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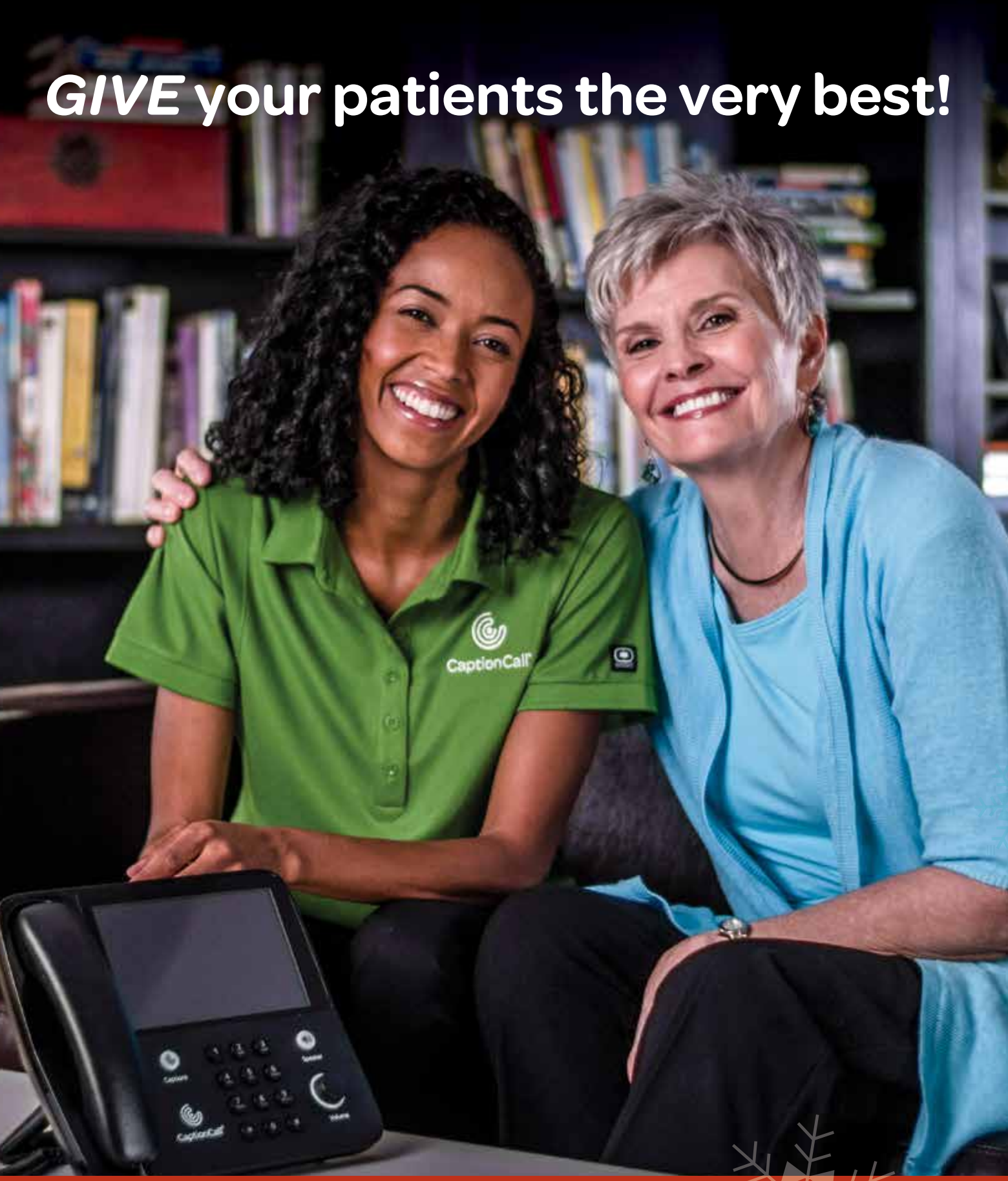

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AT provides comprehensive reporting on topics relevant to audiology, including clinical activities and hearing research, current events, news items, professional issues, individual-institutional-organizational announcements, and other areas within the scope of practice of audiology.

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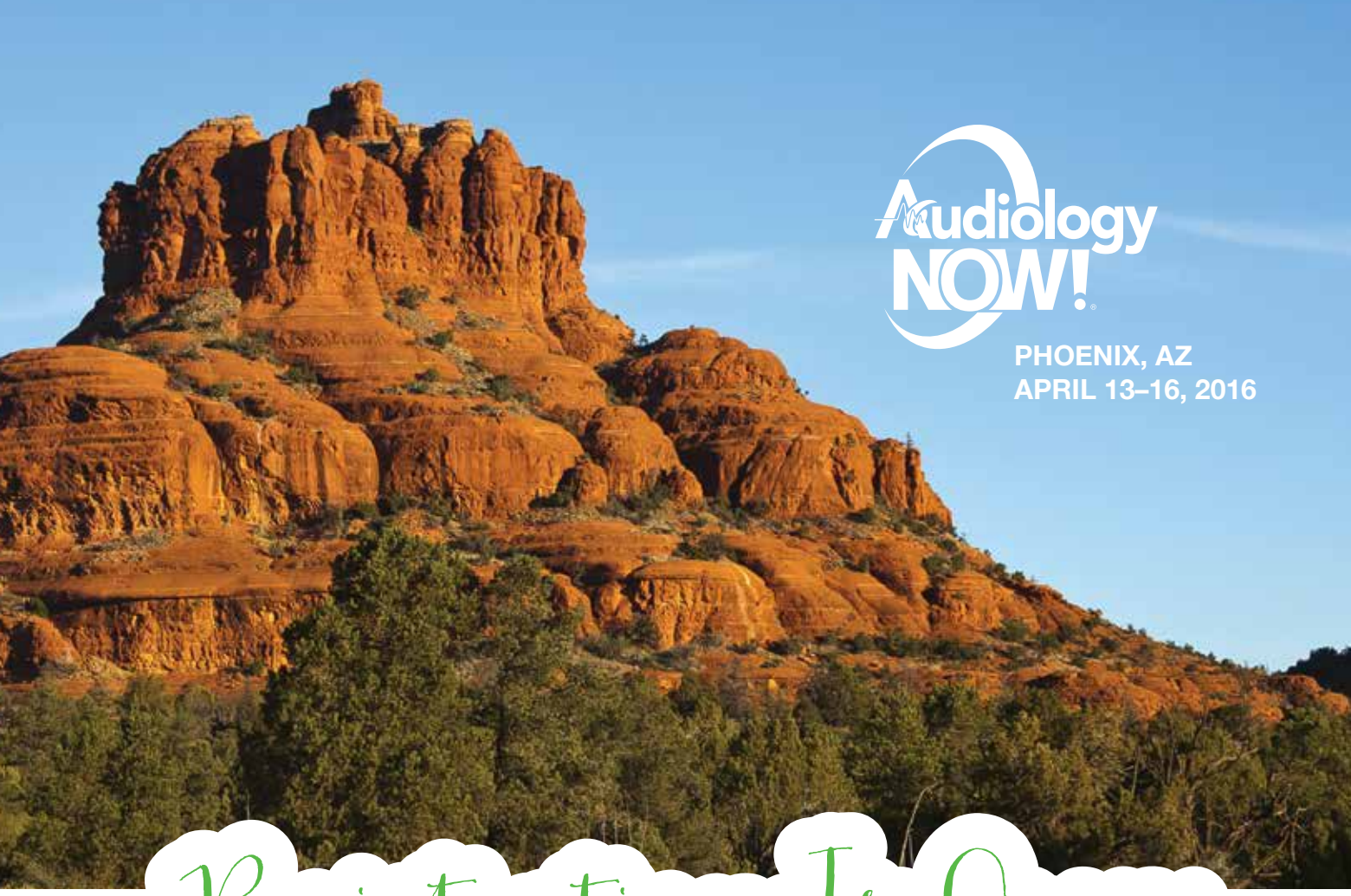

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Academy Elections and ICD-10 Transition

On Maui, the smell of pumpkin spice latte

at my local Starbucks signals that the season is about to change. If you are fortunate to live in the continental United States, many of you can witness firsthand the changing leaves signaling that fall is here for a brief time before winter begins.

This is also the time of year when the Academy's Nominations Committee begins the process of vetting candidates for president-elect and for three positions on our Board of Directors. Those new directors replace the three board members completing their tenure in June 2016. This year, the Nominations Committee will implement a rubric to vet candidates according to the current governance structure of the Academy. Candidates will be announced in the March/April issue of *Audiology Today*, and members will be able to meet the candidates at AudiologyNOW!® 2016, April 13–16, in Phoenix, Arizona.

In a procedural change to accommodate the revised vetting process and to allow adequate time for candidates to provide all required information to the Nominations Committee, voting will begin following AudiologyNOW! 2016, and will close 30 days afterward. Announcement of the president-elect and the new board members will be made on the Academy Web site in late May and in *Audiology Today* in the July/August issue.

I also want to highlight some of the resources that our Coding and Reimbursement Committee (CRC) prepared to assist our members with the ICD-10 transition that occurred on October 1. If you search key word "ICD-10" you will find dedicated information regarding this transition, including an editable superbill template. CRC members also provided valuable ICD-10 coding guidance in their article that appeared in the last issue of *Audiology Today*. I hope many of you were able to take advantage of the eAudiology Web seminar on ICD-10 presented by Deb Abel. This Web seminar is still available on demand in case you missed it.

The Coding and Reimbursement Committee also established a dedicated e-mail address (reimbursement@audiology.org), where members can submit questions regarding coding, reimbursement, and compliance issues, including ICD-10. Our CRC experts monitor this e-mail address and are prepared to answer member questions and concerns.

I want to call your attention to another eAudiology Web Seminar, Medicare Payment Changes and Updates to Quality Reporting: What to Expect in 2016, presented by the Academy's health-care consultant from ADVI, Michael Beebe. Mr. Beebe has been working with the Academy's Practice Policy Advisory Council (PPAC), and has been instrumental in providing guidance to the Academy on Medicare policy, as well as with regard to the American Medical Association (AMA) RUC and CPT processes.

At this time of year and as we celebrate the holidays and remember things we are thankful for, I am thankful to be part of the largest organization of audiologists in the world. Thank you to our members for your support and participation. Together we are able to achieve positive things for our profession and those we serve. Happy Holidays!

Larry Eng, AuD

Larry Eng, AuD
Board Certified in Audiology
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They Say "I Can't Hear in Noise," We Say "Say the Word Base"

To: David Fabry, PhD, Content Editor, *Audiology Today*, and George Lindley, PhD, AuD

In his article, "They Say 'I Can't Hear in Noise,' We Say 'Say the Word Base'" (*Audiology Today*, July/August 2015, pages 44–49), George Lindley, PhD, AuD, provided a succinct description of the problems encountered by the majority of persons with hearing impairment—loss of audibility and difficulty understanding speech-in-noise or adverse listening conditions. He made a case for clinical assessment of speech-in-noise (SIN), as it is not well predicted from speech-in-quiet test scores. There is ample evidence that many hearing-impaired persons perform normally on unaided monosyllabic word tests in quiet but very abnormally when the same materials are presented in noise (e.g., Mueller et al, 2014; Wilson, 2011). Lindley proposed that routine SIN testing will help in counseling prospective hearing aid wearers toward realistic expectations. He also suggested that SIN test results will be helpful in circuit selection or the recommendation of assistive listening devices (ALDs).

There is little argument that real-world communication in adverse listening conditions is a major complaint of hearing-impaired persons and a frequent limitation of hearing aid benefit (Kochkin, 2000, 2010). Beck and Repovsch (2013) suggested that SIN testing is the most important functional test we can perform because it addresses the primary reason that patients seek care. However, it does not follow that clinical SIN testing is either representative of daily communicative function or predictive of that ability with hearing aids. I offer the following thoughts.

1. There are many SIN tests that are sufficiently taxing to hearing-impaired persons to diminish performance and increase the variability relative to word-recognition tests in quiet (e.g., Wilson, McArdle and Smith, 2007; Mueller et al, 2010). The large sample (n=3430) of Wilson (2011) is particularly enlightening with regard to the issue of hearing-impaired persons achieving normal scores on speech-in-quiet tests with abnormal performance on the WIN test. Over 90 percent of the participants had abnormal performance on the WIN test. Of that group, nearly 70 percent had good to excellent scores on the NU-6 in quiet. I agree with Lindley that pre-fitting SIN testing may more clearly define the communication difficulties and be beneficial in shaping patient expectations. Wilson (2011) referred to SIN tasks as the "stress test" for auditory function.

2. My disagreement concerns the other ways in which Lindley (2015) recommends using the SIN test results. He stated, "speech-in-noise test results can be considered when making technology recommendations, along with lifestyle needs, and budget (p. 46)." He continued by proposing that a patient with very good SIN test scores may perform well with hearing aids having modest processing capabilities while another patient with very poor SIN test scores should have a recommendation for a much more sophisticated processor or an ALD.

   Similar suggestions have been made by others (Mueller et al, 2010, 2014). However, research verifying the expected relationship among pre-fitting SIN test results, different levels of technology for improving SNR

and subjective outcomes are not supportive of this application. Walden and Walden (2004) did not find a predictive relationship between most pre-fitting measures and two post-fitting outcome measures. The small but significant correlation they found between the QuickSIN and the SADL and HAUS was largely explained by age. Killion and Gudmundsen (2005) completed a meta-analysis searching for the aforementioned predictive relationship. While they initially identified 300 potential articles, only five met their requirements for inclusion. The only significant finding came from the Walden and Walden study noted earlier.

In the 608-page second edition of *Hearing Aids*, which included 1975 references, Dillon (2012) devoted a scant four paragraphs and one reference to the use of speech identification ability in quiet or noise as a method of determining hearing aid candidacy. He stated that predicting the ability of hearing-impaired persons to improve communication in typical situations is a "very daunting task (p. 263)." Subsequently, he minimized the benefit of using SIN testing for selecting features such as directional microphones. "However, every person with a hearing loss has trouble understanding speech when the SNR is sufficiently poor. Indeed, so does every person with normal hearing (p.344)." Although Mueller et al (2014) provided an extensive review of SIN tests, their discussion of using test results for circuit selection seems more reflective of their vast clinical experience than on a body of supporting literature.

More advanced technology does not always yield the anticipated improvement. For example, the APHAB normative data was updated due to expected changes in outcomes with improved technology (Johnson et al, 2010). Surprisingly, the data for WDRC hearing aids and associated digital processing (circa 2005) were not significantly different from the original norms with linear analog hearing aids (circa 1995) for hearing in quiet or noise. Other recent research did not confirm conventional wisdom related to binaural amplification (Cox et al, 2011a) or providing amplification to "dead regions" (Cox et al, 2011b). While these studies looked at very different topics, they all provide examples when expected outcomes were not substantiated by research. Clinical decisions must often be made for use of new technology before there is conclusive research. However, these situations should stimulate investigation, and not be perpetuated as best practices.

3. Lindley (2015) proposed a clinical procedure for SIN testing while the patient is fitted with stock hearing aids, programmed using manufacturer protocols but without real-ear verification. It is well known that the audibility with manufacturer settings may be considerably different than prescribed by generic prescriptive models (Hawkins and Cook, 2003; Sanders et al, 2015). While this may give the individual the sense of amplification, it may not be a very accurate sense. Also, if the intention is to use this pre-fitting measure to identify desirable circuitry to compensate for SNR loss, it seems that the testing situation should actually incorporate directional microphones or other SNR improving technology. However, as noted by Dillon (2012), results obtained in this manner would be specific only to similar conditions. It is exceedingly difficult to simulate a range of real-world conditions in the clinic. Despite collecting data using this method from 48 actual clinic patients, Lindley (2015) did not provide post-fitting outcome data to validate this procedure.

4. Finally, Lindley (2015) stated that patients "are often more open to trying assistive technology out of the gate, as opposed to waiting until failing with hearing aids alone (p. 49)." That is a very bleak forecast. It concerns me that a new hearing aid candidate, who has likely waited five to seven years to seek help, may be directed to an ALD on the basis of a five-minute SIN evaluation without some extended trial period with hearing aids. Most of my patients are expecting a simple and discreet device and will not accept a recommendation for ALDs unless they have experienced some level of failure with conventional hearing aids. Fortunately, many of my patients actually do better with their new hearing aids than I anticipate. Yes, the most frequent complaint of hearing-impaired persons in our practice is hearing in noise. However, for many, their subjective comments and their data logs indicate that significant background noise is present during a rather small part of their day. Providing effective audibility, as evidenced by an aided SII or close match to generic prescriptive targets, along with counseling, follow-up care and acclimatization will result in very good outcomes for the majority of patients.

Our own outcome data on over 500 patients, fit with all levels of technology verified to NAL-NL1 or -NL2 prescriptive targets, indicated that over 95 percent are full-time wearers and reported improved quality of life. Not surprisingly, we also found that nearly all of them reported better hearing in quiet than in noise. We found similar complaints among groups fit with basic to complex technology. Yet, most reported improved hearing in noise relative to their pre-fitting experience. As we review outcome survey data two to three months post fitting, we contact patients evidencing unsatisfactory outcomes. At this time, (or at an earlier follow-up visit when things are going poorly), there is solid evidence of benefit/satisfaction with the selected technology. Alternative fittings and ALDs can then be incorporated as indicated. With all the variability that exists in testing methods, devices and patients themselves, I can't imagine making these types of decisions on the basis of a pre-fitting test.

Improved hearing in noise is an important goal for most patients. Certainly, having a pre-fitting SIN test that reliably indicates the "best" circuitry for a patient would be a welcome addition to our tool kits. Perhaps a study incorporating outcome measures will demonstrate the efficacy of the Lindley procedure. However, at this time the evidence does not support this or any other SIN procedure as best practice for circuit selection. Killion and Gudmundsen (2005) put this situation in perspective when they concluded, "Despite what many of us believe to be true and recommend to our students and colleagues, we found little evidence to support the hypothesis that there is a significant correlation between self-reported satisfaction with hearing aids and pre-fitting speech measures (p. 445)."

John E. Tecca, PhD
Audiologist/Owner Hearing Services and Systems, Portage, Michigan, and Adjunct Professor of Audiology, Western Michigan University in Kalamazoo, Michigan

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Dear *Audiology Today,*

I would like to thank Dr. Tecca for his insightful comments regarding my recent article, "They Say 'I Can't Hear in Noise,' We Say 'Say the Word Base.'" I would like to take this opportunity to address several of Dr. Tecca's points.

Dr. Tecca expressed concern regarding my proposed use of SIN results in the hearing aid selection process. His concern primarily focused on a lack of research validating the relationship between pre-fitting SIN results, technology level, and subjective outcome measures. I agree there is little empirical data in this regard, especially using more modern technology. Dr. Tecca further stated, "Clinical decisions must often be made for use of new technology before there is conclusive research. However, these situations should stimulate investigation, not be perpetuated as best practices."

Following this logic, most of the best practices recommended in the selection and fitting of hearing aids should not be employed. A quick PubMed search on the topic "real-ear measures and hearing aid satisfaction" yielded no articles. The few studies evaluating collection of loudness discomfort levels in relation to hearing aid satisfaction showed little to no benefit of obtaining this measure. The usage of validated prescriptive strategies is recommended over manufacturer proprietary algorithms, yet no studies exist comparing the relative outcome in large groups of patients fitted to one or the other.

Given the lack of evidence for much of what we do, I believe clinicians should instead ask: "Does the potential benefit of conducting measure X outweigh the cost (e.g., time, equipment, etc.)?" From that viewpoint, measurement of SIN functioning would appear to be a justified practice. Given the conceded degree of variability in speech-in-noise understanding, both aided and unaided, in individuals with hearing loss, there is excellent face validity for conducting SIN testing. There are a number of ways this measure could be used and I presented one approach. No, there is not a perfect relationship between SIN measures and outcomes. The same can be said for real-ear measures. Matching a prescription perfectly may yield a great outcome for one patient, while in another significant deviations are needed. This does not mean the measure or the prescription is invalid. Rather, it shows that each patient is different. We do not know all there is to know, and we need to use all of the tools at our disposal to facilitate our best clinical judgment.

I proposed that knowing Patient A performs normally on a speech in noise task while Patient B has a severe SNR deficit added valuable information that allows the audiologist to make better recommendations and counsel more effectively. At several points in his letter, Dr. Tecca appeared to imply that I make technology recommendations based solely on the SIN results. This is certainly not the message I intended to convey. Rather, I proposed the SIN results be considered as one of many factors.

Dr. Tecca addressed several issues regarding the proposed SIN protocol. He expressed concern regarding the use of stock hearing aids fitted using the manufacturer's algorithm without documentation of audibility. This is a valid concern and in my experience, "first fit" audibility varies significantly from manufacturer to manufacturer. As part of our hearing aid fitting protocol, all hearings aids are pre-fitted in the test box prior to the actual fitting when real-ear measures are then conducted. This allows us to be in the ballpark on the day of the fitting and discover potential device issues in advance. As a result of the numerous test box measures, we know which manufacturers provide significant/sufficient audibility at default settings and use these when obtaining the pre-fitting SIN measures. This protocol does not account for patient related variability although this is typically much less than manufacturer related differences. This aspect of the protocol should have been described in greater detail.

