in those with hearing loss who choose to either have or not have a hearing aid to treat their hearing loss.²⁸

The Active Communication Education programme is offered over a period of six weeks. The downloadable material

Table 2. Ida Institute Telecare Overview

| Prepare for 1st appointment | Prepare for follow-up appointment | Everyday life with hearing loss |
|--|---|--|
| Living well online: PHL identifies when communication without hearing aids is most easy & difficult, & which steps they can take to improve communication | Living well online: PHL identifies when communication with hearing aids is most easy & difficult, & which steps they can take to improve communication | Top tips for managing conversation: PHL learns effective tips & tricks for successful communication, & hears from other people with hearing loss how they apply methods |
| My turn to talk for adults: PHL identifies their most important communication partners & questions they wish to discuss in 1st appointment | My turn to talk for adults: PHL identifies their most important communication partners & questions they wish to discuss in appointment after trying hearing aids | Dilemma game: PHL reviews common difficulties in communication situations, & reviews possible solutions while being encouraged to think up their own |
| Patient's journey: PHL answers a few questions about their hearing to help identify where they are on their journey | Patient's journey: Revisiting the Journey helps determine if they are ready for different interventions than at previous appointments | |
| Tinnitus thermometer: Patient explains how they are experiencing their tinnitus at time of appointment & what expectations they have | Tinnitus thermometer: How patients feel about their tinnitus can change from day to day. This tool is appropriate for use before every appointment | |
| Why improve my hearing? PHL reflects on how improved hearing & communication would change their everyday life | | |

PHL = person with hearing loss

contains recruitment letters, outcomes measure questionnaires, handouts and activities. The programme is facilitated by an audiologist, and can be attended by individuals with hearing loss and their communication partners. This programme provides a unique opportunity to run aural rehabilitation groups in resource-strapped contexts, as it focuses less on technology and more on the development of communication strategies. It also provides opportunities for outcome data to be collected in these areas, and for the programme to be further developed or adapted for these settings.

Another example of free resources that can be helpful for aural rehabilitation is the Ida Institute's Group Rehabilitation Online Utility Pack ('GROUP') aural rehabilitation tool. The tool consists of an extensive set of resources aimed to help the clinician plan and facilitate group aural rehabilitation sessions. The tool provides guidance on: how to get a group started, establishing ground rules, selecting topics, videos with example group sessions, and more.

In order to develop sustainable aural rehabilitation services, hearing healthcare providers will need to consider non-traditional service delivery methods. One-on-one therapy at a clinic outside of the community is unlikely to be viable. It is important to involve and empower the community to take an active role in aural rehabilitation services. Rural areas need to focus on education, awareness, and training of support staff and volunteers. Links could be established with mentors from other geographical areas or with academic faculty members on a remote support basis. From these platforms, support groups, interest groups, case discussions and journal groups could be run, to help develop knowledge and skills. Evidence suggests that group aural rehabilitation with a counselling focus is effective.¹¹

Many aural rehabilitation tools remain under-utilised, but this will change as awareness of aural rehabilitation and available resources is improved. It is important for clinicians in resource-strapped environments to develop links with online communities where they may participate in further professional development, and share practices of clinicians from all around the world. The Ida Learning Hall initiative provides


an opportunity for clinicians to participate in short, 'bite-size' learning modules, and provides the opportunity to engage with online communities who have interests in similar topics.²⁹

Tinnitus information and counselling

Although there are no known prevalence data for tinnitus in South Africa, it is expected that a significant proportion of the population may experience tinnitus and/or suffer as a result of it. A systematic review by McCormack *et al.*, published in 2016, revealed a wide range of global tinnitus prevalence (5.1–42.7 per cent).³⁰ Tinnitus is most often associated with hearing loss and exposure to loud noise.

The websites of organisations such as the American Tinnitus Association and British Tinnitus Association provide access to good quality information to both tinnitus sufferers and clinicians. Tinnitus is typically considered to be a niche area for clinical practice, and many clinicians around the world do not offer services for the assessment and management of this debilitating condition. Reasons for this often include the fact that they feel inadequately prepared by their training institutions, or they lack the necessary counselling skills to be able to deal with tinnitus.

