

Innovations in remote/teleaudiology patient care

BY HUNG THAI-VAN

Audiometry remains the gold standard in hearing evaluations. Changes in the delivery of audiometry remain a key challenge in providing a telehealth approach to hearing care. The team at Lyon University Hospital validated an innovative approach to solving this challenge, the findings of which are presented here.



Figure 1. SHOEBOX patient side setup: headset, bone vibrator, patient response button and video-otoscope are connected to a laptop through a regular USB Hub. Software is accessible thanks to a web browser.

Despite growing demand, access to hearing healthcare remains limited and difficult to access in many parts of the world today. The growth in our ageing population and the declining numbers of hearing healthcare professionals are two of the main reasons, but they are not the only ones [1]. The audiometer, an indispensable diagnostic tool used for measuring hearing levels, also plays a role. The traditional audiometer is unwieldy and expensive to both purchase and maintain. This makes them inaccessible in many emerging markets, as well as for rich and developed markets that still do not have a way to provide hearing care everywhere in their territories. Without automation, they are complex pieces of medical equipment requiring an expert for use, and the lack of connectivity significantly hinders or prevents teleaudiology options, the need for which was clearly highlighted by the COVID crisis.

Technology companies are innovating in the field of audiology, offering novel methods of hearing evaluation that allow hearing healthcare professionals to expand patient care. New secure online tools help to enable a team approach to patient care, even when contributing professionals are not in the same location. For example, an audiology assistant or technician could collect and record initial patient-specific data, and a remote hearing healthcare professional could subsequently analyse the data (case history, otoscopy, audiometry, questionnaires) and determine next steps. These new approaches have enabled a technology platform, developed in partnership with the University of Pretoria in South Africa, to administer a screening hearing test on a smartphone to more than 35,000 people over a two-year period.

Regarding the need for a full audiometer used by remote experts, an Israeli company,



Figure 2. SHOEBOX expert side setup: any regular computer with a web browser and video conferencing capabilities (camera, microphone, speakers).

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recently acquired by WS Audiology, is utilising web-based technologies in an effort to modernise audiometry and associated testing. A new online audiometer incorporates pre-calibrated digital transducers with a 'plug and play' feel. This new design allows almost any internet-connected computer to transform into a clinical audiometer, facilitating testing both in person at a clinic, as well as remotely for a teleaudiology care model.

Intrigued by the capabilities of this online audiometer, the team at Lyon University Hospital proceeded with a clinical validation of the system. A multicentre clinical study was carried out in three audiology clinics in which results from conventional audiometry were compared to results collected with the online digital audiometer, obtained in a randomised order. Study results published in the *International Journal of Audiology* [2] demonstrated that the online digital audiometer provides clinically accurate measurement of air and bone conduction hearing thresholds. It was indeed shown that the differences measured between the two systems were lower than those obtained in test-retest on the same patient with the same audiometer.

As a next phase in these validation efforts, a cohort of adult patients will be invited to participate in a second comparative study. This subgroup can present more testing challenges due to the complexities of cases that can meet an ENT compared to a hearing aid dispenser. Another key difference with this phase is that the testing will be done by clinicians in other cities, and even other continents, addressing the issue of real-time testing from quite a distance away. The analysis included comparing the remote testing results with those obtained conventionally using in-person audiometry will demonstrate the feasibility and viability of a model for which the hearing healthcare professional is remote (both intra- and inter-continental) and the test patient is in clinic, assisted by a nurse for otoscopy, as well as the positioning of transducers.

References

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2. Thai-Van H, Joly CA, Idriss S, et al. Online Digital Audiometry vs. Conventional Audiometry: A Multi-Centre Comparative Clinical Study. *Int J Audiol* 2022:1-6.

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