Another concern expressed by Dr. Tecca was the presentation of the speech-and-noise from 0 degrees azimuth, thus negating the potential impact of directionality in the hearing aids. He further described the difficulty of simulating real-world conditions in the clinic. On this point, I am in complete agreement. It is difficult, if not impossible, to simulate dynamic real-world listening conditions in a typical clinical environment. My goal in conducting SIN measures is to see how the patient performs in relation to individuals with normal hearing. It is the size of the deficit that I find to be a useful piece of data that is then included in the counseling and decision-making process.

Dr. Tecca expressed concern that a new hearing aid candidate may be directed to an ALD on the "basis of a five-minute SIN evaluation without some extended trial period with hearing aids." In re-reading my article, I am not sure how Dr. Tecca came to this conclusion. I proposed that SIN scores be considered among other factors. How big a role this particular measure plays in the decision-making process will depend on the patient. One important consideration is lifestyle/listening needs. If the primary goals identified by the patient relate to TV, phone, and conversation with only one to two people in relatively quiet environments, the SIN results may be less relevant. For the patient with high listening demands (and high expectations), SIN results may take on a higher priority. Whether one introduces the concept of wireless accessories early in the process or after the trial is a matter of personal preference.

Like Dr. Tecca, I have found most of my patients do well with their hearing aids: better in quiet, less so in noise. Benefit can be seen with lower and higher end technology. But our goal should be to maximize their benefit. Going back to the real-ear analogy, even at non-verified, "first fit" hearing aid settings, most patients will hear better. But are they hearing the best they can? Real-ear measures assist in addressing that question and facilitate clinical judgment. I feel SIN measures can play a similar role when included in the fitting process.

Dr. Tecca ended his letter with a quote from Killion and Gudmundsen (2005) regarding the lack of correlation between pre-fitting speech measures and hearing aid satisfaction. As noted by Dr. Tecca, in the Killion and Gudmundsen meta-analysis, only five studies met inclusion requirements. Of these five, only two included an aided pre-fitting measure and only one used the QuickSin (Walden and Walden, 2004) similar to the protocol I described. Interestingly, this study is the one that showed a relationship between an aided SIN measure and hearing aid satisfaction. It is also important to note that in that study, published over 10 years ago, all of the subjects were older males, 58 percent of the participants were fitted with omnidirectional hearing aids, and 62 percent of the fittings used analog technology. None of the hearing aids had automatic/adaptive directionality. The results and conclusions from this excellent study cannot be extended to today's technology and the clinical population of a private practice.

I believe Dr. Tecca and I would agree that there is little empirical data for or against the use of SIN testing as a pre-fitting measure. The disagreement lies in the impact of this deficiency on daily practice. If one gives the existing body of research on hearing aid fitting protocols an honest appraisal, the quote ascribed to pre-fitting speech measures could easily apply to much of what we do. This does not necessarily mean our protocols are invalid, rather there is limited empirical data, to date, to support our anecdotal experiences. This should not serve as an excuse for ignoring best practice guidelines or summarily dismissing new proposals but rather a call to action.

I hope, as a field, we will continue to research fitting approaches and technologies that will allow us to best meet our patients' needs. Until then, I'll perform aided SIN testing, skip the LDLs, and keep conducting real-ear measures until the evidence suggests otherwise.

George Lindley, PhD, AuD
Assistant Professor, George Osborne College of Audiology at Salus University, and Practice Owner in Emmaus, Pennsylvania

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Assessment Based On Patient-Reported Problems

Speech-in-Noise Testing

By Lindsey E. Jorgensen and Jessica J. Messersmith

The standard of care are those practices within the clinical setting that should be completed. In audiology, examples include otoscopy and air conduction threshold testing. However, there are other assessments that should be part of our clinical practice to ensure comprehensive evaluation of hearing status. As audiologists, we not only diagnose hearing and balance disorders: we develop treatment plans for these disorders. To equip ourselves to do so, we must provide care that moves beyond a minimum step-by-step protocol, prescribing a piece of technology based upon the results of the minimum protocol, and sending the patient out the door. As a doctoring profession, we must provide personalized care to our patients through the selection and development of individualized evaluation, treatment, and care plans. There are innumerable objective and subjective assessments that could be employed in the audiology clinic to evaluate different aspects of an individual's auditory performance. While minimum protocols play an important role in the clinical setting, the minimum protocol is not likely to provide a complete picture of the auditory performance of every individual. Inclusion of assessments beyond the minimum protocol allows for the discovery of more precise information about our patients' hearing statuses, which is critical to providing high-quality care. Selection of additional assessments can be enhanced by listening to our patients' concerns, and health and medical histories. Tailoring our test battery to the unique needs of the patients demonstrates the rehabilitative nature of our profession. Further, individualization of our test battery and resultant treatment plan ensures that the patients remain at the center of care, highlighting their role as

partners in their journey toward communication competence.

As previously stated, there are numerous assessments available that can provide very valuable information about an individual's auditory performance. It could be argued that any of these tests should be completed with all patients. However, as clinicians, we know that time restraints and patient willingness preclude this all-inclusive approach. In practical clinical situations, where only a limited number of assessments can be performed, a thorough case history and discussion with the patient about their concerns and desires prior to testing can help direct the decision process of what testing should be completed. Across the majority of patients with hearing loss, one situation continues to arise as a priority for our patients—the ability to hear in the presence of background noise.

Since the birth of the profession of audiology, it has been shown that the most common problem reported by persons with hearing loss and those who use assistive technology is the ability to hear speech in noise (Hirsh, 1950; Carhart and Tillman, 1970; Dubno et al, 1984; Wilson et al, 2003). In 1970, Carhart and Tillman reported that those speech-in-noise situations that are just slightly annoying for those with normal hearing are disproportionately difficulty for those with hearing loss. Throughout the literature, researchers and clinicians have been urging practitioners to implement speech-in-noise testing for appropriate assessment of communication difficulty in terms of word recognition ability in the presence of competing speech. In the July/August issue of *Audiology Today*, George Lindley (2015) reported on his clinical findings of completing speech-in-noise testing. Just as previous clinicians and researchers have reported, Lindley suggested that the information gained through speech-in-noise testing provided him invaluable information about his patients' needs. It could be argued that he was not only getting important information about the patients' speech perception performance, he was also validating the patients' concerns which can build rapport by demonstrating that we are listening and understanding their specific concerns.

Evidence from published research has repeatedly shown that word recognition testing in quiet does not accurately predict performance in real-world settings. For example, Walden and Walden (2004) suggested that patient performance on speech-in-quiet testing only predicted half of the variability on a test of speech-in-noise ability. This suggests that for half of the patients, speech-in-quiet testing was not an accurate predictor for speech-in-noise performance. Furthermore, speech-in-quiet testing has little relationship with patient-reported satisfaction with their hearing assistive technology (Wilson et al, 2003). Trying to infer speech-in-noise ability through patient reports and performance on standard word recognition measurements in quiet does not provide adequate footing for a comprehensive care plan. Additionally, as the patient's primary complaint when coming into the clinic is likely to be understanding speech-in-noise, not assessing it is a disservice to our audiologic practices.

Several surveys of audiologists have reported that less than half of audiologists and hearing instrument dispensers include a speech-in-noise test in their clinical protocol (Martin et al, 1998; Mueller 2003; Lindley 2006; Strom 2003). Although the most recent of these surveys was completed nearly a decade ago, anecdotal evidence suggests little has changed since then. So why are clinicians not including speech-in-noise?

Several possible factors have emerged. Most prominently, audiologists report that they don't have time to complete such testing. Unfortunately, the validity of this concern is questionable given that many speech-in-noise measures require minimal time: about five minutes in many cases. These brief tests provide invaluable information about our patients that will help us meet their needs. The time it takes to administer the measure, explain the results, and integrate results into establishment of appropriate expectations is likely to be saved through a refinement in the treatment plan and resultant reduction in the number of return visits. In those cases where time restraints do not allow for an additional five-minute measure, there are other tests that audiologists typically perform that could be excluded if case history and other aspects of the test battery deem unnecessary (e.g., tympanometry in those cases with no middle ear or conductive hearing loss concerns). Selection of the assessments included in the test battery should follow the patients' needs and address their concerns; this in turn will improve the patients' perception of the clinician and the practice.

This leads directly into a second possible objection to completing speech-in-noise testing: reimbursement. Audiologists could be resistant to include tests that are not currently listed as reimbursable. Some current procedural terminology (CPT) guidelines suggest that the CPT code 92626 (evaluation of auditory rehabilitation status) could be used for speech-in-noise testing, but many insurance companies do not reimburse for this service, or require copious

documentation. While reimbursement is necessary to maintain the viability of a practice, it is also necessary for patients to feel valued thus increasing the likelihood of referring others to the practice. The benefit of improving the long-term practice viability and community perception is arguably worth more than the five minutes needed to complete a speech-in-noise measure.

A third possible opposition to completing speech-in-noise testing is that some audiologists may not have access to the proper equipment and materials to complete this type of testing. For example, word/sentence lists for speech-in-noise testing may not be included on all audiometers with built-in word lists requiring external input from a CD or other media and the speech-in-noise assessment itself. The purchase of some of these speech-in-noise tests can be a large financial investment. While there are many validated speech-in-noise testing materials available for purchase (e.g., QuickSIN, BKB-SIN, etc), the words-in-noise (WIN) test is available on the CDs available from the Veterans Affairs Auditory and Vestibular Research Laboratory. These CDs are available on the Department of Defense Hearing Center for Excellence Web site. As such, there are means for obtaining speech-in-noise measures that are inexpensive and long lasting.

Some opponents state that the testing does not provide useful information. If the testing is completed appropriately, there are several aspects of the treatment plan where a speech-in-noise measurement is useful. The ability to understand speech-in-noise can be used as a pre-fitting measurement to determine appropriateness of technology. A poor score on a speech-in-noise test could demonstrate the need for additional technology such as a remote microphone or FM system. As we all know, audiologists have more hearing assistive technology available to them than just hearing aids. While some will state that patients don't want to spend more money on more technology, patients should be given the option and allowed to make their own decisions regarding additional technology to assist them in achieving their communication goals. In addition, results from speech-in-noise testing can be used as a counseling tool to establish realistic expectations. Our job as audiologists is to work with our patients to develop personalized care plans, through which we must provide all appropriate care options so they may make informed decisions. Speech-in-noise testing provides guidance for setting appropriate expectations and, in the end, is likely to enhance patient satisfaction.

Finally, some audiologists may fear that performing speech-in-noise testing will increase their need for referrals to other facilities for technology, such as a cochlear implant. With the expanding candidacy criteria for traditional cochlear implants and with the approval of the hybrid cochlear implant, non-implant audiologists may fear that they are going to lose their patients to the cochlear implant audiologists/centers. This viewpoint is where audiologists need to think collaboratively and keep their patients' needs and best interests at the center of the care plan.

Our patients rely on us to provide appropriate information and adequate testing to meet their needs. Our goal is to provide quality patient care while effectively using our time. Many believe that adding more assessments to our test battery will decrease productivity and thus reduce the viability of the practice. While it is important to be diligent in our time management, it is also important to connect with our patients. It is a matter of ethics that we provide the best care to our patients. They have the right to expect it from all medical professionals. Listening to our patients ensures they will return their business to our practice. Think of this part of your marketing plan. Patient retention requires listening to the needs, and addressing the specific concerns, of each individual. As speech-in-noise ability is likely decreased in someone with sensorineural hearing loss, a test assessing the status of the patients' ability in these situations should be routinely completed.

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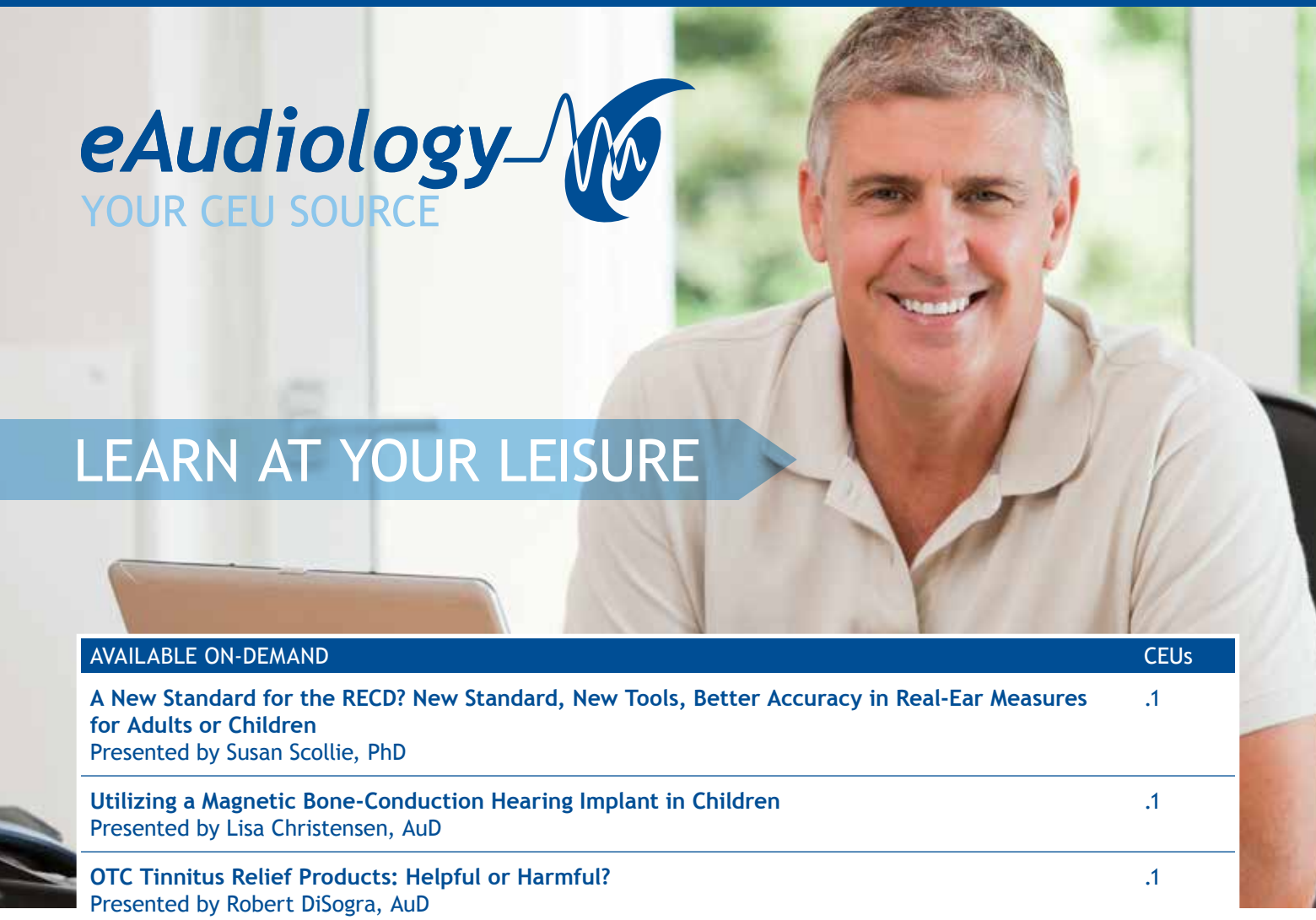

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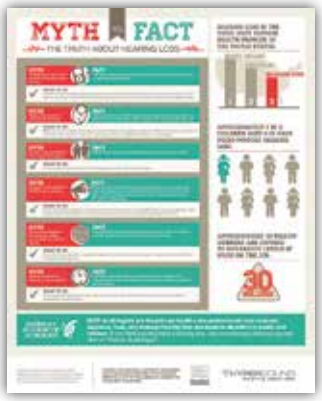

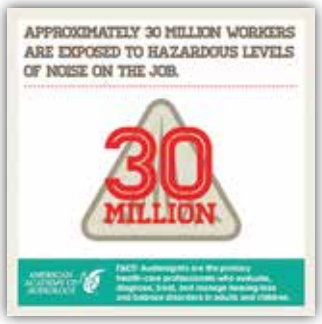

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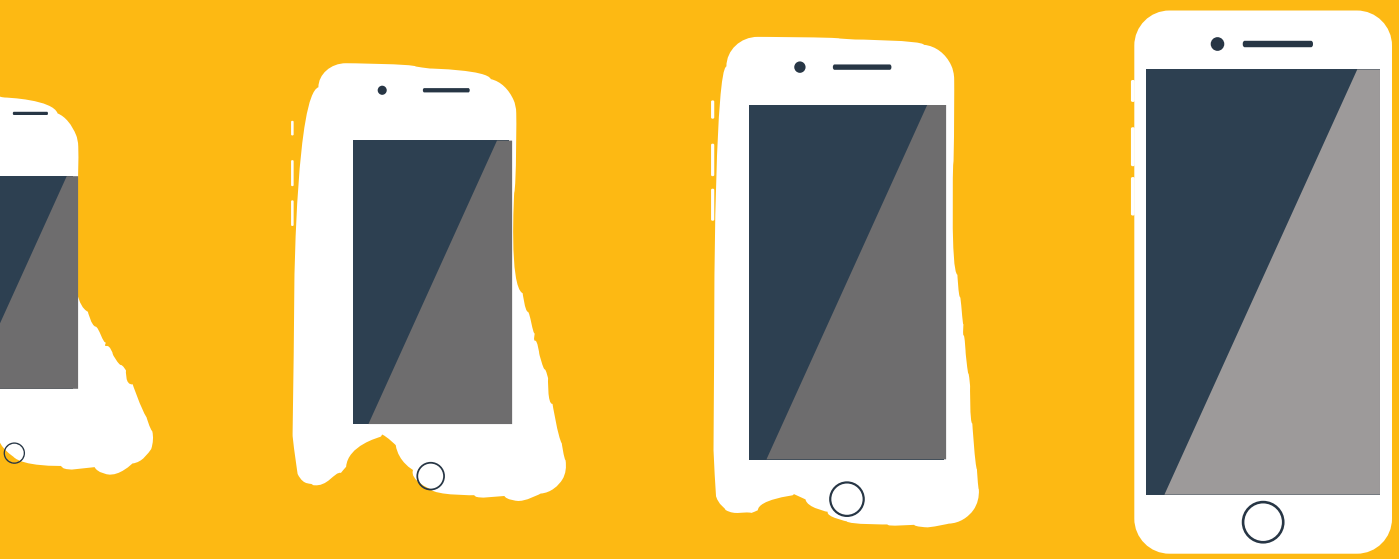
HEARABLES

TODAY, CUSTOMIZABLE MEDICAL DEVICES AND COOL, GADGET-LIKE CONSUMER ELECTRONICS MERGE TO SERVE A MUCH WIDER AUDIENCE WITH CHOICES BEYOND TRADITIONAL HEARING AIDS.

BY BRIAN TAYLOR

THE MORPHING OF HEARING AIDS + CONSUMER ELECTRONIC DEVICES



For decades, audiologists, along with hearing instrument specialists, have served as the gatekeepers of the hearing aid dispensing process. Historically, during this process the flow of information went from audiologist to patient. In essence, audiologists controlled the content of the patient-clinician dialogue and its associated treatment and remediation options, while the patient was the passive recipient of this information. Today, however, mainly due to the rise of smarter, cheaper, faster, and more portable computer processing power, the flow of information has fundamentally shifted. Patients, many of which have a strong desire to be directly involved in the entire decision-making process, now control the flow of information (Topal, 2015). As this article will demonstrate, the shifting relationship between patient and clinician has profound implications for audiologists and may lead to the distribution of new product categories, such as hearables, in our clinics. The central challenge for audiologists will be how they incorporate hearables into their clinical practice without compromising the quality of care or sustainability of their business.

Propelled by Moore's law, incrementally improving

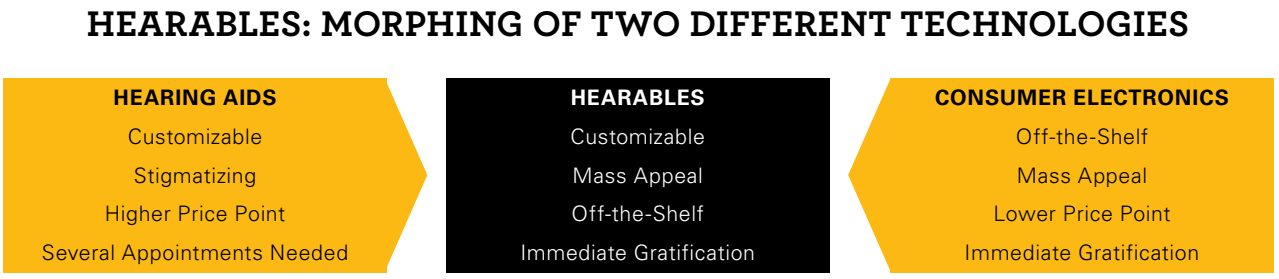


FIGURE 1. Some of the key attributes of hearing aids and consumer electronics morph to create a new product category called hearables.