Clinical tinnitus treatment protocols are available for download from professional organisations such as the American Academy of Otolaryngology – Head and Neck Surgery. These protocols can be helpful to guide clinical practice and provide a solid evidence base for clinicians who are starting to provide tinnitus management services.³¹ The Tinnitus Activities Treatment programme, developed by Tyler,³² provides a comprehensive approach to tinnitus management. Richard Tyler and the University of Iowa have made an extensive set of informational counselling tools and resources available that can be accessed free of charge from the university website.³³ The programme provides information about the impact of emotions on tinnitus, sleep management, concentration and so on. It consists of a set of pre-developed PowerPoint presentations that the clinician can use during the tinnitus management process.

TINNITUS THERMOMETER CLIENT'S NAME _____ 



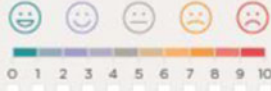
| | DATE | REF: | DATE | REF: | DATE | REF: |
|---|---|------|--|------|---|------|
| 1 When you think of tinnitus, what do you think of? Say one or two words that describes how you feel about it. | | | | | | |
| 2 What do you expect from this appointment? | | | | | | |
| 3 During the past week, was there a time when your tinnitus was less bothersome? | | | | | | |
| 4 Mark the number between 0-10 that best describes how much tinnitus has bothered you in the past week, including today. 0 = No tinnitus 10 = Worst possible tinnitus |  0 1 2 3 4 5 6 7 8 9 10 | |  0 1 2 3 4 5 6 7 8 9 10 | |  0 1 2 3 4 5 6 7 8 9 10 | |

Fig. 1. Ida Institute Tinnitus Thermometer.

The Ida Institute has, through a collaboration and co-creation process, developed three tools to provide high-quality information about tinnitus, and to help clinicians develop their counselling skills related to tinnitus management. The Tinnitus First Aid Kit is an online resource that provides the tinnitus sufferer with high-quality information about tinnitus and what can be done about it. The toolkit has been developed in collaboration with the British Tinnitus Association, and with the help of 15 international experts from Canada, Switzerland, Germany, UK, USA, Australia, Italy and Denmark. The Tinnitus Communication Guide was created to help patients differentiate between the tinnitus and the distress it can cause. The guide aims to help clinicians communicate a message of encouragement and hope. The Tinnitus Thermometer (Figure 1) was developed to help patients describe their experience of tinnitus on the day of the appointment, and can be used to monitor this experience over time. The Tinnitus Thermometer is also available as a telecare tool so patients can complete questions about their tinnitus and rate their 'tinnitus temperature' prior to an appointment. Patients can complete the Tinnitus Thermometer tool and can save it as a Portable Document Format ('PDF'), bringing it to their appointment or emailing it to their hearing care provider ahead of their appointment.

Applications

Software applications for smartphones and tablets are part of a booming industry, with several thousands of new applications being developed each year. Staying up to date with developments in the hearing healthcare arena can prove to be challenging for both clinicians and patients alike. Although many

applications exist, there are currently limited published data on their efficiency and effectiveness. Swanepoel and colleagues³⁴ have been developing applications for community-based hearing screenings that are validated and which adhere to international standards.

Several applications are now available for various elements of aural rehabilitation; however, outcome data from these are still mostly lacking. This presents an opportunity for researchers and patient organisations to join forces to systematically evaluate aural rehabilitation applications and contribute to the body of evidence, in both high and lower income countries. Organisations like Hearing Link (UK), the Hearing Loss Association of America, and the National Deaf Children's Society provide links to applications that adults and children with hearing loss may explore. Some resources have been reviewed by hearing impaired users, and interested patients and clinicians are encouraged to explore and evaluate these for their own use. Clinicians should aim to spend approximately 1–2 hours per week exploring applications and technology updates, to increase their general awareness of products and applications their patients may encounter via the internet. Table 3 provides an example of aural rehabilitation applications that are listed by the Hearing Loss Association of America, Hearing Link, and the National Deaf Children's Society.

