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Collaboration with Other Disciplines

ALTERNATIVES TO CALORIC TESTING
Exploration of the VNG Battery

ELECTROPHYSIOLOGY, DOLPHINS, AND ADVICE
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<table>
<thead>
<tr>
<th>Page</th>
<th>Section Title</th>
<th>Summary</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Telehealth: The Great Equalizer</td>
<td>Smartphone peripherals such as otoscopes, hearing testing, electrocardiogram, stethoscopes, ultrasound, and remote patient monitoring are helping to enable less visit-centric health care, better continuity of care, and increased communication with patients.</td>
<td>Samantha Kleindienst Robler, John Kokesh, Susan D. Emmett, Philip Hofstetter</td>
</tr>
<tr>
<td>24</td>
<td>Blast Exposure and Auditory Processing</td>
<td>Collaboration with other disciplines is strongly indicated when working with military Veterans, particularly those patients with histories of exposure to high-level noise, blasts, or head trauma. Audiology should be a part of the interprofessional treatment team.</td>
<td>Frederick J. Gallun, Elizabeth G. Haley, Lindsey E. Jorgensen, and Sheila R. Pratt</td>
</tr>
<tr>
<td>36</td>
<td>Party Like It’s 1999</td>
<td>Two decades ago, leaders in audiology came together for a special issue of <em>Audiology Today</em> to write predictive articles on the future of audiology. Now at the start of 2020, some of the original authors agreed to revisit what they wrote, and reflect on which notions were most fortuitous, and those which haven’t yet been realized.</td>
<td>Bre Myers</td>
</tr>
<tr>
<td>48</td>
<td>Alternatives to (Not Substitutes for) Caloric Testing</td>
<td>Our understanding of vestibular physiology and the ability to evaluate multiple sensory organs at multiple speeds has advanced, but these tests are still rarely available in most settings. This article explores the role of, and alternatives to, the components of the standard VNG battery, with focus on caloric testing.</td>
<td>Alan L. Desmond and Brady S. Workman</td>
</tr>
<tr>
<td>60</td>
<td>Making Waves: Electrophysiology, Dolphins, and Advice</td>
<td>When asked about his extensive career, Dr. Burkard tells Bre Myers about his recent research focused on dolphins and the way the start of his career still helps him today.</td>
<td>Bre Myers and Bob Burkard</td>
</tr>
<tr>
<td>70</td>
<td>Opinion Editorial: Otolaryngology and Audiology in a Direct-Access Future</td>
<td>Otolaryngologists and audiologists serve important roles in hearing and balance health care. The audiologists' pursuit of direct-access and practitioner status is not an effort to expand their scope of practice or disrupt an otolaryngologist's role in hearing and balance health care.</td>
<td>Christopher Spankovich</td>
</tr>
</tbody>
</table>
EDITORIAL MISSION
The American Academy of Audiology publishes Audiology Today (AT) as a means of communicating information among its members about all aspects of audiology and related topics.

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.

Send article ideas, submissions, questions, and concerns to Erin C. Schafer, editor-in-chief, at dr.erinschafer@gmail.com.

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Incorporating Cochlear Implants into Audiology Practice
Moderated by Sarah Sydlowski, AuD, PhD
Friday, April 3, 2:30-4:30 pm
Convention Center, Room 244
The American Academy of Audiology promotes quality hearing and balance care by advancing the profession of audiology through leadership, advocacy, education, public awareness, and support of research.

The American Academy of Audiology Office
Main Office
11480 Commerce Park Drive, Suite 220, Reston, VA 20191
Phone: 800-AAA-2336 | Fax: 703-790-8631

American Academy of Audiology Management
Executive Director
Tanya Tolpegin, MBA, CAE | ttolpegin@audiology.org
Vice President of Public Affairs
Kitty Werner, MPA | kwerner@audiology.org
Vice President of Communications and Membership
Amy Miedema, CAE | amiedema@audiology.org
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Senior Director of Business Development
Dina Santucci | dsantucci@audiology.org
Senior Director of Government Relations
Susan Pich | spich@audiology.org
Director of Membership and Student Academy of Audiology
Rachael Sifuentes, MA | rsifuentes@audiology.org
American Academy of Audiology Foundation
Sarah Christensen | schristensen@audiology.org
American Board of Audiology
Andrew Stafford | astafford@audiology.org
Accreditation Commission for Audiology Education
Andrew Stafford | astafford@audiology.org

Editor-in-Chief
Erin C. Schafer, PhD | dr.erinschafer@gmail.com
Associate Editors
Sumitrajit Dhar, PhD
M. Samantha Lewis, PhD
Bre Myers, AuD, PhD
Christopher Spankovich, AuD, PhD
Executive Editor
Amy Miedema, CAE | amiedema@audiology.org
Managing Editor
Katie Felix
Art Direction
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Marketing Manager
Amber Werner
Editorial Assistant
Kiersten Valko
Director of Digital Communications and Content Strategy
Margaret Collins, CAE, PMP
Advertising Sales
Eric Gershowitz | eric.gershowitz@mci-group.com | 410-584-1938

EX OFFICIOS
Tanya Tolpegin, MBA, CAE
Executive Director
American Academy of Audiology
ttolpegin@audiology.org
J. Riley DeBacker
President, Student Academy of Audiology
rileydebacker.saa@gmail.com

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Implementation Science—
Moving Guidelines into Practice

Implementation science is the study of methods to promote the adoption and integration of evidence-based practices into routine health care. Clinicians can be at different points along a continuum in terms of readiness to change practices. The continuum moves through (1) pre-contemplation, (2) contemplation, (3) preparation, (4) maintenance, and (5) relapse, hopefully settling in maintenance. Sound familiar?

We think about these stages with our patients every day and we design interventions based on where the patient finds themselves at a moment in time. We know where our patients are on this continuum by listening to them. We can often pinpoint where our colleagues are on this continuum if we listen.

As we are faced with a variety of disruptors in hearing health care, including the impending availability of over-the-counter (OTC) hearing aids, we must ask ourselves: What differentiates us from direct-to-consumer devices and/or online audiological services? The answer: Customization.

Evidence-based practice allows us to provide customization in hearing health care. This starts with the customization of a solution through the measurement of hearing, lifestyle, and communication needs—the physical customization of the device.

Acoustic customization is accomplished by putting a microphone in the ear canal to measure the output of the hearing aid so an audible signal is achieved across frequency and input level. The treatment (intervention) for hearing loss is audibility.

Currently, the most efficient way to verify if you have achieved audibility based on the patient’s hearing and ear-canal acoustics is to perform real-ear aided measures. Colleagues in the “contemplation” stage of evidence-based practice often say, “there is no evidence that using real-ear measures is a better treatment.” That is because real-ear measures are not a treatment. Audibility is the treatment. Real-ear measures are just currently the fastest, most accurate way to verify that you’ve achieved audibility. Finally, we offer the important customization of orientation, auditory training, and follow-up.

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their devices. People understand the need for customization when it comes to their health care and communication needs. We need to make sure we are providing customization that cannot be accessed elsewhere; that is evidence-based practice and that is what we bring to the table.

Does the Academy have a responsibility to empower members to provide evidence-based care? Absolutely. We also need to extend the same consideration we would with our patients. We need to meet people where they are and offer customized solutions.

I encourage you to figure out where you are on the continuum (Contemplating change? Ready to change? Relapsed?) in your areas of practice and join us at AAA 2020 + HearTECH Expo in a way that will move you forward. You will find learning labs, featured sessions, hands-on pavilions, industry support, and colleagues everywhere who can help you on your professional journey.

Catherine Palmer, PhD
President
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Paint for the Profession, sponsored by Starkey, will be back in NOLA! The Student Academy of Audiology (SAA) invites all attendees to help create an audiology-themed mural to be donated to a local community center.

Published January 15

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University of Oregon neuroscientists have shown that a person’s hearing can be assessed by measuring dilation of the pupils in eyes, a method that is as sensitive as traditional methods of testing hearing.

Published January 23

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Does your practice pride itself on giving patients the royal treatment? You may be pleased to learn that the Queen has opted to wear hearing aids to address her hearing loss.

Published January 17

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March 10–11
Meeting
British Cochlear Implant Group and British Society of Audiology Meeting
Nottingham, United Kingdom
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March 30–31
Meeting
8th Belgrade Balance Forum
Belgrade, Serbia
www.bbf.rs

April 1–4
Meeting
AAA 2020 + HearTECH Expo
New Orleans, Louisiana
www.aaaconference.org

April 22
Web Seminar
eAudiology—Cultural Competency for LGBTQ Population
www.eAudiology.org

April 6–8
Meeting
Mississippi Speech-Language-Hearing Association Annual Continuing Education Conference
Biloxi, Mississippi
www.mshausa.org/conference

May 21–23
Meeting
13th International Tinnitus Research Initiative (TRI) Conference
Vancouver, British Columbia
canadianaudiology.ca

The Academy has released a new Clinical Guidance document. The document describes recommended practices for the assessment of auditory function in children.

Published February 3

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TELEHEALTH
THE GREAT EQUALIZER

BY SAMANTHA KLEINDIENST ROBLER, JOHN KOKESH, SUSAN D. EMMETT, AND PHILIP HOFSTETTER
geographical distance and provider shortage in the state of Alaska make access to specialist health care, such as audiology, difficult. To address this challenge, Alaska has developed a homegrown telehealth network that connects small rural community clinics to specialists. Pre- and post-operative care, management of otologic disease and hearing loss, hearing aid programming, and newborn hearing screening follow-up are a few examples of telehealth-based services provided by audiologists in remote Alaska.