HEARABLES REPRESENT AN OPPORTUNITY FOR AUDIOLOGISTS TO OFFER THEIR PATIENTS AN ALTERNATIVE OR COMPLEMENT TO TRADITIONAL HEARING AIDS.

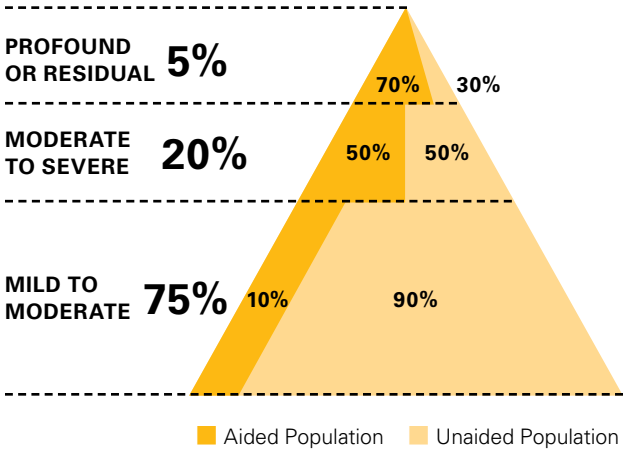


FIGURE 2. Hearing aid uptake segmented by degree of hearing loss (Nash, 2013; Lin, 2011; Wallhagen and Pettengill, 2008).

computer-based technology is leading to the merging of medical devices and consumer electronics. This convergence of technologies is spawning an assortment of hybrid products that can be best classified as hearables. Several of the key attributes of medical devices, such as customizability or programmability, can be readily incorporated into off-the-shelf consumer electronics. Simultaneously, several of the qualities found in consumer electronics that make them stylish, accessible, and cool can be incorporated into the once stodgy medical device.

Although the roles in the patient-provider relationship may be shifting, it is the merging of divergent technologies, shown in FIGURE 1, that has the potential to expand the role of audiology. Consumers with communication difficulties are likely to demand a wider range of treatment options *and* express a desire to actively participate in their selection process. The opportunity to reach an untapped part of the market requires audiologists to embrace emerging technologies used to treat and manage hearing loss. As most audiologists know,

air conduction hearing aids, classified by the Food and Drug Administration as Class I medical devices, must be dispensed through the professional channel. Several appointments are often needed to select, fit, and fine tune them. Additionally, hearing aids continue to have a stigmatizing factor that likely results in many patients avoiding them until their hearing loss is more severe and complex (Wallhagen, 2010). However, consumer electronic devices are readily available and have mass appeal because they are associated with leisure activities, such as listening to music, video gaming, or watching television. Hearables represent an opportunity for audiologists to offer their patients an alternative or complement to traditional hearing aids. To fully realize the potential of hearables without cannibalizing the existing demand for traditional hearing aids, audiologists would be wise to explore ways to expand their role in the delivery and use of hearables.

Hearables will not replace hearing aids, but have the potential to expand the market for audiology services. As shown in FIGURE 2, when hearing aid use is segmented by degree of hearing loss, there are two distinctly different markets. Individuals with moderately severe-to-profound hearing loss comprise approximately 25 percent of the market and more than half of this group possess hearing aids, while 75 percent of the hearing-impaired population have a mild-to-high frequency moderate hearing loss. Historically, our industry has served the top 25 percent of patients in FIGURE 2. These are individuals, typically older in age, often with more complex problems, usually

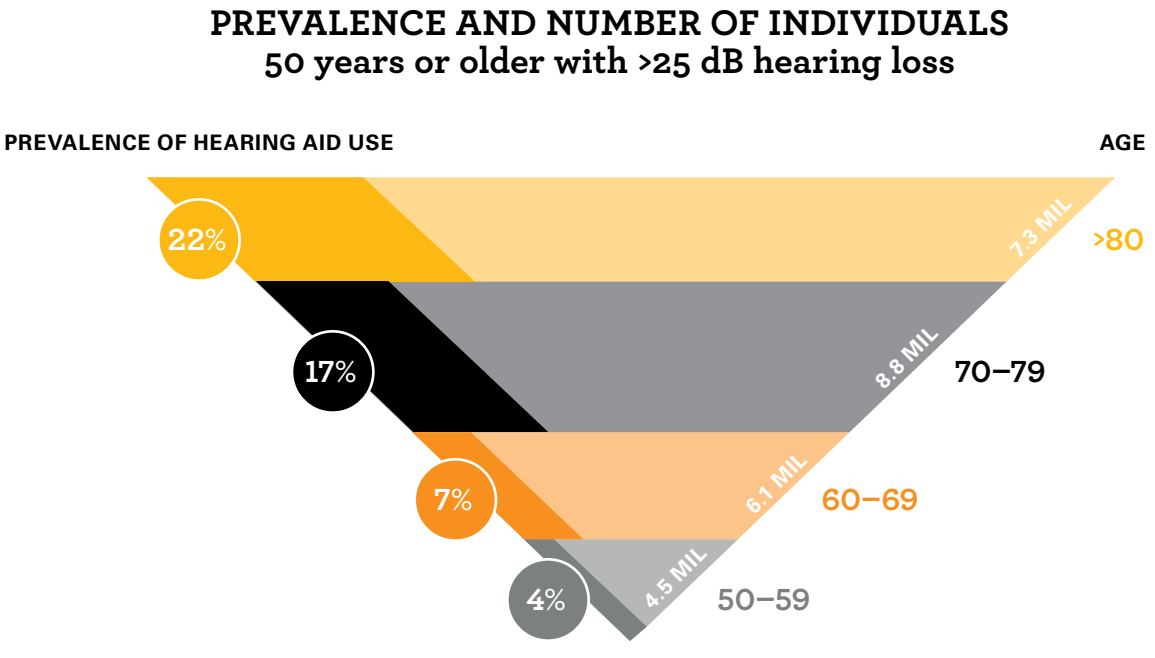


FIGURE 3. Hearing aid prevalence as a function of age (Chien and Lin, 2012).

HEARABLE OPTIONS

On the continuum between traditional hearing aids and consumer electronic devices, there are a range of products that can be classified as hearables. Each has a distinct feature set that may be beneficial and appealing to patients.

Made for iPhone Hearing Aids

Currently, Starkey and Resound make devices that integrate with the iPhone and Apple Watch, essentially turning their hearing aids into fashionable accessories. Patients can not only adjust their hearing aids with their smartphone or watch, but the smartphone can be used as a companion microphone, thus improving performance of the hearing aids in noisy or reverberant listening situations.

Personal Sound Amplification Products

There are dozens of personal sound amplification products (PSAPs). Although there are a range of style options, some with an appearance similar to Bluetooth headsets and others looking more like large, in-the-ear hearing aids, PSAPs are essentially de-featured hearing aids. Considering their off-the-shelf availability and one-size-fits-all feature set, high quality PSAPs may serve as a "starter device" for individuals with less complex hearing loss. Sound World Solutions, SoundHawk, and Etymotic Research's Bean appear to be three of the more high quality (smooth, broadband-frequency response) PSAPs available today, according to anecdotal reports.

Smartphone-Based Amplification Apps

Considering the stigma associated with hearing aids, PSAPs, which to the unassuming eye look an awful lot like traditional hearing aids, may suffer the same fate. After all, if it looks like a hearing aid, it must be a hearing aid. Smartphone applications, many of which can be downloaded for free, essentially turn your smartphone into a body aid when it is paired with earbuds of wireless ear phones. One study suggests that when amplification apps are fine-tuned by the audiologist, they offer some of the same performance benefits as an entry-level hearing aid (Amlani et al, 2013). Additionally, smartphone-based apps have the ability to increase patient self-confidence and reduce stigma. Recently, Amlani (2015) measured greater self-referral and hearing aid adoption in a group of older adults who completed a self-administered smartphone app-driven hearing screening, compared to a matched group who underwent a traditional face-to-face hearing screening. According to the author, this finding has the potential to halve the 6- to 12-year waiting period experienced by many individuals with hearing difficulty.

Wearable Augmented Reality

Combining amplification apps with stylish earbuds, wirelessly paired to a smartphone, wearable augmented reality devices allow individuals to customize their entire daily listening experience. Using the smartphone, individuals can reduce background noise on the street or subway, listen to their favorite music or amplify voices at the table of a crowded restaurant. True lifestyle integration seems to be goal of wearable augmented reality devices. Recently, two start-up companies Eargo ($13.6 million) and Doppler Labs ($17 million) have invested substantial sums of money into the development of ear-worn devices that provide augmented content through a smartphone.

Directed Audio Solutions

Using ultrasonic transmission to create a narrow column of sound in the air over a distance of several feet, directed audio solutions allow individuals to watch television or listen to music without the need of any ear-worn devices or accessories. One example of a directed audio system (e.g., Hypersound) uses NOAH-compatible software to program and fine tune home media audio across multiple channels. With a frequency response beyond 12,000 Hz, Hypersound may be an alternative to traditional hearing aids or used in the combination with hearing aids or PSAPs to enhance the overall television listening experience.

requiring more time and expertise to manage. The successful outcome of the patients in the top 25 percent of FIGURE 2 is often predicated on multiple office visits over an extended period of time. However, those in the bottom 75 percent of the pyramid, where the vast majority of adults with hearing loss reside, are likely to have less complex hearing loss, and often do not require numerous appointments for hearing aid adjustments and counseling. It is this segment of the market, which does not value traditional hearing aids, and the way in which they are delivered, seemingly most open to the use of hearables.

It is not the degree of hearing loss per se, but the functional limitations of an aging auditory system that present opportunities for audiologists to intervene earlier using hearables. Many individuals with a slight hearing loss of up to 25 dB HL experience activity limitations and participation restrictions (Bess et al, 1991), yet 43 percent of patients with milder losses are given a "wait and re-test" approach (Kochkin, 2012). Furthermore, researchers are beginning to better understand the size of the population with self-reported communication difficulties, but no measurable hearing loss on the audiogram. Recently, Trembley et al (2015) reported that 12 percent of adults between the ages of 21 to 84 have hearing difficulties (HD) and normal hearing test results. Furthermore, Chai (2007) reported that 51 percent of adults 49 years of age or older report HD, with approximately half of this group having normal audiograms. Hannula et al (2011) suggested that 60 percent of adults between 54 to 66 have difficulty following conversations in noise (e.g., radio, television, restaurants) with many in this group presenting with normal hearing on the audiogram. Given the nature of self-reported communication difficulties among these groups, and their historical lack of hearing aid uptake, hearables would be a viable option for audiologists to explore when addressing the needs of this demographic.

Further opportunities for audiologists to expand their sphere of influence using hearables can be uncovered when hearing aid use is segmented by age. Chien and Lin (2012) used data from the National Health and Nutritional Examinations Surveys (NHANES), collected between 1999 and 2006, to examine the prevalence of hearing aid use among American adults aged 50 and older.

A summary of their data is shown in FIGURE 3. Chien and Lin (2012) estimated that 14.2 percent (3.8 million) individuals in the United State who are 50 years or older with hearing loss wear hearing aids. Note in FIGURE 3 that 22 percent of adults aged 80 and above with hearing loss use hearing aids, while 4.3 percent of individuals between the ages of 50 to 59 with hearing loss use them.

The data shown in FIGURE 3 reveals that the overall rate of hearing aid use is remarkably low, especially for adults younger than age 70. Younger individuals, often with milder degrees of hearing loss, are far less likely to use hearing aids even though a substantial number of them report communication challenges. According to the National Institute of Deafness and other Communication Disorders (2012), approximately 80 percent of men and 70 percent of woman have some degree of hearing loss before they reach the age of 60. This data is corroborated in a recent study by Stam et al (2014) who reported that the age group of 50 to 59 had the largest deterioration in speech recognition ability in noise over time. While attempts have been made to engage adults under the age of 60 who have hearing loss, to date, our industry has largely failed to make significant headway. Hearables may present an opportunity to address the communication needs of this population who seldom see an audiologist for services.

There are opportunities to incorporate hearables when working with the other end of the age spectrum: individuals aged 80 and older. Twenty-two percent of this group with hearing loss uses hearing aids. Even if we double the number of hearing aid users amongst the oldest cohort, we still have not managed to fit hearing aids on half of the age group that has the highest prevalence of hearing loss. When one considers all of the other co-morbidities affecting this group, such as dementia and other physical conditions that make it difficult to use hearing aids, it is easy to see the need for alternative treatment approaches, such as hearables, to more effectively meet the needs of a larger swath of patients in this age range. Salomen et al (2013) sampled 249 hearing aid users over the age of 70

TO FULLY REALIZE THE POTENTIAL OF HEARABLES WITHOUT CANNIBALIZING THE EXISTING DEMAND FOR TRADITIONAL HEARING AIDS, AUDIOLOGISTS WOULD BE WISE TO EXPLORE WAYS TO EXPAND THEIR ROLE IN THE DELIVERY AND USE OF HEARABLES.

and found that 55 percent used their hearing aids full time, 27 percent used them less than six hours per day, and 11 percent never used their hearing aids. Non-use of hearing aids increased with advancing age, as approximately 25 percent of 75- to 80-year-olds were non-users, while almost 50 percent of 85 years and older were not using their hearing aids. This finding suggests other cognitive and physical factors make the routine use of hearing aids difficult and necessitates audiologists search for alternatives to improve daily communication for this group.

Furthermore, according to data from the U.S. Bureau of Labor Statistics (2010), watching television was the most popular leisure activity among all adults aged 55 and older. Given the self-reported difficulties associated with television viewing by individuals with hearing loss (Kochkin, 2012), it is sensible for audiologists to address this common challenge by recommending hearables as an alternative for those not wanting to use traditional hearing aids.

The Evolving Role of Audiology

If consumers with hearing loss are going to demand that hearables are an option, then audiologists would be wise to adapt or modify their clinical repertoires to differentiate their professional skills and add value to the patient–provider relationship. Regardless of the technology available to individuals with hearing loss, there are at least three fundamental skills central to the provision of audiology services, as we move into a future sure to include several hearables. The ability to implement these three skills is largely predicated on our ability to engage a larger number of patients, especially individuals younger than 70 with milder hearing loss.

Personal Adjustment Counseling

Technology continues to evolve, but the underlying behaviors associated with age-related sensorineural hearing loss remain. Given the chronic nature of hearing loss of adult onset, which is often exacerbated by the aging process, the

ability to identify and move patients through the stages of change (see Laplante-Levesque, 2015, for a review) is a critical aspect of patient-centered care, regardless of the type of technology patients decide to use to remediate their handicapping condition. Motivational interviewing and personal adjustment counseling that promote behavior change need to become a core competency for all audiologists as we move into a new era of healthcare. Furthermore, the number of adults older than age 65 is expected to double over the next two decades. This phenomenon will place a premium on audiologist's ability to sort through issues related to hearing loss, cognitive decline, and aging, and foster strong relationships with other medical sub-specialties that work with aging adults.

Interactive Discussion and Demonstration

As the number of treatment and remediation options expand, and as individuals with hearing loss become more knowledgeable about these options, audiologists need to use more effective communication strategies. It is possible that providing patients with a broader range of treatment and remediation options may even improve overall treatment uptake. For example, when offered options "more than half of patients" with hearing loss will choose an alternative to hearing aids (Laplante-Levesque, 2012) . Thus it is imperative audiologists use things such as patient decision aids, participatory care guidelines, and patient-centered communication techniques to provide a deeper level of engagement. See Taylor and Weinstein (2015) for a summary of these skills. Additionally, as the number of hearable devices grows, audiologists may take a more active role in conducting demonstrations that allow patients to experience the potential benefits of hearables. This may require audiologists to re-evaluate their demonstration process and how they position various technology offerings. We could even see the rebirth of the antiquated assistive device center to an interactive sensory rehabilitation center.

Quality Control and Assessment of Outcomes

Regardless of the technology recommended to the patient, there are several essential acoustic parameters associated with use of any device that can be optimized by the audiologist. When any electro-acoustic device is coupled to a patient's ear, audiologists have the ability to ensure the gain, output, and frequency response are meeting some established performance standards (e.g., NAL-NL2 target). This includes the ability to verify that a device is meeting an independently validated prescriptive target using probe microphone measures. Hearables, including PSAPs can be evaluated using standard verification procedures (Xu et al, 2015). Verification procedures can be used for traditional hearing aids as well as off-the-shelf hearables to ensure they are working properly. The routine and systematic assessment of outcomes related to use of hearables can also be documented by audiologists. As our profession continues to collect data on both quality control and outcomes with respect to hearables, it would be prudent for audiologists to implement standardized assessment tools, such as the APHAB and COSI, to document real-world outcomes in their practices.

Conclusion

Fortunately, we live in an age where the morphing of customizable medical devices and cool, gadget-like consumer electronics allow us to provide hearing-impaired people, both 50-somethings and nonagenarians, choices beyond traditional hearing aids. It's up to forward-thinking audiologists to embrace them and understand how they fit into a clinic filled with patients who want to take a more active role in their care. This starts by carefully considering how hearables fit into the revenue-generating, bread-and-butter activities of hearing aid selection and fitting. The segmentation data clearly shows opportunities to grow the demand for our services if we can provide value to untapped markets. Putting this into action means we have to swim upstream against the inertia of traditional clinical offerings, public indifference

to the consequences of hearing loss of adult onset, and outdated reimbursement methods. It starts with our ability to implement patient-centered communication, participatory care, and shared decision-making in an era of converging technology. Ironically, it may be these basic human skills that offer audiologists our best chance of sustainability in the emerging age of hearables.

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REMEMBERING Raymond Carhart

BY JAMES JERGER

THE ACADEMY FOUNDER REMINISCES ON THE SIGNIFICANCE OF RAYMOND CARHART'S ACCOMPLISHMENTS IN THE FIELD OF AUDIOLOGY.

At the end of a long career in audiology, I often think about the many events and the individuals who have made the journey so interesting and worthwhile. Chief among them are memories of Raymond Carhart and the years I spent under his tutelage at Northwestern University.

Carhart and I overlapped paths at Northwestern for 11 years, from 1950 to 1961 (he as mentor, I as graduate student—then faculty colleague). During this period, we had many frank discussions about the fledgling profession he worked so assiduously to nourish and grow. Here are some of my thoughts, based on my memories and reflections, on the significance of Carhart's accomplishments, complemented, I am pleased to acknowledge, by recent phone conversations and subsequent correspondence with Ray's eldest son, Richard Carhart, professor emeritus of physics at the

University of Illinois at Chicago.

Raymond Theodore Carhart was born on March 28, 1912, in Mexico City. His father, Raymond Albert Carhart, was a Methodist missionary whose own father, Albert Elijah Carhart, was a temperance preacher. The latter penned a tome with the unique title, *How Booze Was Beaten in a Midwestern State: A Partial Biography*. Foreshadowing a life of bold accomplishment, young Raymond, at the age of 18, hitched a ride on a chicken truck to reach the United States and enroll at Dakota Wesleyan University (founded in 1885 by the Methodist church) in Mitchell, South Dakota. Then, with bachelor's degree in hand, he moved to Evanston, Illinois, for graduate study in the School of Speech (now the School of Communication) of Northwestern University, where he remained for the rest of his life. In 1935, Carhart married Mary Ellen Westfall. Their union produced three sons, Richard, Robert, and Raymond, as well as five grandchildren.

Carhart earned a master's degree in 1934 and a PhD in 1936. His doctoral work, titled "Infra-Glottal Resonances and a Cushion Pipe," included the construction of an artificial larynx. With his degree completed, Carhart joined the Northwestern faculty as a trained speech scientist. Fate, however, was to intervene.

Cordia C. Bunch, perhaps the world's first clinical and research audiologist, completed his doctoral degree in psychology under Carl Seashore, the renowned expert in the psychology of music, at the University of Iowa. Bunch's graduate work, during and after World War I, included the construction of an instrument for testing the threshold of human hearing across the audible frequency range in 1919. He used the device to test several patients in the office of a local otolaryngologist, Dr. L.W. Dean. When Dean moved from Iowa to Washington University in St. Louis, he invited Bunch to join him and to test the hearing of all his otological patients. Bunch accepted the post, moved to St. Louis, and spent the next two decades acquiring pure-tone audiograms on literally thousands of individuals who suffered from a variety of hearing disorders.

Carhart AND I OVERLAPPED AT NORTHWESTERN FOR 11 YEARS, FROM 1950 TO 1961. DURING THIS PERIOD, WE HAD MANY FRANK DISCUSSIONS ABOUT THE FLEDGLING PROFESSION HE WORKED SO ASSIDUOUSLY TO NOURISH AND GROW.