Hearing and amplification technologies

In resource-constrained settings, public healthcare budgets are typically limited, focusing on the burden of disease in that specific context. Audiologists in the public sector have to prioritise the limited resources when addressing the needs of the

Table 3. Examples of aural rehabilitation applications*

| Application or programme | Description |
|---|---|
| Angel Sound™ | A free, PC-based, self-paced, interactive auditory training & assessment programme |
| ReadMyQuips™ | A training programme for those who have difficulty understanding speech in noisy situations |
| LACE® (Listening and Communication Enhancement) | Learning to effectively listen again – aural rehabilitation |
| Listening programmes for cochlear implants | Advanced Bionics (www.advancedbionics.com/com/en/support/education.html) Cochlear Americas (http://hope.cochlearamericas.com/listening-tools/self-auditory-rehabilitation-web-sites) Med-El (www.medel.com/us/max-listening-and-com-auditory-rehabilitation) |
| TapTap | This application vibrates phone & flashes screen to draw attention to nearby sounds |
| MyEarDroid | Recognises common sounds (e.g. doorbell, fire alarm, telephone) & alerts user |
| Dragon® Dictation | A voice recognition application that turns spoken words into text |

*As listed by the Hearing Loss Association of America, Hearing Link and the National Deaf Children's Society. PC = personal computer

hearing impaired. Thus, fair and justifiable policies are required to provide services in such settings.

An example in South Africa is the priority of hearing aid fitting for children. All children under the age of six years with a bilateral sensorineural hearing loss of greater than 25 dB HL qualify for state-subsidised hearing aids. Payment is based on the family income, with indigent patients receiving devices and services for free. Where possible, adults with bilateral hearing loss typically only receive one hearing aid, and do not receive state-subsidised amplification for unilateral hearing losses. This is an example of where known international best practice and current best evidence is challenging to follow. There is a large body of research that indicates the benefits of binaural hearing and the provision of a pair of hearing aids; however, pragmatic solutions have to be found when budgets simply do not allow for this. It is important, though, that when someone is then fitted with only one hearing aid, they are supported and offered aural rehabilitation to align expectations about outcomes, and that the hearing impaired individual and their families are taught about communication strategies. It is also important to continue advocating for larger budgetary provisions in the future where possible.

In developing countries, it is beneficial to seek solutions that reduce strain on the limited human and financial resources. Strategies to optimise costs and serve the majority of those with a hearing impairment include the bulk buying of amplification devices through, for example, state tender processes, and offering subsidised technologies to indigent patients. In addition, selecting products that are flexible in terms of their fitting range, to serve different hearing losses, is advisable. In some instances, refurbished hearing aids are supplied as an interim solution. Furthermore, the utilisation of tele-audiology to serve remote areas can potentially widen access to appropriate and timely hearing healthcare.

Self-fitting hearing aids could potentially broaden accessibility to amplification in a developing context, where the audiologist-to-patient ratio is high. Depending on the clarity of instructions and available assistance, the fitting process can be reliable and valid.³⁵ However, the options currently available still require hardware and proprietary software, and a certain level of health literacy.³⁶ Affordability of this technology creates an additional challenge in developing contexts.

Research conducted in developed countries cites hearing aid cost as a major barrier in uptake rates,³⁷ which is similar to findings in a developing context.¹⁶ It is believed that the regulating bodies of amplification devices can play a major

role in reducing such costs.³⁸ Personal sound amplification products can be a consideration in future, but need to adhere to a minimum set of standards before they can be widely regarded as an option for the hearing impaired.³⁹

A portion of individuals with hearing impairment will not benefit from amplification devices, because of the severity of their hearing loss. Often, cochlear implants are a more suitable option. However, the cost of cochlear implants is prohibitive, and remains outside the reach of most individuals with hearing loss in developing countries. In addition, most, if not all, cochlear implant centres in South Africa are in urban settings, and travelling adds additional costs.⁴⁰

Poor uptake rates do not just depend on the cost of the available technology. Cultural diversity needs to be acknowledged in relation to health-seeking behaviour and hearing aid uptake.⁴¹ Factors such as the stigma of hearing loss and denial of an impairment play a role, in addition to different views on ageing and disability.³⁹ The hearing aid uptake rates of 1–8 per cent in developing contexts are considerably lower than those in developed countries.⁴¹

Aside from the abovementioned factors influencing uptake rates, there is sufficient evidence to suggest that technology on its own is not the ideal solution. Therefore, technology should be accompanied by an appropriate rehabilitation programme customised to the end-user's needs and context.