ROLE OF TELEHEALTH
Seventy-seven million people in the United States live in designated health professional shortage areas, with 62 percent in rural areas and 31 percent in non-rural areas (Health Resources and Services Administration, 2019). Shortages in health-care professionals prevent access to timely care. Access limits are further exacerbated by a lack of basic insurance coverage (Institute of Medicine, 2009).

Telehealth, or the use of medical information exchanged from one site to another through electronic communications to improve a patient’s health (American Telemedicine Association), is a powerful tool for delivering cost-effective access to state-of-the-art medical expertise. Telehealth is not a separate specialty but rather a method for delivering
Telehealth: The Great Equalizer

health care, and if implemented well, can be the great equalizer in access to medical care across the population.

THE PROVISION OF AUDIOLOGY SERVICES IN RURAL ALASKA REQUIRES CREATIVE SOLUTIONS TO MEET PATIENT NEEDS DUE TO THE LARGE GEOGRAPHIC DISTANCE BETWEEN THE PROVIDER AND THE POPULATION.

INFRASTRUCTURE IN RURAL ALASKA

Alaska is a state that mirrors the geographic and provider shortage challenges for the provision of health care in rural America. Approximately 75 percent of Alaskan communities are not connected to the road system, necessitating travel by plane to be seen by a specialist (Goldsmith, et al, 2004). The majority of Alaska is medically underserved, with approximately 370,000 (59 percent) residents geographically spread in remote locations across the state (Alaska Department of Health and Human Resources, 2010).

Population sparsity (1.2 per square mile) and a low ratio of doctors to residents further exacerbate delays in health-care delivery in Alaska. Because the majority of Alaska-based physicians are concentrated in more urban areas, the ratio of doctors to residents is worse in rural areas, with at least a 16 percent vacancy in physician positions outside of Anchorage, Alaska’s largest city (Alaska Physician Supply Task Force, 2006).

To address these challenges, Alaska built a robust telehealth-networked solution to improve access to care. One of the largest telehealth endeavors in the world is the Alaska Federal Healthcare Access Network (AFHCAN), the primary telehealth solution in Alaska since its implementation in 2001. AFHCAN is the result of a $30 million grant-funded project established in 1998, which started as an initiative by the Alaska Federal Healthcare Partnership and involved the collaboration of multiple organizations.

Since its implementation, this statewide telehealth network has been integrated into clinical practice in more than 250 clinics across the state. AFHCAN offers multiple medical devices for the collection of health-care data, such as video otoscope, audiometer/
tympanometer, dental camera, electrocardiogram, spirometer, vital signs monitor, scanner, and digital camera (FIGURE 1). This allows consultations to be created at the community level by local providers, such as community health aides (CHAs) (Golnick et al, 2012) and read remotely by specialists, such as audiologists, cardiologists, dentists, dermatologists, and otolaryngologists (Carroll et al, 2011; Hays et al, 2014; Kokesh et al, 2004, 2011; Patricoski, 2004).

Through telehealth, a specialist can manage care provided by CHAs in a village or expedite travel to a regional or state hospital if an in-person visit, imaging, or surgery is required, thus bypassing delays in receiving necessary health care.

APPLICATIONS IN AUDIOLOGY

Provision of audiology services in rural Alaska requires creative solutions to meet patient needs due to the large geographic distance between the provider and the population. Nearly all audiological care is triaged through a telehealth workflow to increase access and timeliness of care and reduce unnecessary travel (FIGURE 2).

In some rural programs, nearly half of audiology encounters are provided through telehealth. A combination of store-and-forward and real-time video teleconference (VTC) telehealth solutions are used to meet the otological and audiological needs of the population.

The rate of hearing loss due to otitis media is higher in the rural Alaska Native population compared to the general U.S. population (Barnes et al, 2010; Reed and Dunn, 1970; Singleton et al, 2009). This necessitates a large proportion of audiological care encompassing telehealth exchange with otolaryngologists (ENTs) located in Anchorage. The majority of otological disease management and surgical decision-making is

CASE STUDY #1

Bilateral Cholesteatoma

- 29-year-old male presented to audiology during a remote field clinic for draining ear
- Found to have large perforations with suspected cholesteatomas and maximum conductive hearing loss bilaterally
- Images, tympanometry, audiometric thresholds sent to ENT through store-and-forward telehealth
- Same-day response with significant concern and recommendations for timely surgical care
- Due to patient tentativeness to travel, VTC telehealth with ENT was scheduled to address patient concerns in real time
- Patient received surgical intervention at state hospital in Anchorage within weeks of initial telehealth referral

FIGURE 2. Workflow for the use of telehealth solutions in audiology/otolaryngology specialty care to increase access and timeliness of care and reduce unnecessary travel.
Telehealth: The Great Equalizer

done using store-and-forward telehealth, which is well validated (Kokesh et al, 2004, 2011; Patricoski, 2004).

Cases #1 and #2: Bilateral Cholesteatoma and Nasopharyngeal Carcinoma

Case studies #1 and #2 are examples of patients identified with ear disease who received high-level specialist care within hours of presenting to the clinic and went on to receive timely surgical and medical intervention.

Case Study #3: Sudden Hearing Loss

Audiology in rural Alaska uses store-and-forward telehealth for diagnostic audiology indicating medical management. The use of telehealth results in immediate treatment for conditions such as labyrinthitis or idiopathic sudden neurosensory hearing loss, which requires immediate medical care and timely treatment of steroids or scheduling of a magnetic resonance imaging (MRI) of the internal auditory canals to rule out the presence of neuroma.

Case study #3 is one example of a patient who received rapid diagnosis and treatment through provider-to-provider, store-and-forward telehealth.

Case Study #4: Unilateral Sensorineural Hearing Loss

In rural Alaska, completing follow-up for referred or missed

CASE STUDY #2

Nasopharyngeal Carcinoma

- 26-year-old male presented to audiology during a remote field clinic for decreased hearing and left-sided tinnitus

- Otologic hx included: Bilateral myringotomy and tubes (MT) as child and right tympanoplasty

- On exam, left serous effusion with immobile tympanogram and 30-40 dB drop in air conduction compared to baseline audiogram

- ENT consulted through store-and-forward telehealth and recommended for nasopharyngeal exam

- Seen one month later in an ENT field clinic at regional hospital and concern for mass noted on exam

- Flown to state hospital in Anchorage for imaging, biopsy, and left MT

- Patient received surgical intervention at state hospital in Anchorage within weeks of initial telehealth referral

- Found to have a malignant tumor and presented to Tumor Board with initial presenting symptom of serous effusion

- Currently managed jointly by oncology and ENT for nasopharyngeal carcinoma

CASE STUDY #3

Sudden Hearing Loss

- 45-year-old male presented to audiology with sudden change to left ear hearing following a cold

- Found to have a moderate to profound asymmetrical sensorineural hearing loss left and – 50 dB drop in hearing

- ENT consulted through store-and-forward telehealth with immediate treatment of Prednisone taper

- Repeat diagnostic hearing test at one-week follow-up indicated complete restoration of hearing
newborn hearing screenings is a challenge. One reason for this loss to follow-up is a family’s reluctance to travel for medical appointments.

To address this challenge and increase the percentage of children diagnosed before three months of age, the state partnered with rural audiology programs to implement the integration of audiology equipment into the existing AFHCAN system.

The increased availability of audiometric data in clinics through telehealth has brought follow-up rates to nearly 100 percent, with families keeping appointments because of the reduced travel burden.

Take case study #4, for example, where a mom was willing to complete a newborn hearing screening follow-up appointment if it did not require travel. This was due to the importance of subsistence to the way of life in rural Alaska. It was opening season for moose-hunting—an essential time for her family to be out hunting. The ability to do a telehealth appointment in her home community enabled timely hearing screening and follow-up for this newborn.

Case Study #4

**Unilateral Sensorineural Hearing Loss**

- Newborn born at 36 weeks, no complications with pregnancy/birth
- No family history of hearing loss but older siblings with history of recurrent ear infections and tubes
- Referred newborn hearing screening on automated auditory brainstem response (AABR) left ear, passed right ear
- Five weeks—completed VTC telehealth with audiology (otoscopy, tympanometry, distortion product otoacoustic emissions [DPOAEs], counseling) with overall results showing referred DPOAE screening (4 freq) left, passed right
- Seven weeks—completed AABR at regional hospital, which referred left with concern for otitis media; treated with course of amoxicillin per store-and-forward telehealth with ENT
- Eight weeks—completed diagnostic ABR at regional hospital, no sign of acute infection; ABR normal Wave V on click @ 20 dB nHL for right ear and no response left @ 90 dB nHL for the left ear; store-and-forward telehealth with ENT resulted in coordinated scheduling of binocular microscope exam, genetics, and ophthalmology
- Currently fit with amplification, and in discussion for cochlear implant

Case Study #5 Remote Amplification Fitting

Rehabilitation for remote audiology services also depends on the use of telehealth solutions to give patients the necessary ongoing

CASE STUDY #5

**Remote Amplification Fitting**

- 69-year-old male with mild sloping to profound sensorineural hearing loss bilaterally
- Seen in person by audiology in field clinic for diagnostic hearing testing, real-ear-to-coupler device (RECD) measures, and custom impressions
- Technology with extra supplies, accessories, tools sent to island via helicopter
- Worked with CHA using VTC telehealth to size and fit earmolds, tubing, placement of hearing devices, communication to patient, counseling, orientation, and validation measures (client-oriented scale of improvement, COSI) and Remote Desktop Connection for programming and first fit testing
- Completed all follow-up appointments using VTC and Remote Desktop Connection
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care. To meet this need, rural audiology programs have piloted programming over distance that uses remote-desktop and real-time VTC technologies to provide follow-up after amplification fittings.