Bunch's book, *Clinical Audiometry*, published in 1943, was a systematic attempt to relate the shape and degree of audiometric loss to the nature and site of the hearing disorder. After Dean retired, Bunch accepted an invitation from Northwestern's School of Speech to come to Evanston as research professor in education of the deaf, and to teach courses in hearing testing and hearing disorders. Here, he met and shared his audiometric knowledge with Carhart. When Bunch suddenly and unexpectedly died in 1942 at the age of 57, Bunch's courses were assigned to Carhart, necessitating a rapid shift of emphasis from speech production to speech perception. Years later,Carhart told me that no single person had influenced his career more than C.C. Bunch.

From 1944–1946, Carhart served in the wartime U.S. Army as captain in the Medical Corps. He was assigned to Deshon General Hospital, in Butler, Pennsylvania, and ordered to set up a system for aural rehabilitation and the dispensing of hearing aids to men and women who had sustained hearing loss as a result of their wartime service. Building on this experience, he returned to the Northwestern faculty in 1947 and established the country's first audiology graduate training program, leading to the doctoral degree. For the next 28 years, he mentored a long list of individuals who have had a significant impact on the profession, beginning with his first graduate student, the late John Keys, who organized the audiology program at the University of Oklahoma, and ending with his last graduate student, Mead Killion, president of Etymotic Research Inc. Throughout his career, Carhart served as valued consultant to many government agencies and programs, especially the Veterans Administration and the National Institutes of Health, until his death in 1975 at the age of 63.

This is the bare-bones outline of Carhart's career, but it was only the beginning of my search to understand the deeper implications of the life of this remarkable audiological pioneer.

A Tough Assignment

Upon his arrival at Deshon Hospital in 1944, Carhart was directed to develop a meaningful system for dispensing hearing aids to U.S. Army personnel returning from the battlefields of World War II. Looking back from our present vantage point, it is difficult to grasp the difficulty of the task facing him. Nothing like this had ever been attempted on such a scale. How do you decide what is the appropriate hearing aid for a particular person with a particular loss? Previous approaches to the problem, in the civilian population, had been limited to matching the gain of the aid to the degree of audiometric loss. This usually fell short of the ideal solution for a given individual, but what else could you do? Well, thought Carhart, quite a bit. The U.S. Army had chosen the right man for the task. In his 1943 book, Bunch said that the information provided by the pure-tone audiogram alone was not enough to guarantee a satisfactory matching of the hearing aid to the listener. Bunch was convinced that it was equally important to understand how well the hearing aid helped the user to understand speech; he regretted that there was no standardized tool available for this purpose in the 1930s.

But Carhart, a previous student of both speech production and speech perception, had been following closely the wartime research from the Defense Research Laboratory (DRL) at Harvard University, headed by Hallowell Davis. One body of this research focused on the problem of quantifying how well a pilot in an aircraft could understand the speech messages transmitted through radio from an operator on the ground and vice-versa. In those days, radio communication between aircraft and ground was constantly plagued by static and competing engine noise. How well, the Harvard researchers asked, was such a degraded signal-in-noise understood by persons at either end of the communication channel? For this purpose, they had developed, among several other auditory tests, two types of word lists to quantify speech understanding—two-syllable words with equal stress on each syllable (the spondee lists), and one-syllable words in which the various phonemic elements of the English language were distributed in equivalent proportion to their orthographic occurrence in the written language (the phonemically balanced, or PB lists).

Carhart, the consummate scientist, realized that to accomplish his mission, he needed to be able to measure, not only whether the hearing aid made speech loud enough, but how well it also made speech understandable. He realized that much of the laborious research making this possible had already been done for him at the Harvard Psychoacoustic Laboratory for the ground-to-aircraft problem. But Carhart visualized a different communication system—one in which the tester, presenting words, took the place of the ground operator. The hearing aid was substituted for the radio system, and the hearing-impaired person, isolated from the tester by means of a sound booth, took the place of the pilot in the aircraft. Thanks to the DRL word lists, one could assess (from the standpoint of speech perception) both the adequacy of the degree of amplification and the extent of supra-threshold understandability.

Carhart reasoned that the spondee lists could be used to measure the threshold of hearing for speech through the hearing aid by systematically varying the intensities at which the spondee words were presented, while the PB words could be used to measure how well the user could understand speech presented well above the intensity of his or her speech threshold. This "threshold for speech" he called the "speech reception threshold" or SRT, an acronym still widely used in the profession. The percent correct score for a 50-word PB word list presented at a level well above the SRT, came to be called the "PB Max." Both SRT and PB Max remain in the audiological lexicon more than 75 years after their invention. With these tools in hand, Carhart developed the concept of what came to be called the hearing aid evaluation (HAE): a systematic procedure for selecting a best-performing hearing aid for each candidate. The exact procedure has been frequently criticized over the years, especially for its dependence on small differences in percent-correct scores, but the

fundamental idea that, for most users, the best hearing aid for any individual is the one that renders ongoing speech most understandable remains an article of audiological faith. In effect, Carhart invented, out of sheer necessity, what we now call speech audiometry. And speech audiometry has grown, over the years, to become one of the unshakable pillars of the profession.

Carhart was also one of the early leaders in calling for systematic auditory training to complement hearing aid use. He incorporated such a procedure in the Deshon program, and, in later years, regretted that it had not enjoyed a subsequent robust acceptance by the profession. He would have been pleased to see how cochlear implants revived, in the 1980s and 1990s, a strong interest in and research on auditory training.

Partnerships

In the late 1940s and early 1950s, the concept of audiology as an independent profession was still a very new idea. There were, among the younger members, pervasive fears that it would be swallowed up by an older, well-established profession—the most likely candidate was otology. This had been the medical specialty responsible for persons with hearing problems for hundreds of years. Would otologists allow a non-medical specialty to invade their territory? Optometry, a good deal older than audiology, was still locked in conflict with ophthalmology over rights and borders.

Shortly after Carhart had returned from his U.S. Army service, he approached the problem locally by forming an alliance with Dr. George Shambaugh, chairman of the otolaryngology program at the Northwestern University Medical School. In order to convince Shambaugh that audiologists could complement otolaryngologists in the overall rehabilitation of hearing-impaired patients, he organized a weekly clinic in which four to six patients from Shambaugh's private practice were jointly evaluated and counseled by a team consisting of Shambaugh, with one to two of his residents and Carhart with two to three of his graduate students. The venue was a suite of offices in the Northwestern University Medical School on the Chicago campus every Wednesday morning. Many of my most interesting conversations with Carhart took place on those weekly drives from the Evanston campus to the Chicago campus.

Each patient was examined otologically by Shambaugh and his residents, and audiologically by Carhart's team of graduate students. After all patients had been examined by both specialties, each patient was jointly counseled. Shambaugh explained the nature of the medical findings and the possible options open in that direction. Then Carhart summarized the audiological findings and explained the non-medical treatment options. Throughout this joint counseling session, there was a small audience consisting of the residents, the graduate students, and other audiology students from the Evanston campus. I cannot tell you how impressive this was to a young graduate student like me, and to so many of the graduate students who followed me at Northwestern. These clinics, and the camaraderie and mutual respect they engendered among all participants, was, I think, important to the subsequent sense of partnership rather than hierarchy that developed between audiology and otology over the next decades. Enlisting in the partnership George Shambaugh, an internationally prominent otolaryngologist of the period, was one of the many maneuvers Carhart successfully made to advance the fledgling profession. I think he knew that Shambaugh would spread the word among his colleagues that Carhart and his cohorts had a good deal to offer hearing-impaired people. I think he reasoned, also, that the many audiology students who were exposed to these clinics would carry the message to their new posts and widen the partnership across the nation.

Hugh S. Knowles, the developer of Chicago-based Knowles Electronics, was an internationally prominent acoustical engineer. He is perhaps best known to audiologists for his development of increasingly subminiature microphones and receivers so common in contemporary hearing aids, and for the development of the Knowles Electronic Manikin for Acoustical Research (KEMAR). He was also a close friend of Raymond Carhart. They served together for several years on the Veterans Advisory Committee on Hearing Aid Performance and greatly respected each other's commitment to improve resources for hearing-impaired persons.

I first met Hugh Knowles in 1953. I was setting up the apparatus for my dissertation study and encountered a problem with the electronic circuitry. I reported the problem to Carhart, who promptly picked up his phone and made a call. A few hours later, Hugh Knowles appeared at

the old Speech Annex Building on the Evanston campus, ready to assist me. It was many years later before I realized the incredible electronic fire-power that Carhart had brought to bear on my minor problem. But that was typical of Carhart's concern for his students. I suspect that, like the partnership he forged with otolaryngology, Carhart viewed his friendship with Knowles as an opportunity to nourish a similar partnership with the hearing aid industry, recognizing its ultimate importance to the development of audiology.

In the Department of No One Is Perfect

In July 1952, the *Scientific American* magazine published an article by Morgan Sparks explaining the newly developed transistor, its underlying principles, and how it was impacting the world of electronics. In those days, hearing aids were necessarily much larger and heavier than they are today, because amplification was achieved by vacuum tube circuits powered by a 6 volt "A" battery and a 20-45 volt "B" battery. I showed the article to Carhart, suggesting that transistors might have a profound effect on hearing aids since they required only 1.5 volts from a single battery to produce amplification. After reading the article, he grimaced and said, "No, I doubt it."

Epilogue

It has been 65 years since I entered the graduate program in audiology at Northwestern. Times have changed, audiology has changed, the world has changed, but Raymond Carhart's incomparable contributions to our profession will never change. AT

James Jerger, PhD, was for many years a professor of audiology at the Baylor College of Medicine, Houston, Texas, and, later, distinguished scholar-in-residence at the University of Texas at Dallas. He and his wonderful wife of 50 years, Susan, have retired to Lake Oswego, Oregon, where they presently pursue a life of leisure. Dr. Jerger can be reached at jjerger@utdallas.edu.

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WHAT PATIENTS SAY: Patient-Centered Interview

BY MARTHA W. WILSON

The best clinician is the one who listens to the patient, understands the concerns and symptoms, addresses the issues, and resolves or, at least, remediates the problems.

Many of us are old enough to remember Art Linkletter's book and television program, *Kids Say the Darndest Things*. Through his skillful interviewing, children made candid comments that were funny, sad, sweet, and prophetic. Their remarks revealed their perceptions of themselves, their lives, their family, and the world. Likewise, audiologists must be just as skilled when interviewing patients in order to gain understanding about their symptoms, their perception of the problem, and the impact on their lives.

To carefully, thoroughly, and competently assess, treat, and care for our patients, we must clearly understand their presenting complaints and concerns. When a patient states, "I just don't hear like I used to," what does he or she really mean? Are sounds not audible, or does he or she hear but not understand what is said? Can he

I'm lost.

When people start to talk, I go into la la land.

When he drops his head, I lose him.

It's like a police whistle that doesn't take a breath.

Unwanted noise is most agitating.

Background noise drowns out everything.

Words are blurred.

My ears seem to have problems shaping sounds.

Some people talk at a range I can't hear.

My interpretation of what is said is hilarious!

Due to noises in my ears, I have to lip read.

or she hear and understand speech in face-to-face conversations in quiet surroundings but not able to communicate in noisy environments? Are people speaking too quickly and he or she cannot process the information fast enough?

I'm All Ears!

If the audiologist does not thoroughly question and investigate the patient's symptoms, the communication and hearing care needs of the patient may not be properly addressed. Lichstein (1990) reminds us that the patient interview is the "most versatile diagnostic and therapeutic tool." In order to best serve our patients and to increase the chance of achieving the desired outcome(s), the clinician must clearly focus, actively listen, and effectively comprehend what the patient tells us—we must understand his or her story. Listening is not a

To carefully, thoroughly, and competently assess, treat, and care for our patients, we must clearly understand their presenting complaints and concerns.

passive activity, but a learned behavior that requires skill and practice (Brittin, 2005). The best clinician is not necessarily the one who can operate the equipment and administer the tests quickly, but the one who listens to the patient, understands the concerns and symptoms, addresses the issues, and resolves or, at least, remediates the problems. "Interviewing is also one of the most difficult clinical skills to master," "the demands…are both intellectual and emotional" (Lichstein, 1990).

Patient Interview: "Learn by Doing"

As clinical educators in a residential doctor of audiology training program, we continually work with students on case history intake skills and patient-centered interaction. We remind them that "interviewing is a practical skill that can only be learned through doing" (Lichstein, 1990). Although we enjoy chatting and visiting with our patients, interviewing is not a casual conversation, but rather a complex process with purposeful goals. The clinician must guide and facilitate the patient's spontaneous report rather than control or direct detailed questioning. We encourage the students to begin the interview with open-ended questions/statements, rather than closed inquiries, to help the patient express his or herself.

For example, the clinician can ask, "Tell me why you are here today. What can I do to help you?" If the student does not understand or appreciate the patient's presenting complaints and concerns, the student clinician is encouraged to explore with follow-up questions ("I am sorry, but I don't understand what happened to you. Please tell me again what you believe caused your hearing problem."). Likewise, we strongly advocate the clinician document, verbatim, relevant comments made by the patient. When we really listen, we learn that many patients explicitly and eloquently describe their experiences, their struggles, and their fears. We must keep in mind that when a patient shares his or her story, it reveals his or her version of reality. We should accept each patient as a unique individual, with his or her own story, and assess and treat specific needs, concerns, and desires.

In Their Own Words

Very often, patients describe their symptoms better than we could imagine. For example, when patients or family members were asked to describe hearing difficulties, our patients have commented:

- "Hearing is clogged up."
- "I'm lost."
- "When people start to talk, I go into la la land."
- "I must focus and focus to listen."
- "I am constantly looking at faces." "I see the mouth moving but I don't know what you are saying."
- "When he drops his head, I lose him."
- "Unwanted noise is most agitating."
- "Background noise drowns out everything."

Although the patient may hear what is said, the problem is understanding clearly:

- "Words are blurred."
- "Some letters, I hear differently."
- "My ears seem to have problems shaping sounds."
- "Some people talk at a range I can't hear."
- "When a friend whispers to me at a meeting, it's the exact pitch I can't hear."
- "My interpretation of what is said is hilarious!"

Spouses and family members have commented:

- "Dad, we don't think you hear right."
- "He hears the wrong thing or he doesn't hear."
- "My hearing is in the top 10 percent; her hearing is in the bottom 10 percent."
- "When you don't hear, you don't think right."

Not only do we want to understand the patient's hearing ability and communication skills, but also we must learn about related symptoms, such as aural pathologies, tinnitus, and vertigo, and the impact these conditions have on the patient's lifestyle. Although some patients are embarrassed or reluctant to describe what they experience, we encourage them to help us understand what

they hear, how they hear, and how they feel. For example, there are numerous descriptions for tinnitus, ear noise, and head noises. When patients are asked to describe their tinnitus or head noises, they have reported:

- "It's like a police whistle that doesn't take a breath."
- "Almost like crickets far away that never stop."
- "Like a fizz; pressure escaping."
- "Fast, oscillating, overlapping, multiple frequencies."
- "Hissing; like pinhole in steam pipe."
- "Sounds like bull frogs, all year 'round."
- "Buzz sound, every now and then."
- "Due to noises in my ears, I have to lip read."
- "Smoking makes ringing worse."

Listen to Their Stories

During the interview, we gather a great deal of data, information, and patient history. Although we may be able to characterize the patient's symptoms and diagnose the hearing loss or balance disorder, we cannot fully appreciate the quality-of-life issues, the impact on the patient's communication abilities, and the patient's feelings unless we actively listen and understand what the patient tells us. We must value the patient's input, and we must trust what the patient shares with us. "For the patient will know the answer and you will ask him, ask her" (Stone, 1985).

With each clinical encounter, the clinician must ask:

- Did I attend to my patient's needs?
- Did I encourage the patient to share his/her story?
- Did I actively listen to the patient, with care, empathy, and understanding?

Each interview should be approached with excitement, interest, and humility, and should be seen as an opportunity to learn more about the human condition and personal spirit. Clinicians should apply attentive listening skills to learn about the patient's story (description of symptoms), personal context (psychosocial context of symptoms, personal attributions), and emotional context (patient's beliefs and feelings) (Fortin et al, 2012). The clinician should treat each patient with respect and offer support. Patient–centered interactions can create better relationships, trust, and increased potential for positive outcomes. "Patients can be a source of renewal if you revel in them and listen to their stories," Stone said, in a 1998 *Wall Street Journal* article (Sharpe).

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BENEFITS OF A TELEPHONE-ADMINISTERED NATIONAL SCREENING TEST

BY CHARLES S. WATSON, GARY R. KIDD, JILL PREMINGER, JAMES D. MILLER, DANIEL MAKI AND ALEX CROWLEY

LONGER-TERM STUDIES MAY SHOW THAT ELECTING TO TAKE A SCREENING TEST AND FAILING IT IS OFTEN AN IMPORTANT INITIAL STEP IN A MULTI-STAGE PROCESS THAT ENDS WITH THE PURCHASE AND SUCCESSFUL USE OF HEARING AIDS.

AUDIOLOGISTS ARE WELL AWARE

that many people who might benefit from treatment for their hearing loss, generally by the use of hearing aids, fail to seek the help of hearing professionals. As a result, millions of people in the United States, and many more across the world, spend their final years, often decades, with a severely degraded quality of life. The reasons for this widespread failure to seek help that could restore the ability to function efficiently in the social world have been studied in detail (McCormack and Fortnum, 2013). This article concerns an effective means of addressing one of those reasons—denial of the problem.

Denial of the Problem

A large percentage of those with hearing loss, especially older persons, find it easy to deny that they have this problem, or that they have a sufficiently serious form of it that they might benefit from treatment. Audiologists are familiar with those who admit they have some problems understanding speech, although their hearing is "not really very bad." They go on to explain that, "My wife mutters!" "My grandchildren don't articulate!" "Our house is so noisy and I have to turn the television volume up high!" "Restaurants have gotten so noisy you cannot have a conversation in them!"

Why don't those with the equally common age-related problems with near vision make the same kind of excuses? The answer is obvious—we are surrounded by evidence that the source of our vision problems resides in us, not in the environment.

When the print in the *New York Times (NYT)* becomes difficult to read, we don't accuse the NYT of reducing their font size (even though they have occasionally done so), but instead assume that the font is a constant and our eyesight the variable. We likewise interpret the decreasing visibility of the fine print on traffic signs, of our cell phone messages, and the instructions on almost all products, as symptoms that should be acted on because the problems must reside in our eyes. And, glasses help most people. So do hearing aids.

A Telephone-Administered Screening Test

The solution to the denial problem is clear. It would be much more difficult to deny one's hearing loss if there were a convenient, inexpensive (or free), readily accessible, trustworthy screening test, that could serve as the auditory equivalent to the *New York Times*. The development of a valid telephone-administered screening test by a group of Dutch hearing scientists accomplished this goal remarkably well (Smits et al, 2004). The validity of their method has now been independently confirmed by numerous groups of investigators (review by Watson et al, 2012) in several European countries, in Australia, and in the United States. Versions of the Dutch test are now available without charge to the public in all of those countries, except the United States.

How Do These Tests Work?

The simple scientific basis on which the telephone tests depend is that there is a close association between hearing sensitivity at various frequencies and the ability to understand speech in the presence of background noise. This association has been studied since Articulation Index Theory was developed early in the last century by scientists at the Bell Labs (Allen, 1996). If measured pure-tone sensitivity could predict the signal-to-noise ratio (SNR) at which speech could be recognized, it should also be possible to predict in the other direction. That is to say, the SNR at which speech is just recognized should be predictable from the magnitude of pure-tone loss. This association has been confirmed by numerous investigators; an example is shown in FIGURE 1, based on data collected by Williams-Sanchez et al (2014). In the Netherlands, the gold standard for a screening test was considered to be a test of sentence recognition in noise, and their telephone test was shown to have very high sensitivity and selectivity when compared to such a test (Smits et al, 2004). However, they also showed that their telephone screening test was significantly correlated with average pure-tone loss.

MOST OF THE TELEPHONE TESTS CURRENTLY IN USE ARE MODELED AFTER THE ORIGINAL DUTCH TEST, IN WHICH RECORDED THREE-DIGIT SEQUENCES WERE PRESENTED IN SPEECH-SPECTRUM NOISE.

