

Tele-audiology Offers Great Promise in Reaching Underserved People Globally

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Editor's Note: This post, first published on August 23, 2011, ended with a hearkening of the future that is becoming a reality for audiology services as we enter 2017. It bears republication as a reminder of the thinking and technology in place six years ago.

"In light of the global shortage of hearing health professionals and the overwhelming need for hearing care, tele-audiology may be the most likely way to make a significant impact on global hearing health care delivery."

Audiological interventions for patients of any age with hearing loss have demonstrated the potential to dramatically alter life course with improved outcomes in language, academic, and vocational achievement as well as far-reaching improvements in socio-emotional wellbeing and quality of life.

According to the World Health Organization (WHO), there are approximately 300 million people in the world who could benefit from hearing health services. Unfortunately, more than 80% of these individuals live in regions where hearing health care services are virtually non-existent or inaccessible to all but a few. In Africa, for example, only two of the 48 countries on the continent of almost 1 billion people offer tertiary professional training in audiology.

This is indicative of the dearth of audiological services that currently exist, and it points to the need to consider alternative strategies to reach patients. The recently developed field of tele-audiology has the potential to help bridge the enormous gap between the demand for hearing care and the available supply.

WHAT IS TELE-AUDIOLOGY?

Telehealth is a system of delivering health care in which the provider and the patient are separated by distance. Telehealth services can be provided by two methods. One is *synchronously*, where the patient and the professional interact in real time through the use of information and communication technology. Or, services may be delivered *asynchronously*, with information being shared in a store-and-forward model.

Both methods may be incorporated into a hybrid model that relies on synchronous and asynchronous components interacting for maximal efficiency. A recent review of the telehealth literature pertaining to audiology reveals that both models have been used for various audiological functions, including screening, diagnosis, and intervention (Swanepoel DT, Hall JW: "A systematic review of telehealth applications in audiology." In *Telemedicine and e-Health* 2010;16(2):181-200).

HOW A TELE-AUDIOLOGY CLINIC CAN OPERATE

The first tele-audiology clinic in Africa was started in 2010 as a collaborative project between the University of Pretoria, GeoAxon, and Witkoppen Health and Welfare Centre. It is situated in a primary health care clinic serving an underserved population with a high prevalence of HIV/AIDS and tuberculosis.

The clinic's daily operation is managed by a trained tele-audiology facilitator. Patients are assessed with diagnostic air- and bone-conduction audiometry. An automated testing sequence is used, and results are uploaded onto a secure server. This allows remotely located audiologists to interpret the audiogram findings. If the results raise questions, a synchronous test is scheduled in which the audiologist takes remote control of the equipment, reinstructs the patient, and tests him or her manually.

The telemedicine-enabled audiometer employed at the clinic is produced by GeoAxon and has unique features suitable for assessments in underserved populations using information and communication technology. The KUDUwave audiometer (Type 2 clinical audiometer) is computer-operated and USB-powered with its hardware encased in the two circumaural earcups. This means the device is fully mobile, which is important for testing in remote areas where services may have to be provided at many sites.

The major obstacle to effective mobile diagnostic audiometry is ensuring that ambient noise levels are sufficiently low to allow for reliable testing. Sound booths are too expensive and unavailable in many developing countries. Those that are available are usually not mobile, which restricts services to a specific location.

The KUDUwave audiometer has two important features that allow it to be used compliantly outside a soundproof booth, as is the case at this tele-audiology clinic. First, the device offers significant attenuation through the use of insert earphones covered by circumaural earphones. Importantly, however, it also actively monitors the environmental noise for compliance by microphones on the circumaural ear cups.

The ambient noise levels are continuously monitored across 1/3-octave bands to ensure that testing is done within permissible ambient noise levels. If these levels are exceeded, the test can be stopped temporarily. Once thresholds are documented, the noise levels at these levels are also stored. Quality control features like these allow for reliable testing in remote areas.

While the pilot phase of this project is almost complete, the formal evaluation phase has not yet begun. However, initial results have been very positive and demonstrate that diagnostic audiological services can be provided at a primary health care level in remote areas within a hybrid telehealth service-delivery model.

Video-otoscopy has also been included as part of the evaluation phase. It is conducted by the facilitator, who is trained to take pictures of the ear canal and tympanic membrane. These can then be evaluated in a store-and-forward manner by ENTs and audiologists. Future phases of this project will include the evaluation of remote hearing aid fittings using non-custom earmold options.

LOOKING FORWARD

Information and communication technology combined with the technical nature of audiological screening, diagnosis, and intervention makes audiology uniquely suited to provide a full range of services remotely. The field of hearing health can capitalize on the exponential growth in information and telecommunication networks in the developing world to reach populations that are

currently without any services.

In light of the global shortage of hearing health professionals and the overwhelming need for hearing care, tele-audiology may be the most likely way to make a significant impact on global hearing health care delivery.