This follow-up care can include everything from additional programming adjustments and counseling to guiding CHAs through earmold fittings. In the most isolated of environments, the use of telehealth for amplification is extended to remote technology and fittings.

Case study #5 is an example of a 69-year-old male located on an island only accessible weekly by helicopter when weather permits. Often travel to or from the island can mean weeks away from home. To provide audiological care to this elder without requiring him to leave the island, a combination of store-and-forward and real-time VTC telehealth solutions were used.

KEY COMPONENTS
There are many state-specific resources for professionals and organizations looking to incorporate telehealth solutions in their facilities (for example, www.telehealthresourcecenter.org). The formation of telehealth solutions must be based on a clear assessment of needs, the type of model for the existing environment, and the sustainability of the program, including reimbursement and market potential.

Implemented solutions should receive ongoing assessments, including service usage, quality of service and outcomes, as well as analyses of financial performance (Weinstein et al, 2008).

Key elements to the development and planning of any program include the following:

1. Use of appropriate equipment and

2. Well-trained, highly experienced personnel.

The most appropriate equipment in many cases, is mobile, or mHealth, technology that has universal access and a user-friendly interface. Furthermore, the technology must be able to integrate with the electronic health record.

It is essential that telehealth models be built upon continuity of care and connected care that allow for the management of complex and chronic problems. Lastly, the importance of the right care team and providers for the provision of services through telehealth cannot be underestimated. From thorough training to specialist expertise, the success of telehealth solutions comes down to the professionals that use them and the foundation of those relationships, whether it be provider-to-provider or patient-to-provider.

INNOVATIVE MODELS
While the use of telehealth solutions have been well used for clinical care, they recently are being used as a preventive tool following referred school hearing screenings. Using telehealth as a preventive tool to connect children to specialist triage is an innovative solution to address the long-standing problem of loss to follow-up after school hearing screening.

Mobile health (mHealth) screening and telemedicine referral to improve the effectiveness of the school-based hearing screenings and the referral process in remote communities served by Norton Sound Health Corporation is being evaluated in a randomized trial involving 1,481 children in northwestern Alaska (Emmett et al, 2019; Emmett et al, 2019b). This ongoing trial has implications for the use of telehealth for prevention across Alaska and in other remote communities worldwide.
The use of telehealth solutions in health care has the potential to increase access to care for underserved populations. Despite broad adoption, existing barriers include state-specific boundaries, such as licensure and insurance laws and regulations. Furthermore, while coverage by Medicaid and Medicare has historically been limited, there is growing recognition by the federal government of the role of telehealth in increasing access to health care.

Opportunities for telehealth solutions are also expanding as new technologies emerge and consumers drive the market. Smartphone peripherals, such as otoscopes, hearing testing, electrocardiogram, stethoscopes, ultrasound, and remote-patient monitoring are helping to enable less visit-centric health care, better continuity of care, and increased communication with patients.

Samantha Kleindienst Robler, AuD, PhD, is the director of audiology at Norton Sound Health Corporation in remote Northwest Alaska.

John Kokesh, MD, is in practice at the Alaska Center for ENT clinic in Anchorage, Alaska.

Susan D. Emmett, MD, MPH, is an assistant professor of surgery and global health at Duke University (Durham, North Carolina), an otolaryngologist and public health expert who develops evidence-based solutions to address preventable hearing loss.

Philip Hofstetter, AuD, is the chief medical officer for Petersburg Medical Center, a critical access hospital in Southeast Alaska.
References


Collaboration with other disciplines is strongly indicated when working with military Veterans, particularly those patients with histories of exposure to high-level noise, blasts, or head trauma and who report symptoms consistent with post-traumatic stress disorder. Audiology should be a part of the interprofessional treatment team.

BY FREDERICK J. GALLUN, ELIZABETH G. HALEY, LINDSEY E. JORGENSEN, AND SHEILA R. PRATT
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Auditory problems are the most common service-connected disability (U.S. Department of Veterans Affairs, 2019) and the fourth leading cause of medical referral for Veterans of the United States military (McIlwain et al, 2008).

Although it is established that noise exposure is one of the major causes of hearing loss and auditory difficulties in Veterans, the recent conflicts (Operation Iraqi Freedom, Operation Enduring Freedom, and Operation New Dawn) have drawn the attention of clinicians and researchers in the Departments of Veterans Affairs (VA) and Defense (DOD) to another significant risk factor for listening difficulties: exposure to high-intensity blasts (Gallun et al, 2017).

Improvised explosive devices, rocket-propelled grenades, and mortars used in modern warfare produce incredibly powerful explosions with associated high-intensity noise. They also are responsible for some of the most serious injuries observed in the contemporary Veteran population.

In addition to limb amputations and traumatic brain injury (TBI), multiple parts of the auditory system also are susceptible to damage from these blasts. Subsequently, auditory injuries are the most common single type of injury consequent to blast exposure, resulting in tympanic membrane perforation, middle-ear, and/or cochlear damage (Gondusky and Reiter, 2005).

Gallun et al (2012) reported that U.S. Service members hospitalized after blast injury had a three-fold higher chance of abnormal performance on one or more tests of auditory processing relative to a control group matched in age and relatively minor differences in audiometric thresholds. Tests of competing speech and temporal processing were the most likely to be abnormal in this population.

Cognitive and Neuropsychological Factors

Listening requires cooperation between cognitive functions, such as attention and working memory, and neuropsychological factors, such as emotion regulation (Belanger et al, 2005). Dysfunction in one or more of these areas can
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manifest in auditory symptoms. For example, in some individuals, listening difficulties could be due to problems modulating attention between two competing sounds (Gallun and Jakien, 2019).

Some individuals may have global cognitive deficits that are most noticeable within the auditory domain, in part because humans rely on hearing to support other complex processes, such as speech perception and auditory language comprehension.

Research suggests that traumatic brain injury is reflected in difficulty comprehending complex language (Angeleri et al, 2008; Coelho et al, 2003). Sentence-level processing with attentional demands appears to be particularly vulnerable and sensitive to TBI (Salvatore et al, 2017). Damage to the brain consequent to blast tends to be diffuse. Furthermore, not only do sensory processing difficulties negatively influence quality of life, but similarly, negative emotional reactions to life situations and function can influence listening abilities (Callahan and Lim, 2018).

Although there have been no studies involving animals who have been exposed to blasts where the auditory processing ability or specific auditory-pathways were studied, two recent animal studies have been completed. Perez-Garcia et al (2019) found a relationship between post-traumatic stress disorder (PTSD) and mild TBI (mTBI) and Ratliff et al (2019) found damage to the amygdala. Auditory cortical and subcortical processing areas are connected to the amygdala, and this connection is responsible for emotional regulation. These connections are implicated in the development and modulation of auditory fear responses (Cambiaghi et al, 2017). This may explain why, for some patients with cognitive difficulties, hypervigilance and anxiety are causing, increasing, and/or co-occurring with auditory processing difficulties.

Innovative Approaches to Helping Patients

Appropriate diagnostic and rehabilitative care for these patients requires a team of clinicians with the collective expertise needed to address all factors that are likely to influence performance and perceived handicap.
heterogeneous and complex. For example, in Gallun et al (2012; 2016), the participants with a history of blast exposure were much more likely to perform abnormally on one or more test of auditory processing than were the control participants, but there was very little consistency in the tests most likely to reveal abnormalities.

Though the rates of PTSD were high in the participants in the 2016 study, very few performed abnormally on more than three of the five auditory processing tests used, suggesting that overall deficits in attention, vigilance, or motivation were unlikely to be solely responsible for the results. This variability does complicate our understanding of how blasts damage the auditory system, but it also makes it quite clear that many Veterans with positive histories of blast exposure will require support from multiple disciplines.

Appropriate diagnostic and rehabilitative care for these patients requires a team of clinicians with the collective expertise needed to address all factors that are likely to influence performance and perceived handicap.

Although interprofessional approaches are regularly used to diagnose and treat individuals with head injuries, audiology is not typically a core member of the interprofessional team. Clinical audiologists can make a substantive impact in the diagnosis, monitoring, and management of anyone with communication difficulties.

Audiologists can also help by educating other professionals about (1) the high rates of listening difficulties in this population, (2) the gains that can be made in addressing these difficulties, and (3) the potential for listening deficits to provide deeper insight into the overall picture of damage caused by blast exposure and other sources of brain injury.

**Future Directions**

Although there are barriers to identifying auditory dysfunction in people with mTBI, there are many approaches that show promise for the future. Peripheral dysfunction can be revealed by otoacoustic emissions even when pure-tone thresholds are not elevated (Job et al, 2009).