The realization that an SNR test could yield valid screening results for hearing loss was critical to the development of a telephone test because it has long been recognized that differences in the amplification produced by

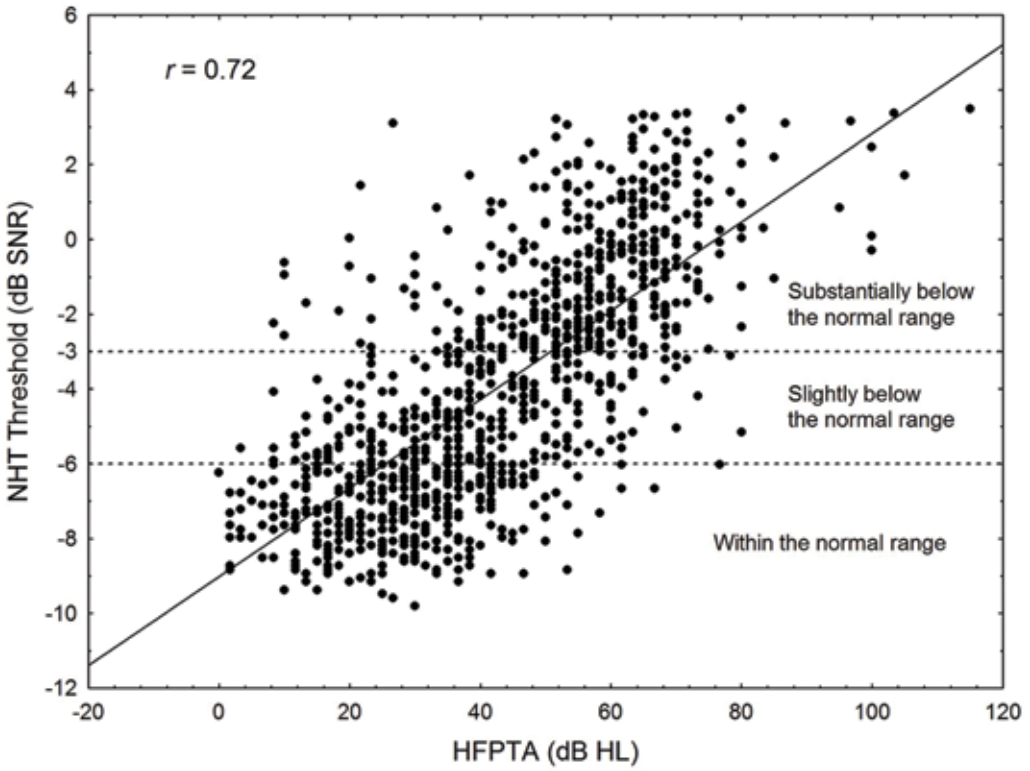

FIGURE 1. Telephone screening tests for 999 individual ears using digits in noise as the stimuli and the same ears tested with pure tones at 1, 2, and 4KHz (Williams-Sanchez et al, 2014).

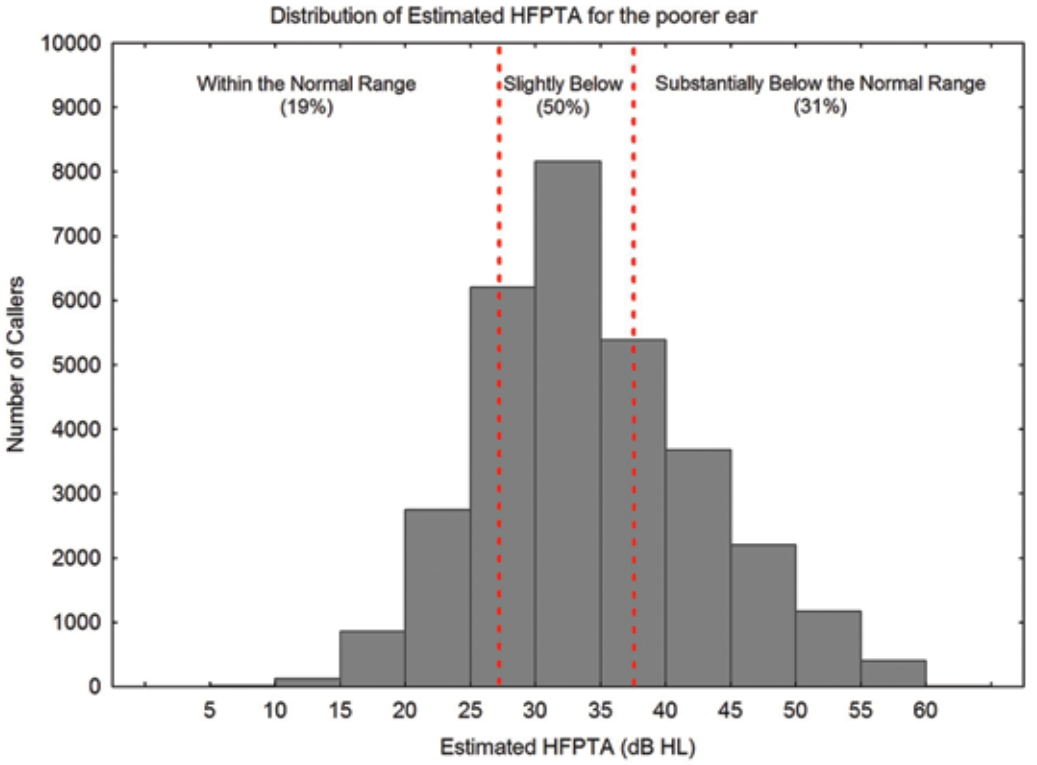

FIGURE 2. The distribution of estimated HFPTA values for the poorer ear of 30,981 callers who took the National Hearing Test during a free promotional period in May and June of 2014).

various telephones would render valid telephone-administered screening tests an impossibility, if the test stimuli were pure tones delivered in the absence of masking noise. However, the variation among telephones has only slight influence on the SNR required for accurate speech recognition.

Most of the telephone tests currently in use are modeled after the original Dutch test, in which recorded three-digit sequences were presented in speech-spectrum noise. Adaptive tracking is used to determine the SNR at which 50 percent of the digit sequences can be identified correctly. Digits were selected because of most listeners' great familiarity with that small closed set of stimuli.

The National Hearing Test

A U.S. version of the Dutch test, the National Hearing Test (NHT), was developed by a team at Communication Disorders Technology and Indiana University, in collaboration with the developers of the original Dutch test (Watson et al, 2012) and with funding from the National Institutes of Health. This 10-minute test (five minutes per ear) uses digits spoken in a general American accent, presented in noise. The current SNR thresholds used by the NHT provide a three-category result for each ear, either "within normal limits," "slightly below normal limits," or "substantially below normal limits." These categorical results correspond to estimated levels of pure-tone average (PTA) loss of less than 27 dB, 27–38 dB, and greater than 38 dB, respectively. The results are immediately presented to the test taker at the end of the call and, if performance is outside normal limits in either ear, the caller is advised to see a hearing professional.

SNR vs. PTA

The pure-tone average (PTA) has long been considered the "gold standard" in the measurement of hearing. It is therefore appropriate to review the association between PTA and the SNR threshold for the NHT. The PTA is commonly calculated as the average threshold for pure tones at 500, 1000, and 2000 Hz. Often a high-frequency version, high frequency pure-tone average high-frequency pure-tone average (HFPTA), based on 1000, 2000, and 4000 Hz (sometimes with 500 Hz included) is used for greater sensitivity to common higher-frequency hearing loss that can affect speech understanding.

Data from a study conducted at three hearing centers operated by the Department of Veterans Affairs (Williams-Sanchez et al, 2014) showed a strong underlying association between the two classes of measurement for 999 ears (see FIGURE 1). The sensitivity and selectivity of the telephone screening test, in relation to the HFPTA values, are 0.81 and 0.65, respectively.

Failure of the screening test SNR and the HFPTA to agree perfectly should not be dismissed as error of measurement. Both tests are sufficiently reliable that differences in performance must mean they are measuring different aspects of hearing (see reliability measures in Vlamming et al, 2014). In addition to sensitivity as measured by pure tones, speech recognition also depends on individual listeners' abilities to recognize the acoustic patterns of speech sounds when only parts of those patterns are audible. This is achieved through the more-or-less efficient use of acoustic and informational context by each listener (Boothroyd and Nittrouer, 1988; Kidd et al, 2007). The telephone screening tests are thus general functional tests of hearing for speech, although they can serve as indirect estimates of hearing loss.

Because the telephone screening tests are not perfect predictors of the degree of hearing loss, in statistical-decision terms, flexible criterion should be set for advising those who take screening tests to seek further help, with the goal of minimizing the miss rate. If the tests were made mandatory for the total population of elderly persons in the United States, this would result in an excessive rate of false positives. However, that was not at all the outcome when a screening test was made available without a fee to the general public.

FIGURE 2 shows the distribution of estimated levels of mean pure-tone loss, for 30,981 persons who took the National Hearing Test during a promotional period (May–June 2014). During that period, the test was offered without charge, rather than for the $5 fee that has been required to support its implementation via a toll-free

telephone line. The data in FIGURE 2 suggest that very few people with normal hearing took the test merely out of curiosity. The vast majority of those who elected to take the test had a hearing problem, 81 percent had estimated loss greater than 27 dB HFPTA in at least one ear

What Is the Public Appeal of the Telephone Test?

So why take the test if most callers were aware they had a hearing problem? Based on follow-up calls made to samples of callers, many of them simply wanted confirmation of their problem from a trustworthy source. But why take this screening test rather than the many others regularly advertised in newspapers and elsewhere? Health-science reporters had written about the test in 30 newspaper articles and blogs during its free promotion and it was those reports that were entirely responsible for the enthusiastic public response.

The articles had stressed three characteristics that distinguished the NHT from other free screening tests. First, its validity had been supported by studies published in peer-reviewed journals and it had been developed under competitive funding from NIH.

Second, it was private, meaning that its results would not be revealed to anyone other than the person who took the test, which was accomplished by providing the results immediately at the end of the telephone call.

Third, the test is entirely non-profit and has no commercial relation to service providers or manufacturers of hearing instruments. We do not know which of those three characteristics accounted for the rates of over 1,000 calls per day during the promotion, but the three together were remarkably effective.

The authors have been told informally by others who have offered free screening tests that this response rate far exceeds that for tests offered by both for-profit organizations and by service clubs.

What Is the "Value Added"?

What value is achieved by screening large numbers of persons who elect to take a telephone administered test? The answer to this question is not self-evident. It was argued earlier that those with hearing loss would benefit from some convenient way to learn whether their hearing was in fact becoming less sensitive, and thus that their denials did not agree with reality. While convenient telephone screening achieves that result, it has also become clear that the large number of persons who elect to take screening tests does not translate directly into an equally large number who immediately seek clinical services or purchase hearing aids (Meyer et al, 2011; Laplante-Lévesque et al, 2015).

Follow-up studies of those who failed screening tests have shown that a small percentage, 6–10 percent, purchase hearing aids in the following year (Yueh et al, 2010). Control data (from non-screened controls) suggested this may be double the percentage who would purchase aids had they not failed a screening test. Follow up research by the NHT on a portion of the 30,981 callers support this conclusion. This response to screening would represent a

very small dent in the fifteen to twenty million persons in the United States who would benefit from hearing aids, but have failed to seek help. Even so, the incremental revenues from a doubling of the purchase rate might make the support of a credible, universally available screening test a very sensible investment for providers of services and hearing technology.

Why do such a large majority of those who elect to take a screening test then fail to seek services or purchase hearing aids when the results confirm their suspicion that they have a hearing problem? Systematic studies of the likelihood of purchasing aids after failing a screening test have been conducted recently using stage models of healthcare decision-making, especially the University of Rhode Island Change Assessment (URICA). This model assumes a sequence of stages through which persons progress when moving from first recognizing a possible health problem to actually seeking help for that problem. The original URICA stages include: pre-contemplation, contemplation, action, and maintenance. When the action under study is that of obtaining a hearing aid after failing a screening exam, data from 224 respondents in Sweden showed that the stage model provides a reasonable description of their progression from disinterest to deciding to purchase (Laplante-Lévesque et al, 2015).

This study did not show greater hearing loss for those in later decision stages, as would be expected. However, those in later stages did have greater self-perceived hearing disability. It seems likely that the relative time spent in each stage is more strongly associated with self-reported hearing disability rather than the severity of hearing loss.

The usefulness of these studies of the decision process appear limited, at this point, to their recognition that the purchase of a hearing aid, like many other health management decisions, is not made quickly. It must be the case that the time course of the decision process is strongly dependent on at least two factors: the severity of the health problem and the perceived likelihood that the treatment will cure the disorder or at least significantly reduce its symptoms. In other words, the impact of failing a screening exam for hearing loss should not be expected to be immediate if persons need to work their way through several states of a decision process before taking action. Those stages may require more time than has been allocated in studies on the impact of screening tests.

Longer-term studies may show that electing to take a screening test and failing it is often an important initial step in a multi-stage process that ends with the purchase and successful use of hearing aids. It seems clear that this initial step would be taken by many more people if a free, reliable, convenient, and private telephone-based screening test were always available to them. Widespread use on an as-needed basis would make telephone screening for hearing loss one of society's most valuable health tools.

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CONNECTING SMARTPHONES TO HEARING INSTRUMENTS WITH ACOUSTIC WIRELESS CONTROL

BY REBECCA HERBIG, THOMAS LOTTER, GUNTER SAUER, AND THOMAS DICKEL

THE ACOUSTIC WIRELESS CONTROL EFFECTIVELY TURNS THE WEARER'S SMARTPHONE INTO A COMPREHENSIVE, INTUITIVE, YET DISCREET HEARING AID REMOTE CONTROL WITHOUT THE EXTRA COST AND HASSLES ASSOCIATED WITH AN ADDITIONAL ACCESSORY. ITS INNOVATIVE AND ROBUST DESIGN MAKES IT COMPATIBLE FOR HEARING AIDS OF ALL SIZES.

With the widespread use of smartphones, the necessity of transmitting data directly from smartphones to hearing aids for control purposes has arisen. One challenge for manufacturers has been to develop an app that could work with virtually all smartphone operating systems (iOS® and Android™) without the need for an intermediate relay or wireless antennas in the hearing instrument. This article describes a new transmission system called acoustic wireless control, which constitutes a direct link from a smartphone to a hearing instrument.

The Challenge

In 2010, MarkeTrak VIII revealed that the hearing instrument feature rated least satisfactory was "ease of volume adjustment" at 60 percent (Kochkin, 2010). In fact, of those who did not have a volume control or remote, only 27 percent reported that they did not want to have one. This result is actually worse than the response to the same question in the MarkeTrak VII. The decline was likely due to the fact that as hearing instruments become smaller, onboard controls are being removed from more instrument housings.

At the same time, the adoption of remote controls has not caught up at the same rate. Thankfully, the new MarkeTrak IV released in 2015 seems to show that the situation has improved. Although the exact question was not asked again, 72 percent of the respondents did report that the "Ease of adjusting settings (e.g., volume, memories, etc.)" was satisfactory (HIA, 2015). Nevertheless, this still means that roughly one out of every three hearing aid users finds the traditional solutions less than satisfactory.

Wearers should have the option to control their hearing instruments, but not every hearing aid has sufficient space on the housing for a program or volume control. This is true for the smaller CICs and ITCs, but now also increasingly so for the mini-BTE and RIC instruments. What's more, these same hearing aids that preclude an onboard control are also often too small to include a wireless coil on the inside. So this becomes a conundrum for wearers, who prioritize discretion and tend to select the smallest

possible hearing instruments. As a result, they often have no means of controlling their hearing instruments at all. Or, in certain cases where an onboard control is possible, they have to reach up and make adjustments on the hearing instrument housing, which is arguably not the most discreet solution. Individuals who choose hearing aids at a lower price point may face a similar problem. The presence of a wireless coil is, for many manufacturers, a performance level differentiator and therefore not always an option for more budget-conscious consumers.

But even when possible and available, onboard controls or traditional remote controls are still not necessarily the best options for wearers. For older users, knowing which program is for what situation can be confusing. For those with dexterity problems, manipulating the tiny buttons and dials on their hearing aids can be difficult. For certain mini-BTEs with rocker switches and inter-device wireless connections, the rocker switch on one aid is sometimes assigned to control the volume of both aids, while the switch on the other aid is assigned to the control program for both. This setup allows these small hearing aids to have both volume and program controls, but for the wearer, it could again be confusing as to which aid controls what.

When it comes to remote controls, manufacturers have tried to make them as discreet and intuitive to use as possible, but they also pose drawbacks and limitations. First of all, for most hearing aid purchasers, remote controls represent an additional cost. It is another gadget that they have to learn to use, carry around, and try not to lose. The more user-friendly models have big buttons, more functionality, and clear displays, but this equates to larger devices that can hardly be categorized as discreet. On the other end of the spectrum, remote controls can be disguised as more "socially-acceptable" objects such as pens, but the trade-off here is that these models tend to be less intuitive to manipulate and offer less functionality.

Recognizing this inadequacy, manufacturers have looked for more innovative solutions. As such, smartphones have been found to have tremendous potential as ideal remote controls. It is a device that most people already own, so there is no need to buy extra accessories. Also, they come with intuitive user interfaces such as touch screens and unified operating systems. So far, smartphones have been in use as hearing aid remote controls through standard wireless system such as Bluetooth®. The drawbacks include high power consumption when a Bluetooth receiver is used in the hearing instrument and the need for an additional body-worn accessory that includes Bluetooth. And again, certain instrument types without a wireless interface are unable to support remote control functionality.

Relying on Acoustic Transmission

An alternative transmission method that allows wearers to control their hearing aids is clearly necessary. The acoustic wireless control (AWC) is a completely new way of controlling hearing instruments wirelessly and without requiring extra physical space. The AWC uses a wireless communication channel well-suited for all hearing aids—data transmission by acoustic signals. This way, instead of relying on the traditional wireless coil as a receiver, the AWC uses what every hearing instrument already has—microphones. Picking up sound through the microphones is a central function of a hearing aid that is already available. The additional resources required by the hearing aid in terms of size and power consumption are minimal, making this type of link perfectly suited for virtually any hearing aid—from super power devices to the smallest CIC and from premium instruments down to more essential models. The AWC allows the hearing instrument to use dedicated ultra-high frequency signals picked up by the microphone as wearer commands, such as volume and program change. As a transmitter, the corresponding app is designed to turn any smartphone into a remote control by emitting these ultra-high frequency command signals.

While the idea of using acoustic transmission to control a hearing instrument from a smartphone is not new, previous attempts suffered from poor usability and were conspicuous. A robust, practical, and inconspicuous acoustic data transmission system from a smartphone to hearing instruments is difficult to achieve for several reasons:

- The propagation of the signal in a room with walls and objects creates different sound paths, which interfere with each other and may lead to distortions.
- Environmental noise is superimposed over the signal, which may mask it. The signal is damped in amplitude due to the distance of the hand-held device to the ear. The loudspeaker of the smartphone may also not face the hearing aids directly in a typical situation, causing additional loss of amplitude (e.g., the loudspeaker is on the back side of the smartphone facing downward).
- The control signal should be discreet—ideally inaudible—to not alert others to the fact that the user is wearing hearing instruments.

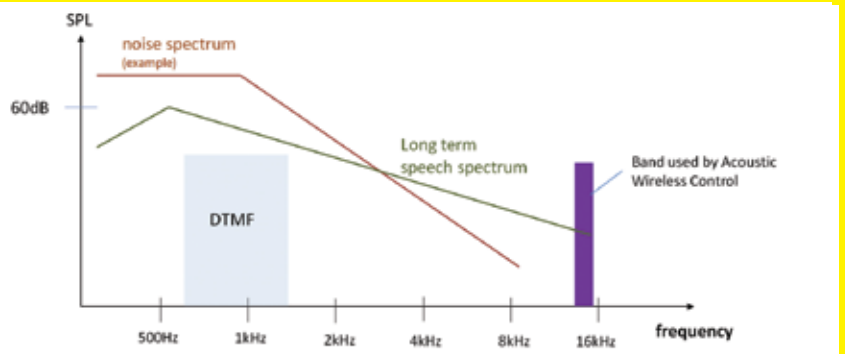

FIGURE 1. Frequency band used by the acoustic wireless control compared to a speech spectrum and a noise spectrum.

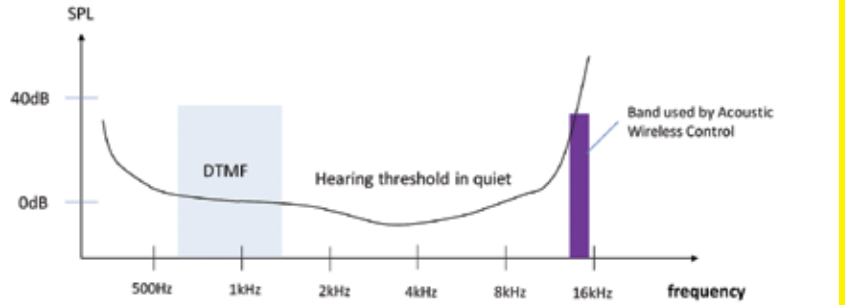

FIGURE 2. Frequency band used by the acoustic wireless control compared to a hearing threshold in quiet.