Practical hints and tips

To enhance evidence-based practice in developing contexts, it is pertinent to measure the outcomes associated with the provision of hearing technology. Partnering with educational and/or research institutions can result in a mutually beneficial relationship. For example, when partnering with a training institution, relevant data can be collected to evaluate outcomes; this can be used to improve services and advocate for resources (additional staff, increased budgets, etc.). In turn, the institution can conduct research that is contextually relevant and socially responsive.

It is advisable to develop outcome measurement tools in the languages relevant to the specific context.⁴² Merely adapting or translating tools might result in invalid and unreliable measurements.

To enhance buy-in from stakeholders, it is important to have a thorough understanding of the context and to provide context-relevant services. Rather than imposing an existing service provision model, including 'foreign' protocols and

procedures, a customised model will address the needs of the community, and maximise buy-in.

Education to address the stigma of hearing loss can be achieved via platforms such as local radio stations, social media and community newspapers. In addition, successful hearing aid users can be used as role models to help reduce the stigma related to hearing loss. Some successful campaigns have used well-known icons, such as the late Nelson Mandela, to debunk myths and common negative perceptions of hearing loss.

In instances where technology is not readily available, sign language is another option for providing a person with hearing impairment with the means to communicate. However, care should be taken to avoid using a blanket approach without taking the context into consideration. For example, if the person with hearing impairment does not have any communication partners using sign language, it is an ineffective means of communication for their context and circumstances. For some families who identify with deaf culture, sign language is their preferred method of communication. Regardless of communication mode, the role of the hearing care professional is to provide unbiased support during the rehabilitative process, to ensure that the individual can participate and contribute to society in the way that they would like to.

Conclusion

In this paper, we have attempted to provide some insight and context to the provision of amplification and rehabilitative services as part of hearing care in resource-strapped settings such as South Africa. The economic and political realities of lower income countries can have a profound effect on healthcare priorities, where often the focus is on improving survival rates, rather than quality of life issues in the first instance. Hearing loss has been proven to have far-reaching effects on a person's wellbeing, both in a psychosocial and economic sense. It is critical that government and hearing care services consider the importance of treating hearing loss as a national priority, to ensure that individuals with hearing loss can lead productive lives and are able to contribute to the economy by having access to technology, aural rehabilitation services, inclusive education, and opportunities for employment.

The large penetration of mobile phones into the general population lends itself to innovation in hearing care services that utilise mobile health and telehealth technologies. These technologies, paired with advances in amplification and aural rehabilitation, can be used to strengthen the solutions that are currently limited for treating hearing loss, such as restricted budgets for hearing aids.

Training institutions and community-based intervention teams have a unique opportunity to collaborate, in order to bring effective hearing care closer to those who need it. Innovative and resilient projects that take advantage of the many free resources available from organisations around the world can be adapted for local use.

There is a strong motivation for resource-strapped countries to embrace aural rehabilitation as an important area of service delivery, especially in light of the limited availability of hearing instruments and implantable technologies. Aural rehabilitation is not yet part of routine audiological care, despite the increasing availability of useful resources that can help clinicians and patients alike. The authors hope that this article can motivate hearing care professionals around the world to refresh their knowledge of, and develop their skills in, this

important area of hearing care, in order to benefit their community and improve the quality of life of individuals with hearing loss.