In terms of the central auditory system, auditory brainstem measures can identify decreases in neural synchrony (Bramhall et al, 2019) and behavioral tests of temporal,
spectral, and binaural sensitivity can reveal specific functional deficits (Mueller and Beck, 1987; Musiek et al., 2005).

In addition, there is evidence that speech-based tests can reveal damage to auditory brain areas (Mueller et al., 1987). In terms of visualizing the damage in an individual brain, advanced scanning technologies, such as diffusion tensor imaging, have been used to reveal abnormalities in white-matter connectivity (Asken et al., 2018).

The time, specialized equipment, and knowledge needed to administer the tests and interpret the results are all factors that keep these tests from being used in clinical settings. To address this, our group, working on a multisite VA rehabilitation R&D-funded grant, has implemented computerized versions of some of the most promising behavioral measures using simple graphical interfaces that make testing easier for both the clinician and the patient.

One example of this is the Portable Automated Rapid Testing (PART) system that was developed with a grant from the National Institutes of Health (NIH DC 015051) and is available for free on the Apple App store (Gallun et al., 2018). This app provides a calibration interface, as well as more than 12 basic tests that can be configured by varying any of several dozen parameters. This application has been used to collect research data on more than 600 participants in 12 different laboratories studying the effects of aging and hearing loss, as well as the development of children's auditory abilities.

PART has also been used in the classroom by more than 100 students. We are also using automated tests of auditory verbal working memory, auditory language processing, and executive function in our research with blast-exposed Veterans (McNeil et al., 2015; Zhen et al., 2019). Over the next few years, our teams intend to provide outreach and education to ensure that these research and educational tools can be transitioned smoothly into clinical testing devices.

Recent and ongoing research from our labs and those of our colleagues suggests that the range of tests and specialists involved in the treatment of brain injury should be expanded. Blast exposure often manifests as a series of complex symptoms that are not always apparent upon a cursory review. Identifying individual deficit patterns and generating a
responsive and effective treatment plan often requires multiple visits to a variety of specialists. Our labs are actively involved in both conducting the research studies to provide clinical evidence and developing the clinical tools needed to provide appropriate care for those who have “borne the battle.”

Frederick J. Gallun, PhD, is an associate professor in the Dept. of Otolaryngology/Head and Neck Surgery at Oregon Health and Science University in Portland, Oregon. He is also the chair of the Mentoring Core at the U.S. Department of Veterans Affairs Rehabilitation Research and Development National Center for Rehabilitative Auditory Research (NCRAR) at the VA Portland Health Care System.

Elizabeth G. Haley, AuD, is research coordinator of a large, multi-site study that investigates the relationship between blast exposure and hearing complaints in Veterans. She is pursuing a PhD at the University of Pittsburgh.

Lindsey E. Jorgensen, AuD, PhD, is an associate professor at the University of South Dakota and a research audiologist for the Department of Veterans Affairs Sioux Falls. She is a member of the Academy Board of Directors.

Sheila R. Pratt, PhD, is a professor in the Department of Communication Science and Disorders at the University of Pittsburgh in Pittsburgh, Pennsylvania. She also has a research appointment in the Geriatric Research Education and Clinic Center (GRECC) in the VA Pittsburgh Health Care System.

Acknowledgments

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References


Blast Exposure and Auditory Processing


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Marc Syversten
Sr. Manager
Hearing Aid Battery Technology
Energizer Holdings, Inc.
PARTY LIKE IT’S 1999
Two decades ago, leaders in audiology came together for a special issue of *Audiology Today* to write predictive articles on the future of audiology. Now, at the start of 2020, some of the original authors agreed to revisit what they wrote and to reflect on the notions that were most fortuitous, and those that haven’t yet been realized.
What a year 1999 was! With excitement and apprehension as to what would happen when the ball dropped and all four digits of the year rolled over to 2000. Some people were stockpiling batteries and canned foods, while others were busy prophesying on what was to come.

As for me, I was an undergraduate. My primary concern was how my friends and I were going to make a 24-hour road trip down to Florida to ring in the New Year at Phish’s Big Cypress Festival and make it back in time for the start of spring semester. Graduate school was a few years away, and I was blissfully ignorant of most of the professional turmoil.

Meanwhile, audiologists were wondering what was to become of the profession. The AuD was in its infancy and master’s level programs still dominated the academic arena. However, changes were on the way.

In October, a special edition of Audiology Today, edited by Jerry Northern, published predictive articles from leaders of the time. Twenty years have gone by and I thought it would be interesting if a few of those leaders could reflect on their original ideas. I am grateful that a brave few returned my email request. You will recognize the names, as they continue to be influential forces in audiology education, business, research, and practice. Enjoy!

Jerry Northern, PhD

Looking Back and Looking Forward

I remember well the uncertainty that surrounded the coming of the new millennium. Unfounded theories abounded about what would happen at midnight on December 31, 1999. However, in the midst of the anxiety leading up to the year 2000, audiologists generally held positive views of the future. At that time, the Academy was a mere 10 years old and we were concerned about turf wars, the AuD, and the effectiveness and inefficiency of hearing aid fittings. Although some audiologists expressed concern for the future of the profession, the promise of the growing population of baby boomers and seniors who would need our services gave us an optimistic view of the coming years.

The past 20 years for me have been a blur of rapid changes that I never could have predicted. We now take for granted technologies that we couldn’t have imagined in the year 2000. Our clinical-practice behaviors have been driven by unexpected turns and disruptive upheavals: one-stop hearing aid fittings, cochlear implants on 12-month-old deaf babies, streaming all forms of content to hearing aids, incredible visual speech technologies, automated audiometry, computer-directed hearing aid adjustments performed thorough the telephone. Who would have predicted those things in 1999?
Looking back is easy; looking forward—not so much. We still have ample problems ahead of us. How do we standardize our clinical practices to ensure high standards of care? Is there a role for aural rehabilitation? What about the exorbitant cost of AuD study versus mediocre starting salary levels? Are we becoming more technicians than professionals? What happened to clinical auditory research?

Will the progressively invasive warehouse hearing aid sales and new over-the-counter (OTC) hearing aid rules dilute our customized contribution to hearing-aid dispensing? How can we expand our limited pool of audiologists to meet the growing demands for our services? And, will we ever, as independent free-standing professionals, totally divorce ourselves from the influence of the American Speech-Language-Hearing Association (ASHA) certification?

Nonetheless, the future is bright. We bring a unique set of skills and attitudes toward helping persons with hearing impairments. The public marketplace will, no doubt, shape and direct our future directions. Who knows what new technologies will bring to our practices?

Twenty years later, it is still our challenge to make the public aware that we are the professionals who can best service their hearing needs. I know we are making progress because when I tell someone I am an audiologist, instead of saying, “What’s that?”, they put their hand behind their ear and, with a smile say “... ya’ mean like, huh?”

JAMES W. HALL III, PHD
LOOKING BACK TO 1999
In my 1999 *Audiology Today* article “Y2K: Clear, Inevitable and Fundamental Changes,” I was careful to refrain from predicting pie in the sky improbable developments for the profession. The opening sentence in the article attests to this caution: “No one expects the profession of audiology to undergo a sudden metamorphosis on January 1, 2000. None of us need to stock our double-walled sound booths with a supply of food, many bottles of our favorite beverage, and a pile of audiology journals in preparation for the end of our profession as we know it.” However, I did make some predictions that, looking back with almost 2020 vision, were reasonably accurate.

Thinking of some of my young, bright, energetic, and highly motivated audiology colleagues (including a few of my students), I commented in the article that “I’m sleeping better these days because there is an ever-growing cadre of ‘future career audiologists’ ready to begin ‘caring for America’s hearing’ and actually the ‘world’s hearing’.”

These audiologists are now among the leaders in the profession. As the first AuD programs began to appear in 1999, I commented about how
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thousands of new doctoral-level and career-minded audiologists “can only strengthen the profession, while also providing incentive for another generation of promising prospective students to enter audiology.” This too has come to pass.

Finally, even as many technology experts warned of a worldwide computer-based apocalypse, I listed the various ways computer technology was rapidly and profoundly enhancing and expanding clinical audiology services, from identification and diagnosis of infant hearing loss to intra-operative monitoring and vestibular assessment. The impact of computer technology on audiology clearly exceeded all of our expectations. Now, 20 years later, I remain equally optimistic about the future of audiology.

LISA L. HUNTER, PHD

WAKE-UP CALL: ARE WE SUCCEEDING AT EVIDENCE-BASED PRACTICE?

Twenty years ago, when I was young and wrinkle-free, looking forward to a bright future, I wrote a column titled: “Education: Even More Important in the 2000s.” I offered only one prediction: “technology will continue to make our lives ever more complex, not more simple.” And it has.

Most of us are now carrying around a smartphone all day long that tracks our every move and keeps us in contact with friends and family all over the world. It can do all manner of amazing things including sound-level meter measures, hearing tests, otoscopy, and can even serve as a personal amplification device with noise cancellation. Those smartphones have made our lives a lot more convenient, but also much more complex. Now that I am looking at our “progress,” this is a wake-up prediction for the next 20 years.

Twenty years ago, I predicted that our profession would slowly evolve into a doctoral profession. Boy, has it been slower than I expected in some ways. While the vast majority of audiologists now have first-degree AuDs or distance-learning AuDs, we are not, as a whole, practicing like doctors. Our culture has not evolved enough, to our own and our patients’ detriment. This likely affects our earning potential, public perception of audiology, and most important, patient outcomes.