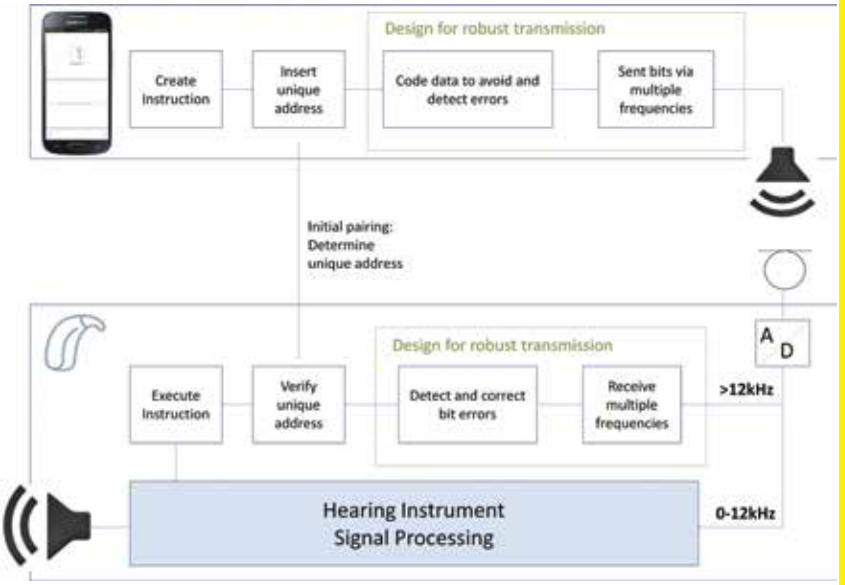

FIGURE 3. Overview of the acoustic wireless control transmission system.

Acoustic Wireless Control

An existing solution for acoustic control uses very audible dual-tone, multi-frequency (DTMF) signals in the range of 700–1600 Hz. However, those are often superimposed by environmental sounds and thus the control frequently fails to operate in loud environments where a change of instrument settings is often desired. In quiet environments, the phone must be brought in close proximity to the hearing instrument. A higher robustness against environmental effects can be achieved by designing the system in a frequency range where minimal ambient noise is present (i.e., close to ultrasound).

Siemens introduced the principle of ultrasonic data transmission in 1987 with the Telos remote control. Due to the prevalence of today's smartphones, AWC revisits this approach with a digital design in the 15 kHz frequency region. The masking effect of surrounding sound sources, like speech or noise, is minimized, since their energy in this frequency range is marginal (see FIGURE 1).

Additionally, the audibility of the control signal for others is minimized as the hearing threshold rises steeply at 15 kHz. Moreover, this frequency range often becomes completely inaudible due to the natural effects of aging on the ear (see FIGURE 2).

The overall transceiver system is outlined in FIGURE 3. The AWC in the hearing instrument is able to process the frequency range above 12 kHz separately from the audio signal processing band to extract the dedicated control codes. And in order to enable any iOS or Android smartphone to transmit these control codes, users simply need to download the corresponding touchControl™ App.

To avoid any conflicts between different touchControl App users,

each transmitted data code is combined with a unique address. Before using the app, a pairing process with a specific smartphone determines this unique address used for communication. By doing so, any risk of the instrument being remotely controlled by another user's smartphone is excluded.

Ensuring a Robust Transmission

Design measures taken to reach a high robustness against environmental effects and false alarms include adding redundancy to the transmission symbols to correct or detect errors, and transmitting bits on various carrier frequencies (see FIGURE 4).

The smallest piece of information is a single-frequency pulse followed by a fixed delay to minimize interference by acoustic reflections. This avoids errors from reverberations (i.e., acoustic reflections, leading to one pulse arriving at the receiver at the same time the next pulse is expected).

The information is duplicated and transmitted on different carrier frequencies. If a single frequency is especially affected by noise, the information can still be reconstructed in the receiver. This increases robustness at low signal-to-noise ratios (SNRs).

The Smartphone App

The wearer interface of the AWC is provided by the corresponding smartphone app. Thanks to the design principles mentioned, the touchControl App reliably provides a large number of useful remote control functions, such as volume control, program change, tinnitus volume control, or tone balance on

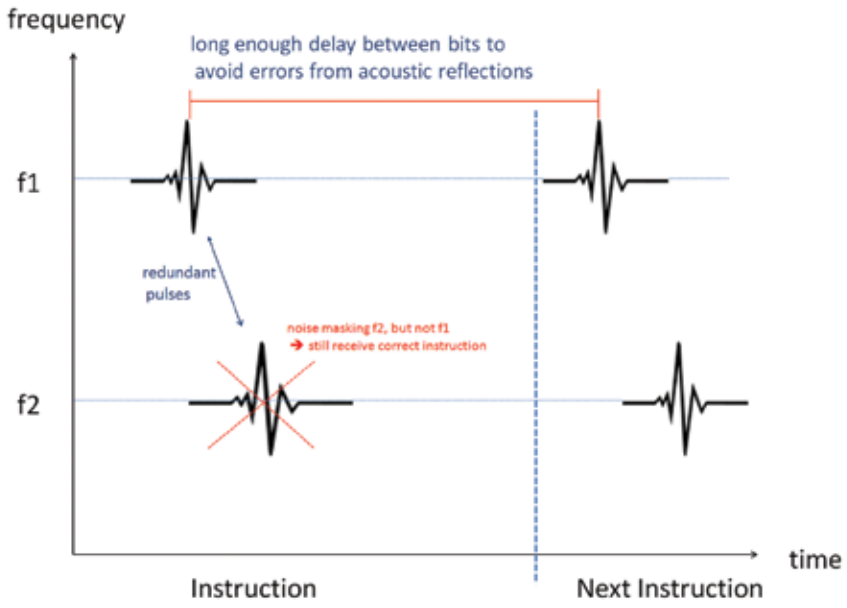

FIGURE 4. Principle of the acoustic wireless control system using various carrier frequencies and redundancy spread over different frequencies. This helps to transmit robustly in low SNRs and in reverberant environments. In this example, two sequential pulses carrying digital information are sent on frequency f1 and f2. While the first pulse on f2 is masked by environmental noise, the digital information can still be recovered from the pulse of f1.

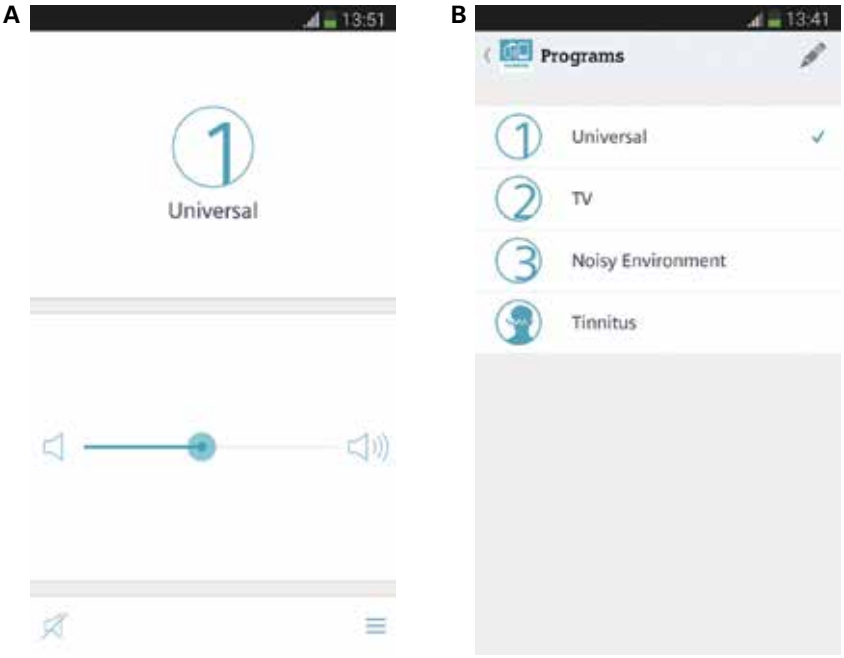

FIGURE 5. Volume and program control provided by the touchControl App on a smartphone.

a wide range of smartphones. The touchControl App is available as a free download from the iOS and Android play stores (see FIGURE 5).

Wearer Advantages

Compared to wireless standards such as Bluetooth 4.0, the AWC system adds only minimal current consumption to the hearing instrument. Due to the use of the loudspeaker of the smartphone and the microphone of the hearing aid, it can be used in virtually every smartphone (since iOS and Android account for approximately 95 percent of all smartphones [IDC, 2013]) and hearing instruments, which previously could not provide that functionality due to the unavailability of conventional wireless antennas.

There are many benefits offered by the AWC. As long as the wearer is a smartphone user, they no longer need to purchase and carry around an extra, dedicated hearing instrument remote control. For more image-conscious wearers, hearing instrument adjustments are now disguised as smartphone operations, which appear more discreet than using any dedicated hearing instrument remote control. For those individuals with dexterity problems, touch screens offer an alternative to small buttons on the hearing instrument housing or traditional remote controls. The bigger screen on a smartphone means that the control interface is easier to see and understand. Even if the hearing instruments do have space for onboard controls, the touchControl App is more intuitive than trying to remember which instrument control does what, and always offers both volume control and program change functionality, and even more controls, such as tone balance and tinnitus therapy feature volume.

Conclusion

The acoustic wireless control effectively turns the wearer's smartphone into a comprehensive, intuitive, yet discreet hearing aid remote control without the extra cost and hassles associated with an additional accessory. Its innovative and robust design makes it compatible for hearing aids of all sizes.

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WELCOME BACK to an ongoing series that challenges the audiologist to identify a diagnosis for a case study based on a listing and explanation of the nonaudiology and audiology test battery. It is important to recognize that a hearing loss or a vestibular issue may be a manifestation of a systemic illness. Being part of the diagnostic and treatment "team" is a crucial role of the audiologist. Securing the definitive diagnosis is rewarding for the audiologist and enhances patient hearing and balance health care and, often, quality of life.

—Hillary Snapp, Investigator-in-Chief

CSI Reference Guide: Visit www.audiology.org and search keywords "CSI Reference Guide."

When "Ouch" Is Seen and Not Heard

By Lindsey Jorgensen and Jessica J. Messersmith

A five-year-old male presented to the University of South Dakota Outreach Clinic (USDOC) for follow-up for his bilateral high-power behind-the-ear (BTE) hearing aids (HAs). The patient's history is significant for speech and language delays with minimal language production. History includes premature birth at 27 weeks gestation resulting in a three-month stay in the neonatal intensive care unit (NICU), followed by one year of oxygen dependence. The patient did not pass his newborn hearing screening, but was lost to follow-up. He did not receive intervention until age two. He was accompanied by his mother to the visit. She was reinstructed on device use and counseled on intervention options for the patient's speech and language delays. She reported the patient cries and refuses to wear the HAs, resulting in loss of four pairs. Patient has a complicated family dynamic that makes him often late or no show for appointments.

Audiologic Evaluation and Habilitation Appointment One (Age 5.5)

- Otoscopy—unremarkable for the right ear, pressure equalizer (PE) tube left ear
- Tympanometry—normal mobility and middle ear pressure in the right ear, non-mobile tympanic membrane with large ear canal volume in the left ear
- Ipsilateral acoustic reflexes
  - Right—90 dB HL at 500 Hz, absent at all other frequencies
  - Left—100 dB HL at 4000 Hz, absent at all other frequencies
- Distortion product otoacoustic emissions (DPOAE)
  - Right—present at 500 Hz, absent at all other frequencies
  - Left—no response; likely due to middle ear issues
- Would not condition to traditional, play, or visual reinforcement audiometry (VRA) through air conduction
- Conditioned easily to speech stimuli presented via bone conduction (See FIGURE 1)
- Speech detection thresholds at 0 dB HL bilaterally (air and bone)

Review of Results from Previous Testing from Other Facilities

The results were not reviewed until after testing was completed by USDOC. This was to ensure no bias of testing methods, results, or interpretation. Reports obtained failed to include actual test data.

Initial Evaluation from Outside Facility (Age 4.8)

- Tympanometry—negative pressure right ear, restricted middle ear mobility left ear
- Acoustic reflexes—absent bilaterally at 1000 Hz, no other frequencies tested
- Otoacoustic emissions—absent bilaterally
- Auditory Brainstem Response (ABR)—moderate sloping to severe sensorineural hearing loss (SNHL) right and a profound SNHL left ear (TABLE 1)
- No behavioral responses were reported
- Patient referred for PE tubes

Second Evaluation from Outside Facility (Age 5.0)

Behavioral responses obtained in June 2013 using a single audiologist suggested severe-to-profound hearing loss bilaterally. The audiologist reported difficulty conditioning the patient.

Hearing Aid Fitting Outside Facility (Age 5.1)

Bilateral super-power BTE hearing aids were fitted and programmed to the behavioral results. No real ear or validation measures were performed.

Summative Analysis of Testing

Based on the information so far, what else might you consider?

ABR tracings were requested; a review of the ABR tracings revealed the presence of a cochlear microphonic (CM) bilaterally. Would this be expected and what does this suggest?

Audiologic Evaluation and Habilitation Appointment Two at USDOC (Age 5.9)

The patient was scheduled for re-evaluation due to the discrepancy in results across audiometric evaluations and the observed CM. A sleep-deprived ABR resulted in limited recordings due to patient intolerance for the task. Using rarefaction click stimuli, presented at a rate of 31.1 per second through insert transducers, recordings revealed no identifiable waves at maximum output levels of the system for the right ear and a questionable wave V response at 70 dB nHL for the left ear. No replicable waves could be identified at presentation limits for bone conduction stimulation. A CM was identified bilaterally.

Consider the Facts

- The patient refuses to wear hearing aids
- The patient has no meaningful oral speech or language
- Premature birth with extended NICU stay
- Newborn hearing screening referral with loss to follow-up
- Initial diagnostic testing (April 2013)
  - Otoacoustic Emissions (OAEs) were absent bilaterally
  - Tympanometry suggested middle ear pathology bilaterally
  - Acoustic reflexes were absent bilaterally
  - ABR suggested moderate-severe hearing loss in the right ear and profound hearing loss in the left ear

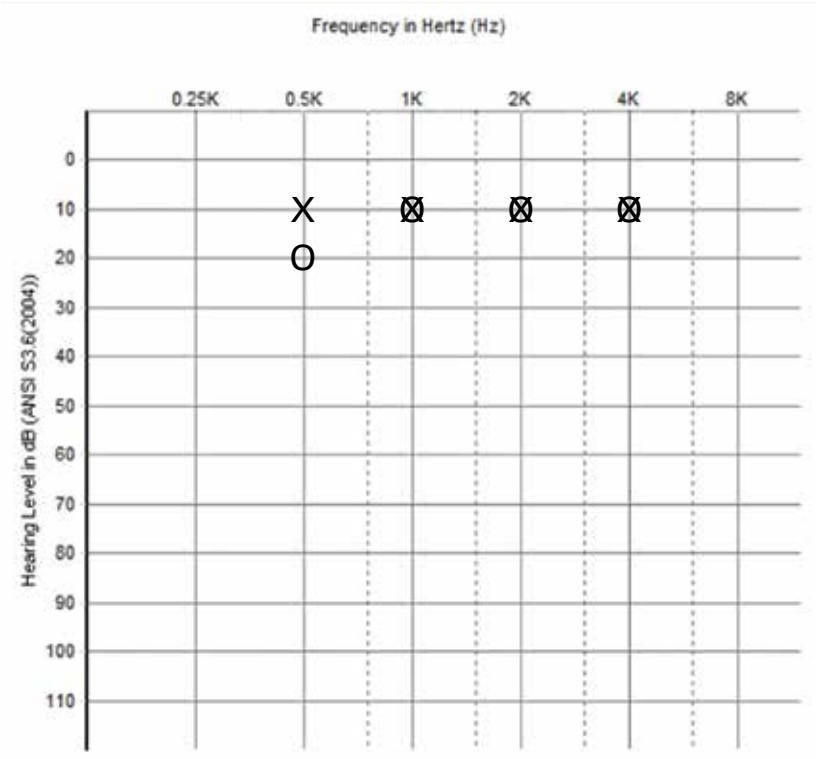

FIGURE 1. Audiogram obtained by USDOC.

    - CM observed bilaterally
- Second diagnostic evaluation (June 2013)
    - No responses to behavioral testing resulting in diagnosis of profound hearing loss bilaterally
- Hearing aid fitting (July 2013)
    - Fit with super-power BTE hearing aids
- Seen by USDOC
    - Behavioral responses (October 2013)
        - Suggestive of normal hearing sensitivity to pure tones bilaterally
        - 0 dB HL responses to speech (SDT) Au (AC and BC)
    - ABR (March 2014)
        - No identifiable responses
        - CM present bilaterally

Diagnosis and Discussion

The results from initial and follow-up testing conducted by the USDOC, along with testing completed by the other two facilities, suggest that the child has auditory dys-synchrony also known as auditory neuropathy spectrum disorder (ANSD). The typical pattern for ANSD is present OAEs, absent ABR, present cochlear microphonic, and varying degrees of and/or fluctuating behavioral thresholds. Audiometric data, lack of speech/language development, and negative response to high-power HAs support this diagnosis. Additionally, it is relevant to note that ANSD is more common in children who are born prematurely and/or spent time in the NICU (e.g., Berg et al 2005, D'Agostino and Austin, 2004, Ry et al, 2006).

For children with ANSD, a cochlear implant (CI) is an acceptable treatment route; however, given the history of a difficult family situation and possible lack of follow-up for CI and aural habilitation services, this option was deferred until consistent care could be established. The patient spends 50 percent of his time with his father who lives in another state and the family has a long history of failure to follow-up. It was decided, at this time, a CI would not be recommended. Rather, alternate acoustical stimulation with more intensive aural rehabilitation and use of sign language were determined to be more appropriate as the patient responded well to sign language and began developing language skills. This was suggested to the mom at the first appointment at the USDOC and she agreed to this plan of care. An FM system (bilateral ear-level FM receivers) was ordered for the child to use at school. Due to history of losing hearing aids (previously had lost four pairs), it was decided that the FM receivers and transmitter would be maintained at the school. The school personnel agreed to this and reported increased success and compliance with these devices over the previous power HAs. Unfortunately, the patient was again unable to be located for an extended period of time. When he was, it was conveyed to our clinic by the outreach consultant that the father had found a surgeon that would "fix his son's hearing" and he was not interested in any audiology-related services. It was explained to the outreach consultant that there was not a surgery available that would "fix" the child's hearing and realistic expectations would need to be discussed if they decided to pursue a surgical option. It was unclear if the surgery reported by the father was a CI or another surgery. All subsequent attempts to contact either parent or grandmother were unsuccessful.

Final Thoughts

A few points come to mind with this case. First, although this child had limited speech and language skills, he was attempting to communicate to the audiologists and the people

TABLE 1. ABR Results from Outside Facility (responses are in dBnHL)

		Stimulus				
Ear	**Transducer**	Click	500 Hz	1000 Hz	2000 Hz	4000 Hz
Right	Air	99	55	65	80	85
	Bone	40	NR	DNT	DNT	DNT
Left	Air	NR	NR	NR	NR	NR
	Bone	NR	DNT	DNT	DNT	DNT

around him that the devices were not helping him. Even after many attempts to teach him how to use the devices, he would not wear them. Through these non-verbal cues, information about comfort should have been gleaned.

Second, although CIs, in many cases, may be the appropriate treatment for children with ANSD, it may not always be the best option. This child presented with a complex situation; although this should not exclude him from the option of a CI, significant aural rehabilitation and family support is needed for successful use of a CI (e.g., Geers et al, 2002) and a proper support system to provide this care did not seem available.

Third, this case demonstrates the need for pediatric audiologists and the need to know when to refer for appropriate evaluation (Jorgensen and Messersmith, 2014). It was clear from the report and diagnosis from the second evaluation that the audiologist attempted to get behavioral responses with only one audiologist. Although they reported difficulty with conditioning, they diagnosed this child with a profound hearing loss. Specifically in the case of this child, this lack of referral led to a false diagnosis of a significant hearing loss and this information was used to inappropriately fit power HAs. Knowing our limitations and when additional testing is needed by a specialist makes us better audiologists and allows us to provide the best care to our patients.

Finally, it can be difficult to obtain reliable responses from children; as such, a test battery approach is the recommended assessment protocol for assessing a child's auditory abilities (Jerger and Hayes, 1976). This case demonstrates the need to look at the compilation of results when diagnosing an auditory disorder and the need to review audiometric data from evaluations when interpreting a report. It should be common practice to include the audiogram, ABR tracings, tympanometry, OAE recordings, etc. for other audiologists to review and consider when interpreting information. It was with the information from this child's first ABR, in conjunction with the behavioral responses and second ABR, that the conclusion of ANSD was made. Although this child did not fit the text book criteria of present OAEs/absent ABR for diagnosis of ANSD, he presented with middle ear involvement that would preclude interpretation of OAE results. Although previous audiometric data should be provided, previous results should not be reviewed until the current testing has been completed to decrease the likelihood of test bias (Gravel, 2002).

In conclusion, this case, although interesting, is not unique. Listening to our patients and providing them the best care should be the goal of all audiologists. The best way to do this is through knowing our limitations, using previously obtained information, and looking at the patient as a whole and not a set of ears.

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The Rarest of the Rare

Anterior Canal Benign Paroxysmal Positional Vertigo

By Richard Roberts

We are all aware that benign paroxysmal positional vertigo (BPPV) is the most commonly diagnosed vestibular problem. BPPV results from an abnormal interaction of displaced otoconial debris from the utricle with the endolymphatic fluid and cupula of the affected semicircular canal. Estimates of the costs associated with appropriate diagnosis of BPPV approach eight billion dollars per year. Using utility measures, we have shown that pre-treatment, health-related quality of life measures in patients with BPPV were comparable to measures of patients with HIV/AIDS, age-related macular degeneration, and hepatitis B. It is incredible to consider the magnitude of the financial and quality of life impact of BPPV, which is a highly treatable health condition. Effective treatment is dependent on accurate diagnosis of involved semicircular canal, which leads to appropriate selection of management techniques.