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References

- Schow RL. A standardized AR battery for dispensers is proposed. *The Hearing Journal* 2001;**54**:10–20
- The World Bank in South Africa: Overview 2017. In: <http://www.world-bank.org/en/country/southafrica/overview> [22 July 2018]
- World Health Organization. Deafness and hearing loss. In: <http://www.who.int/mediacentre/factsheets/fs300/en/> [22 July 2018]
- Mayosi BM, Benatar SR. Health and health care in South Africa-20 years after Mandela. *N Engl J Med* 2014;**371**:1344–53
- South African Government. National Development Plan 2030. In: <https://www.gov.za/issues/national-development-plan-2030> [20 July 2018]
- Olusanya BO, Ruben RJ, Parving A. Reducing the burden of communication disorders in the developing world: an opportunity for the millennium development project. *JAMA* 2006;**296**:441–4
- Gallacher J, Ilubaera V, Ben-Shlomo Y, Bayer A, Fish M, Babisch W *et al.* Auditory threshold, phonologic demand, and incident dementia. *Neurology* 2012;**79**:1583–90
- Lin FR, Metter EJ, O'Brien RJ, Resnick SM, Zonderman AB, Ferrucci L. Hearing loss and incident dementia. *Arch Neurol* 2011;**68**:214–20
- Humes LE, Rogers SE, Quigley TM, Main AK, Kinney DL, Herring C. The effects of service-delivery model and purchase price on hearing-aid outcomes in older adults: a randomized double-blind placebo-controlled clinical trial. *Am J Audiol* 2017;**26**:53–79
- Chisolm TH, Johnson CE, Danhauer JL, Portz LJ, Abrams HB, Lesner S *et al.* A systematic review of health-related quality of life and hearing aids: final report of the American Academy of Audiology Task Force on the Health-Related Quality of Life Benefits of Amplification in Adults. *J Am Acad Audiol* 2007;**18**:151–83
- Abrams H, Chisolm TH, McArdle R. A cost-utility analysis of adult group audiological rehabilitation: are the benefits worth the cost? *J Rehabil Res Dev* 2002;**39**:549–58
- Hawkins DB. Effectiveness of counseling-based adult group aural rehabilitation programs: a systematic review of the evidence. *J Am Acad Audiol* 2005;**16**:485–93
- Boothroyd A. Adult aural rehabilitation: what is it and does it work? *Trends Amplif* 2007;**11**:63–71
- Montano JJ. Defining audiological rehabilitation. In: Montano JJ, Spitzer JB, eds. *Adult Audiologic Rehabilitation*, 2nd edn. San Diego: Plural Publishing, 2013;27–9
- Pienaar E, Stearn N, Swanepoel de W. Self-reported outcomes of aural rehabilitation for adult hearing aid users in a developing South African context. *S Afr J Commun Disord* 2010;**57**:4, 6, 8
- Olusanya B. Self-reported outcomes of aural rehabilitation in a developing country. *Int J Audiol* 2004;**43**:563–71
- Makhoba M, Joseph N. Practices and views of audiologists regarding aural rehabilitation services for adults with acquired hearing loss. *S Afr J Commun Disord* 2016;**63**:e1–10
- Audiology Online. CEU Courses. In: <https://www.audiologyonline.com/audiology-ceus/all/> [20 July 2018]
- Ida Institute. Tools. In: <https://ida.institute.com/tools/#.category-6,.category-7,.category-10,.category-11> [20 July 2018]
- British Society of Audiology. *Common Principles of Rehabilitation for Adults in Audiology Services*. Bathgate: British Society of Audiology, 2016
- Fiordelli M, Diviani N, Schulz PJ. Mapping mHealth research: a decade of evolution. *J Med Internet Res* 2013;**15**:e95
- Saunders GH, Chisolm TH. Connected audiological rehabilitation: 21st century innovations. *J Am Acad Audiol* 2015;**26**:768–76
- Campos PD, Ferrari DV. Teleaudiology: evaluation of teleconsultation efficacy for hearing aid fitting. *J Soc Bras Fonoaudiol* 2012;**24**:301–8
- Thorén E, Svensson M, Törnqvist A, Carlbring P, Lunner T. Rehabilitative online education versus internet discussion group for hearing aid users: a randomized controlled trial. *J Am Acad Audiol* 2011;**22**:274–85
- Sommers MS, Tye-Murray N, Barcroft J, Spehar BP. The effects of meaning-based auditory brain training on behavioral measures of