As an educator, I regularly ask my students what they are doing in externships. And the shocking truth is that they do not get to see or do best practice as regularly as they need to. When I ask how many have been doing real-ear measures, few hands go up. What about speech-in-noise testing? Maybe a couple have done it once or twice. Okay, how about the new auditory steady state response (ASSR) tests? Nope. Only in their classes. Are they using best practice otoacoustic emission (OAE) measures? How about aural rehabilitation? Outcome measures? Only a few, and not routinely. Are they
using audiology assistants? Not really. What? Really?

By and large, these students are witnessing audiology practices similar to what I saw 30 or more years ago. That means pure-tone thresholds only up to 8 kHz, speech-reception threshold (SRT) and speech-in-quiet (often monitored live voice), 226-Hz tympanometry, hearing aids fit using “first fit” without real ear or outcome measures. Even worse, deferring to physicians for follow-up decisions and audiological treatment decisions. This is unacceptable for a profession that has made the transformation to a doctoral degree that costs well over $100,000 to obtain. We are not doing right by our students or our patients if we continue to practice as if it was 1999 or earlier. Educators all over the country report the same situation; it is not unique to Ohio.

Now to be fair, there are many successes in the realm of newborn screening, cochlear implants, vestibular practice, tinnitus management, and patient-centered care. More than 97 percent of babies are now screened at birth and referred for diagnostics. If they receive timely hearing aids, cochlear implants and/or sign language, their outcomes are extremely good. But when we carefully look at our screening follow-up numbers, less than half of those babies receive a timely diagnosis from an audiologist AND early intervention.

My hopes for the next 20 years? We are now at a pivotal moment in our field. Health-care providers and payers are starting to understand that untreated hearing loss is a public health concern. The Academy, ASHA, and ADA are working together on legislation. Let’s capitalize on this positive news. When we provide the best, evidence-based care, our patients and our professional colleagues will understand that hearing care is vital for our patients’ quality of life. What we do matters, and we should be proud to do it right.

DENNIS VAN VLIET, AuD
BACK TO THE FUTURE: WHERE ARE WE NOW?

In 1999 I was mid-career with more than 20 years behind me as a clinician. I decided to address a potential 2026 class of new AuD graduates.

I smiled as I read over my article from that publication. I naively predicted that holographic imaging technology would be commonplace. I’m not sure what I had in mind, but it sounds pretty entertaining. Similarly, I predicted that we would be employing physicians by 2026 since they would be having a hard time with reimbursement. I should have had better future goggles!

It also turns out that I was stretching a bit when I described a national consolidation of educational programs that resulted with a mythical California School of Audiology and four other world-class programs in the United States. We are not there, and I should
have foreseen the huge problem of the student loan crisis as well.

What I was right about was the fact that technology and other systemic changes in hearing assessment and remediation do not serve as a substitute for counseling. Yes, YouTube videos are helpful, but they aren’t a substitute for the face-to-face addressing of the multiple issues that our patient population faces. There is justified concern about changes in our profession brought about by technology, consolidation, and changes in the delivery system of products. However, I have no doubt that we will adapt and I am optimistic that we will be able to do so by developing new and better approaches to hearing care.

Quoting myself from the past for our future:

“Maybe you will become famous, maybe you won’t. Maybe you will provide services to kings and movie stars, maybe to the poor. Respect them all and provide the gift of hearing in the best way that you can. Don’t forget the counseling.”

BRENDA RYALS, PHD

THE NEXT CHAPTER

In the 1999 special issue of *Audiology Today*, I was invited to write my thoughts about audiologists of the 21st century. The discovery of hair-cell regeneration was 11 years old, and my thoughts revolved around how that discovery would progress and how audiologists of the future might be involved. To that end, my predictions were that treatments involving hair-cell regeneration or restoration would become a reality and that we would have available to us sensitive and more specific diagnostic tests to guide candidacy selection for those treatments. Technically, I was wrong on both counts—but I’m not giving myself an “F.” We are only 20 years into the 21st century, and the advances toward these treatments since 1999 have been tremendous!

While biochemical or pharmaceutical treatments of sensorineural hearing loss have not come to pass, we’ve made tremendous strides in identifying the molecular and genetic triggers for hair-cell regeneration or replacement in mammals. In fact, there are at least three drugs under evaluation in either in Phase I or II (safety and efficacy) human clinical trials that target hair-cell regeneration or restoration. That doesn’t mean we will have a pharmaceutical “cure” for sensorineural hearing loss tomorrow (only approximately 10 percent of Phase I trials make it successfully to market), but I think it does mean that we are looking at “when” and not “if” this treatment will work.

As for more specific diagnostic tests, unfortunately, I don’t believe we’ve made remarkable strides in this area. We continue to have great objective tests for the loss of sensory or neural cells, but we lack more specific
tests that relate, for example, to the endoco-chlear potential and/or synaptic junctions. Recent discoveries in animals with inner hair-cell synaptic loss (synaptopathy or hidden hearing loss) are driving current research efforts to find new tests or combinations of current tests that can specify synapse loss in humans. Such efforts will certainly help in the future identification of appropriate candidates for pharmaceutical interventions involving hair-cell regeneration/restoration.

The title of my 1999 article included a reference to a Gary Larson cartoon about “Chapter Nine” of a medical textbook for students of veterinary medicine. The chapter listed a page full of medical ailments, with only one option for treatment: shoot. I suggested that audiologists were faced with a similar dilemma whenever they made the diagnosis of sensorineural hearing loss—our only treatment option was amplification.

I will go out on a limb now and say that I continue to believe we will have more options for treatment in the 21st century and that our diagnostic tests will improve. I stand by my statement from 20 years ago: The “Chapter Nine” for audiology students of the 21st century is bound to be much more interesting and a whole lot more challenging!

Dave Fabry, PhD

PREDICTIONS: TWO DECADES IN REVIEW

Upon further review of my “millennium” predictions from 1999, I realize now that I should have predicted that I would have significantly fewer “outer” hair cells, and those that remain would be very gray! Regarding my audiology predictions, my record is mixed. By my count, I achieved around a 70 percent to 80 percent “hit rate.”

1. AARP is a much stronger lobby group due to the aging baby boomers and their Chief Medical Officer, Charlotte Yeh, is a strong advocate for the role of the audiologist in brain health as means to “disrupt aging.” Oh, and another difference is that now I am an AARP member (for the discounts).

2. Neural networks and artificial intelligence (AI) are now used widely in hearing aids to improve performance and adjust hearing aid signal processing.

3. Adaptive beamforming arrays and remote microphones are capable (to the degree that the hearing loss allows) of augmenting reality for hearing aid users so that they can outperform their normal-hearing counterparts in certain noisy listening environments. But people still don’t use them enough!

4. Telemedicine is easier to use than ever and yet clinicians have not adopted it widely as a means to combat commoditization.
of their role in hearing health care. I did mention, however, that telehealth could serve as a mechanism for monetizing audiology services within an over-the-counter environment.

5. Sadly, we have not yet moved beyond the audiogram as the basic building block of defining hearing loss, yet.

6. Audiologists and ENTs are still working collaboratively (mostly), and while cochlear implants have increased in popularity, implantable middle-ear devices and hair-cell regeneration have not replaced conventional amplification.

7. Chris Campbell represents Indiana House District 26 and serves as the ranking member of the Government and Regulatory Reform Committee. Although I got that right, patients do not (yet) have direct access to audiology services. But we have made progress.

8. We have many more than 50 AuD programs, some of which reside in colleges of liberal arts, but many more are housed in the health sciences.

9. Sadly, we lost David Cyr shortly after this article was published, and Bob Brey and Neil Shepard are now retired. Awareness for the importance of healthy hearing and balance
has increased dramatically. Hearing aids are now capable of fall detection, and balance training provides an important opportunity for audiologists to serve the needs of the millions who struggle with balance disorders.

10. The Academy, the American Speech-Language-Hearing Association (ASHA), and the Academy of Doctors of Audiology (ADA) have once again discovered that it is better to provide a unified front toward legislative agendas for audiologists and have signed on to support proposed legislation (HR 4056: Medicare Audiologist Access and Services Act of 2019). Unfortunately, world peace has not yet been achieved, and cold fusion (what’s that?) was never scientifically proven.

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<th>Jerry Northern, PhD</th>
<th>Lisa L. Hunter, PhD</th>
<th>Brenda Ryals, PhD</th>
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<tr>
<td>Academy Founder and Former Editor-in-Chief of Audiology Today (1994 – 2008) Professor Emeritus, University of Colorado School of Medicine</td>
<td>Scientific Director for Audiology in the Communication Sciences Research Center at Cincinnati Children’s Hospital Medical Center Professor of Otolaryngology and Communication Sciences and Disorders at the University of Cincinnati</td>
<td>Editor-in-Chief of Ear &amp; Hearing Professor Emerita in Communication Sciences and Disorders at James Madison University in Harrisonburg, Virginia</td>
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<tr>
<td>James W. Hall III, PhD</td>
<td>Dennis Van Vliet, AuD</td>
<td>Dave Fabry, PhD</td>
</tr>
<tr>
<td>Academy Founder and Chair of the Accreditation Commission for Audiology Education Professor, Osborne College of Audiology at Salus University in Elkins Park, Pennsylvania, and in the Department of Communication Sciences and Disorders at the University of Hawaii in Honolulu, Hawaii</td>
<td>Immediate Past Chair and Founding Member of the American Board of Audiology Clinical Service Provider in Orange County, California</td>
<td>Former Editor-in-Chief of Audiology Today Chief Innovation Officer, Starkey Hearing Technologies</td>
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I can’t wait to see what the next 20 years bring for audiology—perhaps hair-cell regeneration really will happen! I want to thank all of the original contributors and especially thank those willing to revisit this idea. As for me, while I have no idea what the future will bring for audiology, I do believe that we are (at least partly) in control of our destiny. We are still headed in the right direction, but the journey is far from over.