By far, the majority of BPPV cases involve the posterior canal (see TABLE 1). Across a number of studies, this is the involved canal in 61–97 percent of cases. This is followed by horizontal canal BPPV, accounting for one to 32 percent of cases. Anterior canal BPPV (AC-BPPV), by most accounts and from clinical experience, is the least common form of BPPV and ranges from one to 21 percent of cases.

In the typical BPPV office visit, the patient presents with a complaint of episodic vertigo with change in position. We do some form of a Dix-Hallpike maneuver, side-lying, or roll test while watching the direction of nystagmus. Up-beating torsion is observed for posterior canal BPPV (PC-BPPV), horizontal for horizontal canal BPPV, and down-beating torsion for AC-BPPV (see TABLE 2). We use the direction of nystagmus to identify the involved canal and then complete some form of canalith repositioning maneuver: Semont, Epley, Gans, BBQ roll, Gufoni, etc. In nearly every case, we manage their problem in about ten minutes on a good day. It is miraculous to the patient but it can become almost routine to clinicians because BPPV behaves as expected in most cases.

The numbers are interesting and impressive. But what does that mean to a patient (a person) who comes into your office with BPPV symptoms but you see nothing with your typical methods? What if you see a purely vertical, down-beating nystagmus: no torsion like you may expect with PC-BPPV or even the rare AC-BPPV? Vertical nystagmus is central, right? Back out of that positioning, stop what you're doing, and send that patient to neurology? That person doesn't care that 90 percent of patients have PC-BPPV or that you can miraculously cure 80 percent of patients in 10 minutes. That person only cares that they are experiencing something truly horrible and you are just like everyone else they've seen: you are not able to help. That person is the point of this article.

There is a sub-group of patients with AC-BPPV who present with purely vertical down-beating nystagmus. That same sub-group may not provoke with traditional methods and may not respond to traditional therapy maneuvers. We can help these people if we are aware of other methods for assessment and management. We must recognize when to use them.

It is certainly true that down-beating nystagmus is observed with degeneration and lesions of the cerebellum, issues at the craniocervical junction (i.e., Arnold-Chiari malformations), multiple sclerosis, vertebrobasilar insufficiency, and even drug intoxication. Baloh and Honrubia (2001) suggest changes in the cerebellar flocculus and paraflocculus may release the inhibitory neural pathways on the inherent upward eye movement bias from the six semicircular canals. This would result in a nystagmus with

downward fast-phase. Hojnacki and Watkins (2015) describe this very issue for a patient with vertebrobasilar insufficiency in a recent CSI: Audiology. So, we must be careful as there are serious medical issues that can cause down-beating nystagmus.

However, Bertholon et al (2002) reported on a series of 50 consecutive patients with down-beating nystagmus. They identified 24 percent (12) with no other indicators of central nervous system (CNS) involvement. Interestingly, these 12 patients had symptoms consistent with BPPV. The authors, based on an upwards bias in vertical slow phase eye velocity using calculations of angular eye velocity vectors derived from known canal geometry, suggest that AC-BPPV would favor a more vertical nystagmus as opposed to the more torsional nystagmus expected and observed with PC-BPPV. Zapala (2008) stated that in the absence of other CNS symptoms and findings, patients with down-beating nystagmus should be treated for AC-BPPV. He supported this with successful intervention using a reversed Epley maneuver in just such a case. This is a very interesting concept as he advocates use of BPPV treatment to aid in differential diagnosis. Ogawa et al (2009) reported findings from four patients similar to Bertholon et al (2002) and Zapala (2008). Down-beating nystagmus observed along with symptoms of BPPV and, aside from the vertical nystagmus, no other indicator of CNS involvement. There is evidence supporting purely down-beating nystagmus in AC-BPPV.

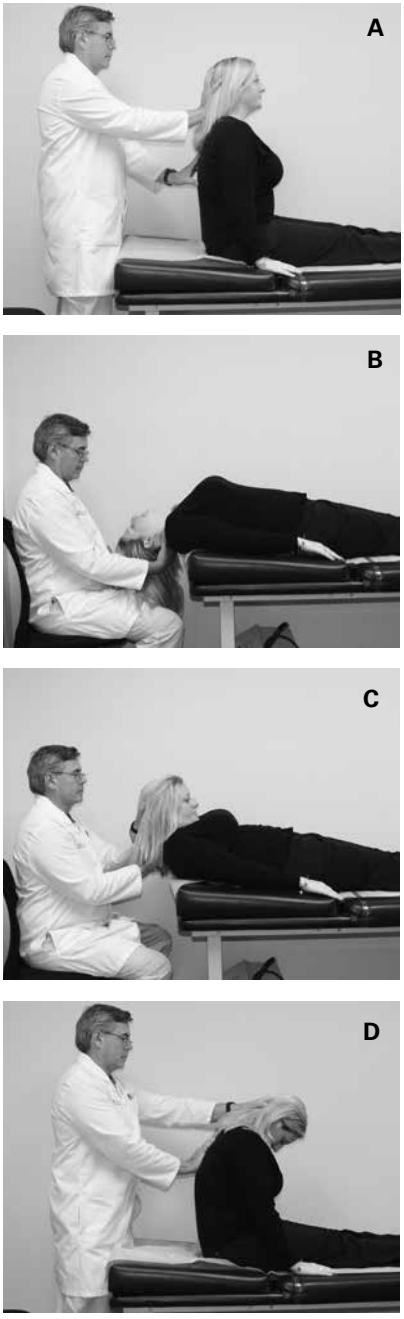
We do expect to provoke nystagmus and symptoms in patients with AC-BPPV using typical methods and that often occurs. In Bertholon et al (2002) 75 percent (nine of 12) of their patients were identified with Dix-Hallpike positioning alone. Zapala (2008) provoked symptoms using

TABLE 1. Incidence of Benign Paroxysmal Positional Vertigo by Semicircular Canal

Study	n	PC	HC	AC
Herdman et al (1994)	59	63.6	1.3	11.7
Fife (1998)	424	91	6	3
Wolf et al (1999)	107	95.3	1.9	2.8
Honrubia et al (1999)	292	93.5	5.1	1.4
Ruckenstein (2001)	86	96.5	2.3	1.2
Korres and Balatsouras (2004)	122	90.2	8.2	1.6
Cakir et al (2006)	169	85.2	11.8	1.2
Moon et al. (2006)	1,692	60.9	31.9	2.2
Jackson et al (2007)	260	66.9	11.9	21.2
Celebisoy et al (2008)	157	87.9	9	1.3
DeStafano et al (2011)	412	70.9	27	2.4
Soto-Varela et al (2013)	614	88.4	6.4	5.2

TABLE 2. Semicircular Canal Involvement and Associated Nystagmus

Canal	Paired Extraocular Muscles	Nystagmus Fast Phase
Poster	Ipsilateral Superior Oblique Contralateral Inferior Rectus	Torsional, Up-beating
Horizontal (Lateral)	Ipsilateral Medial Rectus Contralateral Lateral Rectus	Horizontal
Anterior (Superior)	Ipsilateral Superior Rectus Contralateral Inferior Oblique	Torsional, Down-beating, *or* Down-beating



Most patients with AC-BPPV should exhibit a downward and torsional nystagmus, but a smaller group will exhibit purely down-beating nystagmus.

a side-lying technique for his case. However, there is a sub-group with AC-BPPV that will only provoke with a supine, head-hanging position. This position is shown in Panel B of FIGURE 1. The patient is supine with head maintained midline, but the neck extended to at least a 30 degree angle. In Bertholon et al (2002), two of 12 patients diagnosed with AC-BPPV only experienced symptoms with this position. All four of the cases reported by Ogawa et al (2009) only provoked using this type of position. Bertholon et al (2002) explained that additional downward positioning of the head, with hyperextension of the neck, may be necessary to move the anterior canal ampullary segment into a vertical down-pointing position needed to provoke AC-BPPV for some individuals. We would reserve the supine, head-hanging position to test for AC-BPPV in individuals with a history consistent with BPPV, who have no contraindications to neck hyperextension, and who do not provoke with the other types of test positioning.

Now that we've identified that rarest of the rare form of BPPV, we need to help the patient. Anagnostou et al (2015) provide the most comprehensive review of assessment and management of AC-BPPV. The authors identified 20 reports detailing management techniques and outcomes with an overall patient sample of 312 participants. Regardless of management technique, the authors determined a sample-size-weighted mean success rate of 85.6 percent. This is in close agreement with outcomes for treatment of other forms of BPPV. Anagnostou et al (2015) also divided treatments into Epley/reversed Epley, Yacovino, and other treatment maneuvers. Each group had similar success rates even

FIGURE 1A-D. The examiner is completing the Yacovino maneuver for anterior canal benign paroxysmal positional vertigo. A: The patient is seated on the examination table with back to the examiner. The examiner is positioned behind the patient and supports the patient's back and neck. B: The patient is lowered to the examination table as the examiner sits. The head of the patient is off the examination table to allow the neck of the patient to be extended at least 30 degrees. The examiner has a clear view of the eyes of the patient. C: The neck of the patient is flexed forward while the patient remains supine. D: The patient is assisted to a sitting position as the examiner rises to standing and continues to support the back of the patient. The neck remains flexed forward. Reprinted with permission from Alabama Hearing and Balance Associates, Inc.

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with variation in actual technique. We will focus on the Yacovino method here because it incorporates the supine, head-hanging position and their patient series presented with down-beating nystagmus.

Their maneuver consisted of supine with head hanging 30 degrees dependent with respect to the body, then supine with head inclined to 30 degrees of flexion (forward), and ending sitting with head with 30 degrees of flexion. Our depiction is shown in FIGURE 1. Yacovino et al (2009) reported successful outcome in all of their patients. We have seen a similar response in our own patients. Aganastou (2015) points out a practical benefit of this type of treatment maneuver. It is dependent on knowledge of affected canal but not ear. The same approach should work with right or left AC-BPPV.

There is an uncommon group of patients that will present with AC-BPPV. Most patients with AC-BPPV should exhibit a downward and torsional nystagmus, but a smaller group will exhibit purely down-beating nystagmus. Down-beating nystagmus is most often a sign of CNS involvement so that must be carefully considered. This smaller sub-group may not provoke with standard Dix-Hallpike positioning but only with supine, head-hanging positioning. Ensure there are no contraindications for placing the patient in this position. The Yacovino method of treatment should be considered for management of AC-BPPV as it incorporates the supine, head-hanging position, is efficacious, and does not depend on knowledge of involved ear. These methods should allow the clinician to identify and manage this rarest of the rare AC-BPPV.

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Zapala D. (2008) Down-beating nystagmus in anterior canal benign paroxysmal positional vertigo. *J Am Acad Audiol* 19(3):257–266.

THE ACADEMY'S CODING AND REIMBURSEMENT COMMITTEE (CRC) is charged with identifying and monitoring coding and reimbursement issues that impact the profession of audiology, and communicating this information to Academy members. To facilitate this process, the CRC works to develop informational resources such as guidance documents, presents in eAudiology Web seminars or sessions at AudiologyNOW!, and provides updates and content through the *Audiology Weekly* e-newsletter and this *Audiology Today* magazine.

To better serve the needs of the membership, the CRC, in conjunction with the Practice Compliance Committee (PCC), has established an e-mail address where Academy members can e-mail their questions about coding, reimbursement, and compliance. This e-mail, reimbursement@audiology.org, is a resource available for all members. A panel of experts from these committees reviews the questions and provides timely, thorough responses.

In this article, the CRC would like to highlight questions that the committee receives regularly, whether it be through the committee mailbox or through other channels such as the General Audiology Community. By addressing some of these frequently asked questions, the CRC hopes to provide more detailed guidance that will assist members.

ICD-10

At this time, all health-care providers have made the transition from ICD-9 to ICD-10. Now that the October 1, 2015, compliance deadline has come and gone, audiologists have been working to familiarize themselves with proper coding using ICD-10 codes. Many audiologists are still adjusting to this new system. The Academy has many resources available on its Web site to assist audiologists in familiarizing themselves with the ICD-10 system. These resources include a list of codes pertinent to audiologists, a sample superbill template with ICD-10 codes, and other helpful compliance information. To access this information visit the Academy's Web site at www.audiology.org and search keyword "ICD-10." The Academy also has ICD-10-related eAudiology Web seminars available on demand. These are available as part of the Coding and Reimbursement Series at www.eaudiology.org.

Medicare Policy

Navigating Medicare payment policies can be quite challenging. As such, the CRC has developed a number of resources to assist members in gaining a better understanding of these policies and how they relate to audiology. Understanding Medicare policy also provides members with a good foundation to understand the policies of private payers, as many insurance payers, such as the VA Choice program, base their payments and guidelines on Medicare rules and policies. The CRC has a list of Medicare Frequently Asked Questions (FAQs) on the Academy's Web site. Members can access this page by searching keyword "Medicare" on the Academy's home page (www.audiology.org).

We urge members to review the FAQs, as this page summarizes many of the common questions that the Academy receives. Even with the available materials, the CRC understands that audiologists may still have questions. Most frequently, members look to the CRC to provide additional guidance on three specific topic areas. The first area relates to physician order requirements and the second relates to when and if it is appropriate to send appointment reminders for Medicare patients. The third area addresses how to review Medicare reimbursement decisions.

Physician Order Requirements

To clarify, physician orders are considered to be verification of a *medically necessary* evaluation. The intent is that a physician is requesting further information regarding the patient's hearing status as it relates to medical conditions, such as tinnitus, vertigo, sudden hearing loss, etc. The physician's recommendation for an audiological evaluation should be documented in the patient's medical record in the referring physician's office. Receipt of a recent order for evaluation (through mail, fax, or phone) should also be documented in the audiologist's record. It is important to remember that Medicare does not cover annual or routine hearing evaluations or those evaluations for the purpose of selecting hearing aids.

Reminder Cards

Sending reminder cards to patients reminding them of the need for an annual hearing evaluation can be considered by Medicare to be solicitation of a medically unnecessary procedure since Medicare does not cover such routine services. Billing Medicare for these procedures is not appropriate and considered fraudulent. However, it is appropriate to send reminder cards for visits for hearing aid maintenance, warranty expirations, etc., as long as the patient understands that any charges incurred are not covered by Medicare, cannot be submitted to Medicare for reimbursement, and are the patient's responsibility.

Medicare Reimbursement Decisions

The CRC also receives many questions about Medicare reimbursement decisions. Below is some basic information to assist audiologists in understanding, reviewing, and responding to such decisions.

- Medicare Summary Notice (MSN): This is a notice that a beneficiary (patient) receives every three months, when he or she receives a Part A or Part B Medicare-covered service. The notice explains services and supplies that were billed, the amount Medicare/other insurance companies paid, and that amount the beneficiary (patient) may owe.

- Remittance Advice (RA): This is a notice of payments and adjustments that is sent to the provider, supplier, or biller. The RA explains reimbursement decisions, reasons for payments, and adjustments of processed claims. For additional information on Reason and Remark Codes, see the *Electronic Billing Guide*, Chapter 13.

- Unprocessable: In an effort to reduce the costs in the Medicare program, CMS implemented an editing process for pending claims. The editing process returns the paper or the electronic claims to the provider as unprocessable. In summary, an unprocessable claim is any claim with incomplete or missing required information or any claim that contains invalid information.

- Rejected Claims: The rejected claim will be reflected on the Medicare Remittance Advice with reasons and remark codes to indicate the claim was rejected and why. In this case, the provider must correct and return the claims or resubmit as a new claim.

- Reason and Remark Codes: There are three major code sets that appear on the standard paper and the electronic remittance advice.

- Group Codes: Identifies the financial liability of the provider for the unpaid portion of the claim. For example, CO—Contractual Obligation.

- Claim Adjustment Reason Codes (CARCs): Provides a general explanation for financial adjustment. For example, 16—Claim lacks information that is needed for adjudication.

- Remittance Advice Remark Codes (RARCs): These codes further explain a claim adjustment and are used in conjunction with an appropriate CARC. For example, MA130—Your claim contains incomplete/invalid information and no appeal rights are afforded. Please submit a new claim.

Coding

The CRC would also like to address questions regarding the use of certain CPT codes. Most recently, the CRC has received inquiries related to the use of CPT codes 92626 and 92627. Members of the CRC worked with representatives from the American Speech–Language–Hearing Association (ASHA) and the Academy of Doctors of Audiology (ADA) on a joint guidance document addressing the intended use of these codes. This guidance document can be accessed by searching key word "92626" on the Academy's Web site. The CRC would also like to provide additional information regarding the use of this code.

CPT code 92626, Evaluation of Auditory Rehabilitation Status; first hour, appears in the Special Otorhinolaryngologic Services subsection of the CPT code set. Code 92626 was added in 2006 to describe the assessment of a patient's auditory rehabilitation status. The procedure includes the quantification of speech perception ability of a patient when using hearing aids, auditory osseo-integrated implants, middle ear implants, and/or cochlear implants. CPT code 92626 is a time-based code, which should be reported for the first hour of evaluation. This CPT code should not be used for evaluations less than 31 minutes. CPT code 92627 is reported for each additional 15 minutes of evaluation. For further guidance, the CRC encourages all members to review the aforementioned guidance document on the Academy's Web site.

In addition to questions related to the use of CPT codes 92626 and 92627, the CRC receives many questions regarding the use of CPT code 92700. Many of these questions arise as a result of insurance denials. Because CPT code 92700 is an unlisted code describing a procedure or service, it is necessary to submit the appropriate supporting documentation along with the claim. Supporting documentation, such as a procedure report, serves to provide the payer with an adequate description of the nature, extent, and need for procedure, as well as the time, effort, equipment, and supplies necessary to provide the service. It is also important to refer to specific payer policies or guidelines. By searching the Academy's site for keyword "Coding," you will find more information related to the use of CPT code 92700, as well as information on other coding scenarios.

What's Next for the CRC?

In the coming months, the CRC will be launching a complete redesign of the Practice Management/Coding and Reimbursement sections of the Web site. This redesign will help to simplify navigation and increase user ease in accessing the information available on the site. Look for future announcements regarding these changes.

Disclaimer: The purpose of the information provided above by the American Academy of Audiology Coding and Reimbursement Committee is to provide general information and educational guidance to audiologists. Action taken with respect to the information provided is an individual choice. The American Academy of Audiology hereby disclaims any responsibility for the consequences of any action(s) taken by any individual(s) as a result of using the information provided, and the reader agrees not to take action against, or seek to hold, or hold liable, the American Academy of Audiology for the reader's use of the information provided. As used herein, the "American Academy of Audiology" shall be defined to include its directors, officers, employees, volunteers, members, and agents.

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The Science Is In

Giving Is Good for You

By Brenna Carroll

In September, the Foundation surveyed donors and learned that a belief in the mission of the Foundation and a desire to give back to the profession are the top two reasons donors contribute. Now donors can add a third reason to their list: scientific research indicates that making charitable gifts is good for your health!

A growing number of studies have emerged that indicate charitable donations and helping others coincide in feelings of gratification and overall improved health. The Science of Generosity Initiative found evidence that those who volunteer, donate to worthy causes, and participate in generous kindness to friends and neighbors have higher levels of good health and happiness. They also have lower levels of depression and maintain a sense of purpose in life and a sense of personal growth (Smith and Davidson, 2014). Other studies indicate that other health benefits of generosity include lower blood pressure, lower risk of dementia, less anxiety, and reduced cardiovascular risk (Yablonsky, 2015; Piferi and Lawler, 2006).

Even the small act of thinking of helping others activates the mesolimbic pathway of the brain, which is responsible for feelings of gratification. Acting altruistically physiologically activates the happiness chemical dopamine and produces endorphins that block pain signals. These actions also activate the hormone oxytocin, known as the tranquility hormone (Yablonsky, 2015).

AudiologyNOW! Member Assistance Program

If you are experiencing financial hardship (due to medical, family, professional, or for other personal reasons) and cannot otherwise afford to attend AudiologyNOW!, the Foundation encourages you to apply for conference support through the Member Assistance Program (MAP). Selected recipients may receive lodging, registration, and/or a travel stipend to facilitate their participation at the meeting in Phoenix, April 13–16, 2016. Applications are due on January 8, 2016, and are available at www.audiologyfoundation.org. Corporate support for MAP is provided by Auban, Inc. and Oaktree, Inc. Thank you!

A compelling longitudinal study of 2,000 Americans revealed a consistent link between demonstrating generosity and leading a better, happier life. This study indicated that regular acts of generosity resulted in the greatest feelings of well- being and the fewest incidences of illness and injuries (Smith and Davidson, 2014). If you are the recipient of a good deed, you may have momentary happiness but your longterm happiness is greater if you are a giver. Studies show that people who donate meaningfully, even once, feel happier months later, though more happiness results from donating meaningfully with regularity (Yablonsky, 2015). And, individuals who give to others have lower stress and lower risk of dying in addition to naturally feeling better (Poulin, 2013; Harbough, 2007).