- perceptual effort in individuals with impaired hearing. *Semin Hear* 2015;**36**:263–72
- 26 Pichora-Fuller MK, Levitt H. Speech comprehension training and auditory and cognitive processing in older adults. *Am J Audiol* 2012;**21**:351–7
- 27 ACE: Active Communication Education. A program for adults with hearing loss. In: <https://shrs.uq.edu.au/files/123/ACE-training-booklet.pdf> [22 July 2018]
- 28 Hickson L, Worrall L, Scarinci N. A randomized controlled trial evaluating the active communication education program for older people with hearing impairment. *Ear Hear* 2007;**28**:212–30
- 29 Ida Learning Hall. In: <http://idalearninghall.idainstitute.com/> [20 July 2018]
- 30 McCormack A, Edmondson-Jones M, Somerset S, Hall D. A systematic review of the reporting of tinnitus prevalence and severity. *Hear Res* 2016;**337**:70–9
- 31 American Academy of Otolaryngology – Head and Neck Surgery. Clinical Practice Guideline: Tinnitus. In: <http://www.entnet.org/content/clinical-practice-guideline-tinnitus> [20 July 2018]
- 32 Tyler RS. *Tinnitus Treatment: Clinical Protocols*. New York: Thieme, 2006
- 33 University of Iowa Health Care. Tinnitus and Hyperacusis. In: <https://medicine.uiowa.edu/oto/research/tinnitus-and-hyperacusis> [20 July 2018]
- 34 Swanepoel DW. mHealth improves access to community-based hearing care. *The Hearing Journal* 2016;**69**:30–2
- 35 Convery E, Keidser G, Seeto M, Yeend I, Freeston K. Factors affecting reliability and validity of self-directed automatic in situ audiometry: implications for self-fitting hearing aids. *J Am Acad Audiol* 2015;**26**:5–18
- 36 Keidser G, Convery E. Self-fitting hearing aids: status quo and future predictions. *Trends Hear* 2016;**20**:2331216516643284
- 37 Kochkin S. MarkeTrak VIII: the key influencing factors in hearing aid purchase intent. *Hearing Review* 2012;**19**:12–25
- 38 President's Council of Advisors on Science and Technology. Aging America & Hearing Loss: Imperative of improved hearing technologies. In: <https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/PCAST%20hearing%20letter%20report.pdf> [22 July 2018]
- 39 Valente M, Amlani AM. Cost as a barrier for hearing aid adoption. *JAMA Otolaryngol Head Neck Surg* 2017;**143**:647–8
- 40 Kerr G, Tuomi S, Müller A. Costs involved in using a cochlear implant in South Africa. *S Afr J Commun Disord* 2012;**59**:16–26
- 41 Zhao F, Manchaiah V, St Claire L, Danermark B, Jones L, Brandreth M *et al*. Exploring the influence of culture on hearing help-seeking and hearing-aid uptake. *Int J Audiol* 2015;**54**:435–43
- 42 Pascoe M, Norman V. Contextually-relevant resources in speech-language therapy and audiology in South Africa: are there any? *S Afr J Commun Disord* 2011;**58**:2–5

Appendix 1. Resources for aural rehabilitation

Websites and organisations

<http://www.idainstitute.com>
<http://idalearninghall.idainstitute.com/>
<http://www.entnet.org/content/clinical-practice-guideline-tinnitus>
<https://medicine.uiowa.edu/oto/research/tinnitus-and-hyperacusis>
<https://www.tinnitus.org.uk>
<https://www.ata.org>
<http://www.hearingloss.org>
<http://www.thebsa.org.uk/wp-content/uploads/2016/10/OD104-52-Practice-Guidance-Common-Principles-of-Rehabilitation-for-Adults-in-Audiology-Services-2016.pdf>

http://www.ncds.org.uk/family_support/technology_and_products/apps_for_deaf_young_people/apps_for_deaf_young_people/communication_apps.html
<http://www.hearingloss.org/content/listening-training-programs>
<https://www.hearinglink.org/living/loops-equipment/useful-apps-for-hearing-loss/>

Sensory management

HARL Decision Aid

Perceptual training

Oticon ClearSpeech
 cLEAR Auditory Training

Listening and Communication Enhancement (LACE)

AngelSound
 Med-El Soundscapes
 Advanced Bionics: The Listening Room
 ReadMyQuips

Counselling

Tinnitus First Aid Kit
 Tinnitus Thermometer
 Tinnitus Communication Guide
 Tinnitus Activity Treatment
 Siemens Counselling Suite

Instruction

ACE Programme (<https://shrs.uq.edu.au/files/122/ACE%20Booklet%202.pdf>)
 Cochlear Communication Skills Programme
 C2Hear

Applications

Oticon Tinnitus Sound
 Beltone Calmer
 iAngelSound
 Advanced Bionics rehAB
 Cochlear Hope Words
 CBT-I Coach
 Starkey Hear Coach

Books

Montano JJ, Spitzer JB. *Adult Audiologic Rehabilitation*, 2nd edn. San Diego: Plural Publishing, 2015

Hull RH. *Introduction to Aural Rehabilitation*, 2nd edn. San Diego: Plural Publishing, 2013

Tye-Murray N. *Foundations of Aural Rehabilitation: Children, Adults, and their Family Members*, 4th edn. Stamford: Cengage Learning, 2014