Bre Myers, AuD, PhD, is an assistant professor at the Osborne College of Audiology, Salus University, in Elkins Park, Pennsylvania, and an associate editor for Audiology Today and www.audiology.org.

Reference

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Alternatives to (Not Substitutes for) Caloric Testing

BY ALAN L. DESMOND AND BRADY S. WORKMAN

The videonystagmography (VNG) test battery has changed little since its introduction more than 60 years ago. This article explores the role of, and alternatives to, the components of the standard VNG battery, with particular focus on caloric testing.
The standard electronystagmography/videonystagmography (ENG/VNG) exam, first described 80 years ago, has been around for about 60 years. The recording techniques have improved, but the tests are the same. Our understanding of vestibular function and methods to evaluate the vestibular ocular reflex (VOR) also have improved, but our profession still relies primarily on VNG testing to determine vestibular function. Let’s take a critical look at this standard of care.

The Test Components
The four main components of VNG testing include the following: (1) examination for gaze and spontaneous nystagmus, with and without visual fixation, (2) oculo-motor assessment (including saccade, smooth pursuit, and optokinetic tracking), (3) positional testing, and (4) caloric testing. This article focuses primarily on the role of, and alternatives to, caloric testing. But, first, let’s briefly consider the other test components.

Gaze and Spontaneous Nystagmus
The ability to view for nystagmus under infra-red assisted VNG goggles is a great advantage over any other technique. Nystagmus associated with a persistent labyrinthine asymmetry typical of vestibular neuritis, labyrinthitis, or a Meniere’s episode is often not visible through direct viewing due to suppression by visual fixation.

Several alternatives to suppress visual fixation have been suggested, but none are nearly as effective as placing the patient in total darkness with eyes open. Fresnel lenses have been used as a substitute, but Guidetti et al (2006) demonstrated that only about 40 percent of patients with nystagmus visible under VNG goggles had visible nystagmus with Fresnel lenses. Other techniques have been suggested, such as shining a penlight in the eye or having the patient stare at a large piece of paper, but these are not as effective at eliminating visual fixation as VNG goggles (Newman-Toker et al, 2009).

Oculo-Motor Assessment
The primary purpose of performing the oculo-motor assessment is to examine motor control of eye movements modulated by the cerebellum. Historically, this information was used to make judgments about cerebellar and brainstem function. Abnormalities were often vaguely described as “central” dysfunction. This test battery was in place long before magnetic resonance imaging (MRI) existed. Today, it is unlikely that a diagnosis of cerebellar, brainstem, or “central” disorder would be made without the benefit of MRI. Still, oculomotor testing plays a role in screening for cerebellar disorders and identifies eye-movement abnormalities that might affect the interpretation of vestibular tests.

Positional Testing
Benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disorder (Battacharyya et al, 2017) and, as such, is the most common cause of positional nystagmus. The main benefit of the VNG exam as it relates to BPPV is that Dix-Hallpike and Supine Roll testing are part of the test battery.

While one does not necessarily need the video goggles to make the diagnosis of BPPV, one must complete positional testing to reach a diagnosis of BPPV. Although positional testing under video goggles offers great benefit for replay and review of nystagmus associated with BPPV, this nystagmus is typically visible
to the naked eye and does not require VNG goggles in every case. Some non-BPPV positional nystagmus is only visible with goggles for the same reason some spontaneous and gaze nystagmus is only visible with goggles. It is also beneficial to be able to review, replay, and document other forms of positional nystagmus.

These recordings are useful for (1) review, as the examiner is often attending to the patient in real time at the expense of focusing on the transient nystagmus, (2) replay for patient education, and (3) documentation for second-opinion and billing purposes.

Caloric Testing

The caloric test has long been used to explore labyrinthine asymmetry. The idea being that, if we stimulate each ear equally, we should get symmetric nystagmus responses to the stimulation. If the responses are asymmetric, that may explain the dizziness symptom that brought the patient to us in the first place. To make this assumption, one must have symmetric stimulation and symmetric anatomy.

Past studies of repeated irrigations on the same subjects demonstrated variations in responses of up to 24 percent between ears (Proctor et al 1986). Variations in temporal bone anatomy can also impact the symmetry of caloric testing, even with normal labyrinthine function (Carpenter et al, 2018).

The vestibular ocular reflex (VOR) works across a range of head speeds in multiple planes. Making judgments about overall VOR function based on caloric results has been proven incorrect. Goebel and Rowdon (1992) determined that two-thirds of patients with absent caloric responses

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**FIGURE 1.** Gain as low as .50 Hz is considered normal at the frequency of .04 Hz.

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Rotational Chair Summary

VOR Summary

<table>
<thead>
<tr>
<th>LH (Left Horizontal)</th>
<th>CW Rotation Weaker (%)</th>
<th>CCW Rotation Weaker (%)</th>
<th>deg. (degrees) Lead</th>
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<td>Phase</td>
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bilaterally have normal VOR function at 0.5 Hz. Of those patients with a clinically significant unilateral caloric hypofunction, 95 percent have normal VOR function at 0.5 Hz. The caloric test provides no information about VOR function in the range of normal head speeds and no information about the functional impact or state of compensation of any caloric abnormality.

The VOR doesn’t have to be very efficient for speeds below 0.5 Hz to provide visual stability, as there are alternative gaze-stabilization strategies available at these slower speeds. At speeds below 0.5 Hz, the VOR is augmented by voluntary ocular tracking, so gain is progressively lower with slower head movements.

At higher speeds, only a functioning VOR allows for gaze stabilization with head movement. With higher speeds of head movement, the gain of the VOR is near 1.0 (otherwise known as “unity gain”), where the velocity of eye movement is equal and opposite of the head movement (see FIGURE 1).

MEASURING ROTATION
Audiologists are familiar with the unit-to-measure frequency, Hertz or Kilohertz (KHz), from completing hearing evaluations. We know that a 5 KHz sound is a sound wave oscillating at 5,000 cycles per second. In the world of vestibular-function testing, we are most commonly discussing the range between 0.5 Hz and 5 Hz. A 1 Hz head movement would equate to one 360-degree rotation in one second.

For the purposes of describing VOR function (which in real life involves back-and-forth head movement, as opposed to continuous rotation), we will discuss Hz as sinusoidal motion with one cycle including a head movement from center to right shoulder, then smoothly to left shoulder, then back to center. A 1 Hz cycle would take one second to complete. A 0.5 Hz cycle would take two seconds to complete.

A 5 Hz cycle would involve moving the head from center to right shoulder, to left shoulder, back to center, 5 times in one second. This may seem very fast, but this is a speed of head movement frequently encountered during daily activities. Viewing the graph below (FIGURE 2), considering the

![FIGURE 2. Sinusoidal waveforms of low, medium, and high frequencies.](image_url)
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recording window time to be one second, the top cycle is 0.5 Hz (two cycles), while the bottom tracing is approximately 7 Hz.

The caloric test stimulates the labyrinth through temperature change, altering the density of the inner ear endolymph, which causes fluid movement and a temporary asymmetry in labyrinthine activity. This alters the activity at the level of the vestibular nuclei, creating a sensation of angular movement, analogous to a head movement of around .003 Hz. That would mean a cycle as described above would take more than 240 seconds (4 minutes). This would be considered a non-physiologic speed, as the VOR is not really efficient or needed at this exceedingly low speed.

The graph by Dumas et al (2017) (Figure 3) provides a visual of the natural range of head movements, the normal VOR gain range at each frequency, and the frequency range associated with various vestibular function tests. Tests such as rotational chair and active head-rotation tests such as the vestibular autorotation test (VAT) and the video head impulse test (vHIT) provide gain, phase, and

**FIGURE 3.** Commonly used vestibular function tests and the frequency range that they are assessing. Image courtesy of Dumas et al, 2017.
vHIT has several benefits including lower equipment cost, minimal test time, and low stimulation for the patient.

OTHER TESTS
Rotational chair, while being a very effective test of VOR function, suffers from high equipment cost and marginal reimbursement. Active head rotation, while having lower equipment cost and requiring little test time, suffers from poor test-retest reliability. In contrast, vHIT has several benefits including lower equipment cost, minimal test time, and low stimulation for the patient, which makes associated nausea less likely and provides reliable lateralizing information regarding the high-frequency VOR. Currently, vHIT does not have a code or value assigned for billing purposes and the patient can be directly billed market value.

Several articles have been written regarding the sensitivity of vHIT as a substitute for caloric testing. This is not necessarily helpful because the two tests are not trying to answer the same question. Calorics examine the low-frequency VOR, while vHIT examines the high-frequency VOR. It is important to note that a patient can have normal VOR function for one frequency range and abnormal function for another frequency range.