Giving to the American Academy of Audiology Foundation (AAAF) directly benefits your profession and assists budding new professionals. Your donations fund research in areas ranging from tinnitus in patients with cochlear implants to the impact of concussion on auditory processing. These findings lead to treatment innovations directly benefiting your patients. Your donations assist colleagues encountering financial hardship by providing conference registration and travel support to update skills and network for employment opportunities. Your donations create tools and resources that promote audiology and elevate the profession toward becoming a household term. Your donations are investments in emerging professionals by providing academic scholarships to students. Your donations also provide funding for humanitarian projects that support audiology services in underserved locations including Appalachia, Mexico, Brazil, and Peru, and for Special Olympic athletes at local, national, and international games.

Embrace happiness and make a donation for your profession and your health. And, since giving more often exponentially increases your health benefits, consider becoming a Visionary donor to the AAAF with a monthly sustaining gift automatically billed to your credit card. Contact the Foundation at 703-226-1048 or make a one-time donation online (www.audiologyfoundation.org) and/or with your membership renewal. Contributions made before January 1 are tax deductible for 2015.

End 2015 and begin the 2016 New Year with a resolution to embrace happiness, good health, and well-being by giving to your professional Foundation. And best of all, making a gift is easier than dieting!

Brenna Carroll, AuD, Board Certified in Audiology, is a clinical audiologist at Swedish Medical Group in western Washington. She is a member of the American Academy of Audiology Foundation Board, and serves as the Foundation's Development Chair.

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Audiology Alumni: Show Your School Spirit

Student Academy of Audiology (SAA) colleagues from your alma mater are seeking your support during their 15-15-15 fundraiser. During this annual benefit, SAA chapters ask 15 supporters to donate $15 during the week of November 15. All gifts are restricted to support of audiology student programs. Contributions should be made to the Foundation through the online donor portal. Visit www.audiologyfoundation.org and click on "Members Make a Gift." Indicate "15-15-15: Your University" on the tribute line, so the students at your alma mater get credit for your contribution.

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AMERICAN ACADEMY OF AUDIOLOGY

15-15-15 in 2015? Challenge Accepted

By Anna Marie Jilla

Each November, the Student Academy of Audiology (SAA) and American Academy of Audiology Foundation (AAAF) partner to raise funds for audiology student programs through the 15-15-15 fundraiser, held in conjunction with National Philanthropy Day®.

What is National Philanthropy Day?

National Philanthropy Day, held annually on November 15, is the day when the philanthropic community celebrates giving, volunteering, and charitable engagement. Each year, the SAA and the AAA Foundation recognize their generous donors on November 15 and encourage them to continue to support the next generation of audiologists and the 15-15-15 initiative.

So then, what is 15-15-15?

15-15-15 is a fund-raising event sponsored by the SAA and the Foundation. Students from university SAA chapters, faculty, and alumni challenge each other to make contributions in support of SAA programs.

Okay, but why all the 15s?

The tagline for the event is actually a calling. We challenge each chapter to seek 15 donors (students, faculty, alumni, professionals, family, and friends) to each donate 15 dollars to the AAAF during the week of November 15th. And now, we are upping the ante, because it is 2015! Now that's a first! **15-15-15 in 2015**!

What Can Your SAA Chapter Accomplish with $1,000?

SAA Chapters can now apply for grants up to $1,000 for projects with a humanitarian, educational, or public awareness focus. Information on HEAR Grants, funded by the AAA Foundation with a gift from Starkey Hearing Technologies, is now available at www.audiologyfoundation.org. Application deadline is February 1, 2016. Applications for support for SAA Special Olympic Healthy Hearing initiatives are also due on February 1, 2016.

What does this initiative support?

Glad you asked. The money raised from 15-15-15 directly supports audiology student initiatives—not just across the country—but around the globe! Scholarships, research, education, and humanitarian programs are funded with proceeds from this fundraiser.

And all of the money from 15-15-15 goes to students?

Absolutely, 100 percent! Since students are the future of audiology, funds from 15-15-15 directly impact students who are making a difference in our communities, clinics, and in the lives of our patients.

Anna Marie Jilla is a third-year AuD/PhD student at the University of Oklahoma Health Sciences Center in Oklahoma City, Oklahoma. Her research and clinical interests are in aural rehabilitation, specifically hearing aid uptake, treatment adherence, and outcomes measurement. She currently serves as SAA treasurer, fundraising committee chair, and AAA Foundation liaison.

How do students directly benefit from funds raised during 15-15-15?

There are more than 15 ways that students benefit from this event. You can find more information on the AAA Foundation Web site (www.audiologyfoundation.org). Here is a list of student-focused programs supported by the Foundation:

- Empowering People Scholarships
- Judith Blumsack Scholarships
- Roger Ruth Memorial Scholarships
- Sadanand Singh Memorial Scholarships
- SAA Conference Scholarships
- SAA Special Olympics Healthy Hearing (SOHH) Chapter Participation Grants
- SAA Student Leader Scholarship
- SAA Humanitarian, Education, and Awareness Resources (HEAR) Chapter Grants
- Student Travel Award and Reimbursements
- James and Susan Jerger Awards for Excellence in Student Research
- Research Grants in Hearing and Balance
- Student Research Forum Awards
- ARC Research Conference Award

That's quite impressive! How do I get involved?

Join students and alumni from your audiology program by making your 15-15-15 gift today! Make a donation at www.audiologyfoundation.org/supporters/makeagift.html. You can also take a picture of your chapter participating in the 15-15-15 challenge and post it to SAA's Facebook or Twitter pages (@StudentAuD). You can also contact the Foundation office at aaaf@audiology.org to see how you can match gifts from students at your alma mater. Also, look for updates on Facebook from SAA chapters across the United States during the week of November 15. "Like" your favorite chapter by making your $15 contribution.

Sounds like a plan! Challenge accepted!

Great! Mark your calendar for November 15! Thank you for your support…and for helping us make 2015 a record-breaking year!

New Members of the Student Academy of Audiology

Deedra Alford
Tracey Aloisio
Jinna Borgstrom
Sarah Bradshaw
Michaela Brown
Jaclyn Costa
Ashton Crain
Deirdre Creegan
Katie Dellorso
Allison Evans
Aubrey Ewing
Lesley Franklin
Stephanie Gable
Erica Gardner
Gerilyn Gigante
Leslie Gilbert
Erik Jorgensen
Avinash Kaur
Lindsay Koehler
Rebecca Labowe
Aleksandra Martinovic
Hilary Maxim
Julia McDowell
Kylee McFarlin
Thomas Mills
Cailey Mortensen
Lindsay Nation
Erin Nelson
Haiden Nunn
Naya Owusu
Jordan Press
Ariana Quinn
Kaitlin Ring
Marin Schweigert
Melanie Shaffer
Michael Simpson
Jason Smith
Terrell Stoll
Alyssa Whinna
Kyle Whittle
Marla Wilcox
Brady Workman

Newly Elected 2016 Board of Governors Stress Certification as the Path to Excellence

By John Coverstone

As a result of our most recent American Board of Audiology® (ABA) Board of Governors election, we are excited to welcome one new member and two veteran members back to service. These three dedicated audiology professionals care deeply about the future of the profession and about certification as a mark of excellence for audiologists.

Deborah Hayes, PhD, Board Certified in Audiology, PASC; Edwin Harless, PhD, Board Certified in Audiology; and Angela Pond, AuD, Board Certified in Audiology, will begin three-year terms in January. They recently shared their thoughts about working with the ABA and its certifications with me.

"I have chosen to advance the concept of board certification from the ABA because I believe that the ABA certification awards the highest standards for the audiology profession," Dr. Pond said. "In addition, the ABA Board of Governors is constantly striving to elevate those standards and will continue to ensure that ABA Board Certification means excellence in audiology."

"I'm excited to be elected to the board for another term," Dr. Pond continued. "Working with those audiologists who hold board certification brings me into contact with the best of the best, and I think it was that concept that prompted me to run for a second term. My fellow board members are outstanding; I truly believe in the mission and goals of the ABA; and the opportunity to work to further those goals was a compelling reason to run again."

Dr. Harless, who is returning to the board for another three-year term, also feels that ABA certification implies excellence in audiology. "Certification for audiologists implies a maturity of the profession that encourages the highest possible achievement in the provision of care to the population we serve."

He chose to run for the board for a second term because, as he said, "The ABA Board is comprised of an outstanding group of individuals who are dedicated to the ABA and who work together to make it a cohesive, positive, and active board."

"I serve as chair of the Eligibility, Recertification, and Reinstatement Committee, and I believe the ABA is set for much broader acceptance and growth. Within a few years, even more practicing audiologists will be seeking board certification as a professional goal," Dr. Harless continued. "I will continue to work tirelessly in this effort and am honored to have the opportunity to serve another term on the Board of Governors."

The third elected member, who is new to the ABA Board of Governors, is Dr. Deborah Hayes. She decided to run for the board because she has a great enthusiasm for certification in general and specialty certification in particular.

"I believe board certification is an important process for recognizing practitioners who maintain high standards of practice and currency with their profession," Dr. Hayes explained. "In addition, I enthusiastically supported the ABA's development of the Cochlear Implant Specialty Certification (CISC®) and Pediatric Audiology Specialty Certification (PASC®) as a way to identify practitioners with high levels of expertise and skill in those areas.

"For this reason, in addition to earning the PASC for myself, I have encouraged all of the audiologists with whom I work at Children's Hospital Colorado to seek this certification and many have done so," she continued. "I would like to see more audiologists pursue ABA certification and specialty certification, as appropriate. I view board and specialty certification as a win-win for the professional, the practice site, the patients, and the profession as a whole."

In the coming months and years, as the ABA continues to focus on expansion of audiology certifications and assessment-based training certificates, the organization will benefit greatly from the contributions of Drs. Hayes, Harless, and Pond. Their guidance, expertise, and experience are greatly valued by me and everyone at the ABA, and I look forward to working with them!

John Coverstone, AuD, Board Certified in Audiology, is the president and a clinical audiologist with Sentient Healthcare, Inc. in New Brighton, Minnesota. He is also the current chair of the ABA Board of Governors.

Audiologists Speak Out!

By Doris Gordon and Lisa L. Hunter

At the AudiologyNOW!® 2015 and Council of Academic Programs in Communication Sciences and Disorders CAPCSD conferences this past spring, the Accreditation Commission for Audiology Education (ACAE) held interactive sessions with conference attendees instead of lecture presentations. Questions that had been written and discussed by the ACAE board over the past year (2014–2015) were distributed to participants in each session for their input and insights.

Some questions revolved around why accreditation/education are foundations for the growth of the profession, why audiologists should stay ahead of the curve, neglected aspects of audiology that needed to be addressed, evidence that audiology is up to par, and how we could prevent complacency—essentially, how can ACAE make a difference in the effort to strengthen the profession?

The candid responses reflected many of the same comments that ACAE found in the findings and results of its 2013 stakeholder survey. We will note these similarities as we go along.

In this article, we emphasize two compelling areas that the participants voiced. The first—a compilation of sobering items that pinpoint neglected areas in audiology education and practice. The second—a focus on the future-looking view that audiologists stated, in response to two questions: "How can audiology stay ahead of the curve?" and "How can we avoid complacency in audiology education?"

Area One—Audiology Education and Practice

In our review, this is what we found:

Foundational and Diagnostic Management

Attendees expressed comments that in 21st century education and practice, each area cited below should be *enhanced* in the didactic and clinical settings.

- Vestibular assessment and management in programs and practice
- Knowledge in balance disorders, e.g., falls and risks
- Knowledge and diagnostic management in several biomedical components, such as pharmacology, genetics, neuroscience, and tinnitus
- Evidence-based research/literature to provide to students in didactic and clinical education and to use when treating patients

Professional Issues/Areas in Need of Strengthening

Attendees identified a need for better communication, especially between academic programs and affiliated clinical sites.

The distinct issues mentioned were:

- Business management skills in academic programs throughout the United States
- Professional communications, report writing, spontaneous writing, detail-oriented presentations, and problem-solving
- Basic science exposure in undergraduate education
- Audiology pre-AuD requirements in curricula throughout the United States
- Student outcomes
- Knowing the expectations from preceptors training students and, conversely, preceptors knowing an academic program's expectations for students in the clinical setting
- Ongoing communication with preceptors
- Producing and owning our own research
- Qualified faculty to teach students, i.e., PhDs especially with clinical experience
- Costs related to the purchase of important equipment for teaching and treatment
- Education regarding use of audiology assistants
- Uneven administrative structures throughout the United States where audiology programs are located, i.e., in schools of medicine, health sciences, or graduate arts

Another Important Issue Identified

These areas and others were also identified in the stakeholder survey's findings and results. Thus, in 2014, and today in 2015, these same findings and results continue to be expressed.

Finally, in the recent peer review, "Call for Comments," for ACAE's proposed and revised standards, similar points were raised. What do these consistent "comments" from our national stakeholder survey, peer review, and focus groups tell us? The authors suggest two thoughts for serious consideration:

1. It is in the interest of every audiologist to listen to remarks made by their peers and, subsequently, act on them, and
2. Health-care and education arenas are being transformed as we speak, and if audiology is to be an autonomous provider and a rigorous doctoring profession, we need to demonstrate continuing dedication to excellence in our education and practice models

The best way a profession can prepare its graduates for the future is to strengthen its educational base across the board, i.e., its educational standards. ACAE is committed to making this happen.

Area Two—Recording and Analyzing Two Questions

As discussed earlier, the faculty who attended the focus groups provided an honest critique of the state of education, but also identified numerous improvements that needed to be made.

In the question regarding how to stay ahead of the curve, many ideas surfaced: accepting excellent students, keeping up with the latest technology, changing audiology education to keep abreast of new trends, keeping licensure laws updated to conform to practice, and having competent, practice-ready audiologists upon graduation. An analogy was made to law schools—not memorizing laws, but thinking like lawyers, which is similar to audiologists engaging in critical thinking instead of performing isolated procedures.

Learning leadership skills, as well as writing and delivering presentations for professional audiences, were considered high priorities in staying ahead of the curve and also appeared among responses in other questions. In addition, there were statements about three- or four-year programs and the efficacy of the accelerated ones. Although this remains a controversial subject, it is still too early to evaluate the pros and cons.

In the responses to the question regarding avoiding complacency, one participant asked: "How satisfied are we with how things are currently done, i.e., with faculty who are teaching in the class and also working in the clinic?" One wondered from this response if some faculty were out of touch with what was happening in busy clinical practices throughout the country. Also, many participants were curious about how business management and processes were taught to students. There was consensus that academic programs were not sufficiently preparing graduates in business and management.

Other important suggestions that arose included to:

- Promote teamwork across training programs and clinical sites
- Develop peer reviews across training programs and clinical sites.

- Hold case presentations on a regular basis with participation by both research and clinical faculty
- Consider whether a single accreditation body is possible for unification of audiology
- Keep up with continuing education units

Conclusion

All of the comments we received across our stakeholder survey, peer review of our draft standards, and focus groups were extremely valuable. We believe that

- Every important suggestion should be incorporated into program curricula
- Updated ACAE standards will include the significant statements made for today's programs and the future
- *Programs throughout the United States should be standardized, meaning that a national competency level in standards must exist for all students in all programs*

ACAE wants to thank all those audiologists who participated in these meetings and added meaningful insights into what the future of education for students should and will be. In the next issues of *ACAE Corner*, we will discuss the finalized standards, incorporating this important input and peer review.

Doris Gordon, MS, MPH, is the executive director of ACAE, and Lisa L. Hunter, PhD, is the scientific director of audiology at the Cincinnati Children's Medical Center in Cincinnati, Ohio, and the chair of ACAE.

MiSLAM Is a Grand Slam for Inspiring Future Audiology Leaders

By Kate Marchelletta

The issues facing our profession today are challenging. To confront these issues successfully, we need innovative, competent leaders who are skilled in our field and dedicated to pursuing creative and inventive solutions. The question then becomes how do we cultivate these leaders? For the Michigan Academy of Audiology (MAA), the answer seems to be, at least in part, by engaging and investing in our students.

Annually, the MAA hosts the Michigan Student Leaders in Audiology Meeting (MiSLAM). This meeting was developed to bring together doctor of audiology students from around Michigan to recognize and promote leadership in the field of audiology. Each of the AuD programs in the state nominates three outstanding students and a faculty member to attend. The students and faculty members learn about state and national advocacy issues, educational considerations, and leadership skills. Speakers from across the country, with a wide variety of backgrounds, share their expertise and perspective on leadership and advocacy with the group.

This year, MiSLAM 2015 was held on October 14, and a total of nine students and three faculty members from across the state attended. The program focused on leadership building, legislative updates, and issues in audiology education. The MAA was pleased to welcome speakers from many different areas, including Kate Thomas, director of payment policy and legislative affairs for the American Academy of Audiology; Gail Whitelaw, PhD, past president of the American Academy of Audiology; Virginia Ramachandran, PhD, AuD, clinical education coordinator at Wayne State University and current American Academy of Audiology board member; Brad Stach, PhD, founding member and past president of the American Academy of Audiology; and myself, Kate Marchelletta, AuD, current advisor of the national Student Academy of Audiology (SAA).

For states interested in planning a similar meeting, the MAA typically seeks out donations and sponsorships to help defray the cost of the event. This also gives audiologists, individual practices, and manufacturers the opportunity to invest in students. In many cases our speakers, though nationally recognized, have ties to Michigan, so it may be advantageous to seek out audiology leaders within your home states to serve as speakers. In other cases, the MAA searches for speakers who are known to be experts in their subject areas. Past speakers at MiSLAM have been very gracious and excited to present to the group, recognizing this type of meeting as an opportunity to support the personal and professional growth of future leaders of the profession.

After attending the meeting, many of these students go on to volunteer for national committees, become leaders of their local SAA chapter, spearhead letter-writing campaigns to their legislators, and serve on the MAA board as student liaisons. The students and faculty leave the meeting with a better understanding of the issues facing our profession, as well as an excitement to serve.

Past attendee Rita Hofmann of Wayne State University wrote, "This experience led to a greater awareness and insight into some of the local and national legislative issues surrounding audiology, some of which directly affect me, such as the Praxis examination. This experience also allowed me to meet several students from surrounding programs. It gave us the opportunity to get to know each other better and potentially work together toward common goals through combined efforts of our SAA chapters. Through MiSLAM, I have been inspired to become a more active participant in leadership roles, to stay educated on issues affecting our profession, to advocate for our profession, and to reach out to students other than the ones in my program."

Another past attendee, Chynna Frana of Western Michigan University wrote, "MiSLAM really gave me the desire to advocate for audiology as a graduate student and in the future as an audiologist. [The meeting] really fired me up this year! You just have to be motivated to stand up for your profession and I think MiSLAM gives you that motivation."

What started five years ago, as an attempt to more actively engage and develop future leaders in the profession, has turned into a sought-after opportunity for many students in the state. The MAA has also found that investing in future audiologists is a direct investment in the future of the MAA, as well as the American Academy of Audiology, and the profession of audiology in general. The MAA understands how difficult it can be to encourage members to get more involved at the state level and thought that by sharing this example and highlighting the success of the MiSLAM meeting, we would encourage other states to establish similar opportunities for students within their states.

Kate Marchelletta, AuD, is the externship coordinator for Henry Ford Health System and audiology clinic coordinator at Wayne State University.

Erratum: National Audiology Awareness Month Poster

We would like to clarify a statistic printed on the 2015 poster, *Myth vs Fact: The Truth About Hearing Loss*. The statistic regarding hearing loss being the third most common health problem in the United States, should have been more accurately presented identifying that "hearing loss is a chronic health problem in the United States among the aging population."

The poster and statements are part of our public relations efforts to recognize that hearing loss is an important health concern. Given this perspective, we would think that most individuals would interpret the statement, in light of the two other health factors displayed in the chart (i.e., heart disease and arthritis), as pertaining to the geriatric population. However, we do recognize that this is not explicitly stated. We appreciate your understanding.

New Members of the American Academy of Audiology

Alora Anderson, AuD

Stephanie Bourn-MacDonald, AuD

Mohamed Elwany, AuD

Nishat Fatima, AuD

Samar Khaddam, AuD

Katie Kirleis, AuD

Pamela Reynolds-Klocke, AuD

Margarida Serrano

Michael Thompson, AuD

Katrien Vermeire, PhD

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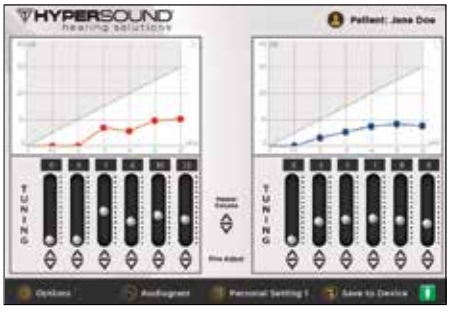

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