Sometimes this disagreement can even be beneficial in diagnoses. It has been reported that the pattern of a unilaterally abnormal caloric response and normal ipsilateral vHIT is frequently found in patients with Menieres disease (McCaslin et al, 2014; Hannigan et al, 2019). This is an observation that we have made clinically, as well. vHIT is more relevant than caloric testing in determining functional impact of a vestibular disorder.

Cross-Check Measures
Skull vibration is a fast, reliable method of identifying significant labyrinthine asymmetry (Dumas et al, 2017). The premise is that vibration induces global, therefore symmetric, bilateral vestibular
stimulation. If both labyrinths register the stimulation equally, then nystagmus is not elicited. If a significant labyrinthine asymmetry exists, nystagmus is generated, beating toward the ear registering greater excitability.

In a labyrinthine hypofunction such as encountered in vestibular neuritis/labyrinthitis or vestibular schwannoma, the nystagmus beats away from the lesion. In lesions associated with increased labyrinthine response, such as superior semicircular canal dehiscence syndrome (SCDS), the nystagmus beats toward the lesion.

Skull vibration involves low equipment cost, as it can be completed with a simple handheld massager. One does need access to VNG goggles, though, for optimal testing. Skull vibration is very fast, repeatable, and not affected by state of compensation. Even if caloric testing is performed, skull vibration can provide information that may allow a cross-check of caloric findings, potentially reducing the number of irrigations required. At this time, there is not a billable insurance code for skull vibration and the patient can be billed directly at market value.

Caloric Testing as the Gold Standard?
Both vHIT and skull vibration have been examined for sensitivity and specificity using caloric results as the gold standard or benchmark. A gold standard is most commonly agreed upon as a measure or technique that is widely used with high accuracy and sensitivity. Caloric testing may meet the first standard in that it is, or at least has been, widely used. We disagree that it is the most accurate or sensitive test possible to identify patients with symptomatic vestibular dysfunction.

Other Considerations
In 2010, Medicare reimbursed $98.80 for bilateral bi-thermal caloric testing. Current reimbursement for the same test is around $41.00, an almost 60 percent reduction in payment.

“Caloric testing in the USA is dying out,” according to the website dizzinessandbalance.com, run by Dr. Tim Hain. The site’s section on VNG testing begins with: “The reason is that doing caloric testing is generally a financial loss for the outpatient medical facility, because it takes a long time (often more than an hour), it requires an expensive piece of machinery, it requires a highly trained individual to do the test, and because many large insurance companies and Medicare pay very little for the caloric test. If you are fortunate enough to find an outpatient facility that still does good quality calorics, you are lucky!”

Caloric testing has the potential to point some clinicians in the wrong direction in determining the exact source of symptoms. For example, a patient complaining of brief positional vertigo, even with a negative Dix-Hallpike test, is more likely suffering from BPPV with a negative examination than from a chronic labyrinthine asymmetry, despite what caloric test results show.

A patient with transient postural lightheadedness and imbalance is more likely suffering from orthostatic hypotension than from a mild caloric hypofunction that was detected. Of course, an existing vestibular hypofunction has the potential to exacerbate any imbalance or dizziness symptoms associated with postural lightheadedness and BPPV may be developed secondary to a pre-existing vestibular injury. This is where a thorough case history and a review of pertinent medical conditions and medications are necessary.
**Better Alternatives**

Calorics are the most unpleasant, time-consuming part of the evaluation for all involved. Technology has changed. We have better alternatives that are faster and easier for examiner and patient and have more functional relevance.

Calorics are still important for some patients but, in our opinion, dependent on symptoms, you can safely skip them with many patients.

Alan L. Desmond, AuD, is director of the Balance Disorders Program at Wake Forest Baptist Medical Center and a faculty member at the Wake Forest University School of Medicine. He is the author of Vestibular Function: Evaluation and Treatment (Thieme, 2004) and Vestibular Function: Clinical and Practice Management (Thieme, 2011). He serves as a representative of the American Academy of Audiology at the American Medical Association.

Brady S. Workman, AuD, is a staff audiologist in the Balance Disorders Program at Wake Forest Baptist Medical Center. He is a co-editor of the Dizziness Depot at Hearing Health and Technology Matters.org.

References


When asked about his extensive career, Dr. Burkard tells Bre Myers about his recent research focused on dolphins and the way the start of his career still helps him today.
I recently had the opportunity to do an email “interview” with Robert (Bob) Burkard, PhD, a professor at the University at Buffalo in Buffalo, New York. His most recent project caught my attention at the American Auditory Society meeting in March 2019, and he agreed to take some time and answer a few questions on his work. Dr. Burkard’s voluminous list of publications fills 13 pages of his curriculum vitae and spans 39 years.

Dr. Burkard, thank you for taking time out of your schedule to answer a few questions for Audiology Today. Can you highlight some of your favorite lines of study over your career?

I see my research as one main line of research that has focused on the effects of various stimulus manipulations to elicit the auditory brainstem response (ABR), which has over time involved different collaborators (including students) and animal species. I have, on occasion, veered off my ABR path and done some auditory steady-state-evoked response (ASSR) studies, but those (in my view) are just overlapping ABRs at the high modulation rates I have typically focused on. I have also had the opportunity to collaborate in a few functional imaging studies and some vestibular/balance work.

Taking a primacy and a recency perspective, I will bookend my research career to date and pick my doctoral research and my current bottlenose dolphin research as my favorite lines of research.

I went to the University of Wisconsin-Madison for my master’s and PhD in audiology. I received an amazing education in Madison. Bob Goldstein taught me about auditory-evoked potentials. Terry Wiley gave me a firm foundation in instrumentation and acoustic-impedance measures and Ray Karlovich
taught me acoustics. I still use this foundational knowledge in my research efforts. They gave me the tools I needed to have a research career.

I also interacted with the faculty in engineering and neurophysiology and prominent hearing scientists (e.g., Bill Rhode, Dan Geisler, John Brugge) took the time to educate me in areas such as auditory physiology and signals and systems. They taught me what I needed to pursue a career in auditory physiology and, without that knowledge, I would have been severely limited in establishing a research program.

After beginning my PhD program, a young pediatric neurologist (Kurt Hecox) took me under his wing and I was tasked with setting up a laboratory and beginning to do experiments in normal-hearing young adults studying the ABR. My dissertation work was studying human ABRs in response to stimulus manipulations including click rate, background masking noise level, and using high-pass subtractive masking to limit where in the cochlea the ABR could arise.

This was one of my favorite times in my career because Kurt Hecox gave me the responsibility of putting together a laboratory, an experience that has helped me set up laboratories as I have changed jobs. In addition, he set me on the path of studying the ABR to various stimulus manipulations that I have continued over the last nearly 40 years.

That takes me to my other favorite line of research—the one I am involved in currently. I’m investigating (mostly) the ABR in the bottlenose dolphin (Tursiops truncatus) to similar stimulus manipulations as performed in my human (and other terrestrial mammal) research. To me, the important part of a research program is the experimental questions asked, the animal species involved, and the folks you are working with.

I think the dolphins are interesting. The technical challenges of experiments with the underwater speakers and microphones—and the dolphins—are substantial. Finally, the people I am working with are great scientists and amazing human beings. The fact that this line of research gets me out of Buffalo to San Diego and I get to spend a few days on San Diego Bay is icing on the cake.

I thoroughly enjoy talking science with the people I’m working with, whether that takes place early in the morning while eating breakfast burritos, during data collection, or later in the afternoon over a beer. My San Diego collaborators have reminded me why I originally fell in love with doing research—it is about both the experimental question AND the collaborators.

It sounds like you were fortunate to have not just one, but a few, important mentors early on who helped shape your career. Who would have known that path would lead to work with marine life? Escaping to San Diego periodically to work with dolphins certainly sounds appealing. I know very little about the dolphins’ auditory system, except that they use echolocation. What are the similarities and the differences between the dolphin and human auditory system?

Both species are mammals, and the cochlea and auditory nervous system appear quite similar. I say appear, as bottlenose dolphins (like humans) are protected from invasive experimentation. What we know about their auditory
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system is limited, compared to what we know about mice and rats.

The neocortex (including the auditory cortex) of bottlenose dolphins is quite different from that of humans. Cortical differences are, no doubt, in part due to a very long evolutionary timeline separating the two species, as well as the fact that dolphins echolocate and humans do not.

When our mammalian ancestors came out of the ocean, the outer and middle ears evolved for hearing in air, rather than in water. The transfer function of the middle ear attempts to compensate from the ~30 dB loss in acoustic input when going from the low impedance medium of air to the high impedance medium of water.

When cetaceans decided that it was time to return to the sea, the outer and middle ears were not useful for underwater hearing. Thus, in dolphins, there is no external pinna, the ear canal is atrophic, and the middle ear is vestigial. The lateral aspect of the jaw appears to connect to the inner ear via fat pads, but this transmission pathway is not completely understood.

The nominal frequency range of hearing in humans is from 20–20,000 Hz. This, of course, depends on age and how intense the sound can be at the hearing extrema, not to mention that vibrotactile thresholds may likely be below several hundred Hz.

Bottlenose dolphins hear up to ~140 kHz and behavioral studies have shown responses below 1000 Hz. The dolphin inner ear is acoustically isolated from the rest of the skull. If I had to hazard a guess, I would suggest that the dolphins’ high-frequency hearing and the acoustic isolation of the cochlea evolved to enhance echolocation function.

I would imagine, then, that the dolphins’ evoked potentials may be similar, but not exactly the same, as humans. What does a dolphin’s evoked potential waveform look like in comparison to a human’s evoked potential waveform?

The human ABR is a series of five vertex-positive peaks with approximately 1 ms between peaks (e.g., a 4 ms I-V interwave interval).
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Waves II and IV are often challenging to identify, so we mostly look at waves I, III, and V. Perhaps because of our fat heads, thick skulls, or because we do not hear very well in the high frequencies, the human ABR peak amplitudes are typically less than 1 µV.

The prominent dolphin ABR peaks include positive waves P1, P3, and P4, as well as negative wave N5. The P1–P4 interwave interval to a click is on the order of 2 ms. Dolphin ABR peaks to higher-level click stimuli are typically several µV in amplitude, and may exceed 5 µV.

There appears to be one less positive peak in dolphins than humans, the interwave interval is smaller in dolphins than humans, and the amplitude of the dolphin ABR is larger than in humans.

It would be difficult to imagine that this line of research would have direct clinical applications. However, there are a few “animal electrophysiology” courses that focus on measuring thresholds, particularly in canines. There are also many occurrences of marine life, such as whales and dolphins, that beach themselves for unknown reasons, which some hypothesize could be attributed to sonic interference. How will your findings affect the field of audiology or zoology?

I try to do research that I find interesting and rewarding based on the scientific questions asked, not necessarily because the experimental results will ever be clinically relevant. I use my experience with human ABRs (and those of other terrestrial mammals) to guide some of the experimental questions I ask.

The results of these marine mammal studies are likely not generalizable to humans, but do inform us about the unique auditory system of the bottlenose dolphin. Our results address how to optimize hearing testing of toothed whales (a dolphin is a toothed whale). These stimulus optimizations in bottlenose dolphins include the use of chirps and optimal rates that can be used to obtain ABRs at a specified signal-to-noise ratio in the least amount of time.

There is interest in obtaining audiometric information on marine mammals in the wild (perhaps even stranded animals) to assess the possible consequences of man-made noise on their hearing abilities (and behavior). This would be difficult, if not impossible, using behavioral methods (it is way too time consuming to train the animals). In fact, there is now an American National Standards Institute (ANSI) standard related to performing hearing assessment using the ASSR (I wanted this to be ABR, but I lost that battle) titled “Procedure for determining audiograms in toothed whales through evoked potential methods.”

For audiology, where do you think the next new ideas or “breakthroughs” are going to come from, or where is the biggest knowledge gap?

There is nothing rarer in a scientific field than a new idea. What usually drives a field forward is the development of a new experimental technique that lets you study something that was previously very difficult (or impossible) to study. The ABR was a tool that allowed us to see the auditory periphery and brainstem in a new way. Otoacoustic emissions gave us
Making Waves: Electrophysiology, Dolphins, and Advice

a window into looking at cochlear micromechanics. Functional imaging made it possible to investigate (non-invasively) the brain’s response to sound.

On the physiological side of things, it would be great if we could find a technique to identify inner hair cell and type I afferent function and separate that from outer hair cell loss and strial changes resulting in a degradation of the endolymphatic potential. It would be game changing if we could record single-unit responses to sound, in the eighth nerve and central auditory nervous system, non-invasively.

I think we have a much better understanding of the auditory system than the vestibular system and hope that techniques are developed and refined allowing us to better diagnose end-organ-specific otolith and canal disorders. I like the emerging body of work on listening effort, as it gets us away from defining hearing loss on the threshold audiogram and moves us into the suprathreshold domain.

Pupillometry is proving useful for the study of cognitive effort and it will be interesting to see where that line of research leads us. Finally, the body of work on acoustic absorbance has led to the possibility of separating incident from reflected sound waves in a sound cavity, with the incident wave being quantified as forward sound pressure.

Coupler measurements of sound pressure ignore individual differences in the acoustics of the outer ear. Currently, there is nothing real about real-ear measures, as those measurements reflect the incident and reflected sound waves at the location of microphone placement, and that may (or may not) faithfully represent the sound pressure at the plane of the tympanic membrane.

The development of replicable measures of forward sound pressure paves the way for true real-ear measurement of sound pressure, which might lead to less variability (across normal hearing young adult subjects) in threshold and could make the audiogram a more sensitive measure of the true sensitivity of the auditory system.

Those are all interesting points to ponder. I hope our readers are encouraged to pursue some of them. To answer some of these questions and move the field further, we need inquisitive minds in people with grit and fortitude. Finally, do you have any advice to new researchers?

Do research on a topic that interests you. It is often challenging to get an experiment to work, to get a grant funded, and/or to get that article published. Unless you are passionate about doing your research, you will have trouble seeing the work through to completion.

Your collaborators are as important as your research question. It is often not possible to do research in isolation and, if you cannot do
it yourself, you will need to find collaborators. Sometimes those can be students and hired technicians who will basically do as you say. If you are working with other scientists, they will have their own views on an area of investigation, rules of publishing, and their own scientific and personal strengths and weaknesses.

Pick collaborators whose skill set complements your skill set. If you find yourself working with one or more collaborators and you are unhappy with that collaboration, communicate your reasons for your unhappiness. If you cannot work out your disagreement, end that collaboration and find some new folks to work with.

Periodically change the direction of your research. I am not talking about going from studying the ABR to working in aerospace medicine, but change things up. For example: change jobs, change the animal model you are using, change from normal-hearing to hearing-impaired subjects, or change collaborators.

Change is scary, but often rewarding. It is hard to be innovative after 20 or 30 years of studying exactly the same thing.

At the beginning of this interview, I mentioned some of the many mentors who helped me with my research career. Once you have begun your research career, and achieved some success, serve as a mentor for those with less experience than you.

These could be your own graduate students (if you are in academia) and this could also be someone you ran into at a meeting who was having some career challenges. You can listen and offer advice. The American Speech-Language-Hearing Association MARC (Mentoring Academic-Research Careers) program pairs graduate students, post-docs, and young faculty with more senior faculty. I have served as a MARC mentor and found it personally gratifying.

Dr. Burkard, thank you for taking the time and putting so much thought into answering these questions. I am hopeful that those who may be considering pursuing a career in research will be inspired. As for the rest of us thick-skulled humans, let this be encouragement that we can stay curious throughout our careers.

Robert (Bob) Burkard, PhD, is a professor in the Department of Rehabilitation Science at the University at Buffalo School of Public Health and Health Professions in Buffalo, New York.

Bre Myers, AuD, PhD, is an assistant professor at the Osborne College of Audiology, Salus University, in Elkins Park, Pennsylvania, and an associate editor for Audiology Today and www.audiology.org.
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IN A DIRECT-ACCESS FUTURE
Otolaryngologists and audiologists serve important roles in hearing and balance health care. The audiologists' pursuit of direct-access and practitioner status is not an effort to expand their scope of practice or disrupt an otolaryngologist’s role in hearing and balance health care.
The American Academy of Audiology (the Academy), the Academy of Doctors of Audiology (ADA), and the American Speech-Language Hearing Association (ASHA) are together seeking changes in Medicare rules. The changes proposed will allow Medicare patients direct access to audiology services without a referral from a physician and would reclassify audiologists as practitioners. Classification as practitioners would allow audiologists to be recognized by Medicare (i.e., reimbursed by Medicare) for the full scope of their state-defined licensure law. Notably, the Medicare Audiologist Access and Service Act (MAASA) delivers a uniform message from audiology organizations to Capitol Hill for the pursuit of enhanced patient access to audiological care.

MAASA would ensure that seniors and persons with disabilities on Medicare have access to a full range of hearing and balance health services provided by a licensed audiologist (see Table 1).

The American Academy of Otolaryngology-Head Neck Surgery (AAO-HNS) opposes direct access and status change to practitioners within the Medicare program (www.entnet.org/content/scope-practice-issues). The AAO-HNS argues to the Centers for Medicare and Medicaid Services (CMS) and members of congress that direct access and practitioner status for audiologists would...

“undermine the overall hearing health-care team...” and that “hearing and balance disorders are medical conditions that require a full patient history and physical examination by a medical doctor (MD) or doctor of osteopathic medicine (DO).” Further, the AAO-HNS opposes

### TABLE 1. Medicare Audiologist Access and Service Act (MAASA)

<table>
<thead>
<tr>
<th>WHAT THE BILL WOULD DO</th>
<th>WHAT THE BILL WOULD NOT DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adds a definition of “audiologist services” to Medicare. Authorizes audiologists to provide covered services that fall under their state scope of practice.*</td>
<td>Expand the audiology scope of practice*, e.g., allow for prescription or ordering rights.</td>
</tr>
<tr>
<td>Amends the Medicare definition of practitioner to include audiologists (similar to providers such as clinical social workers and clinical psychologists)</td>
<td>Change health benefits covered by Medicare such as inclusion of hearing aids.</td>
</tr>
<tr>
<td>Removes pre-treatment order requirement for audiology services.</td>
<td>Change Medicare provider status to physician or limited license physician at state level.</td>
</tr>
<tr>
<td>Allow audiologists to opt-out of the Medicare program.</td>
<td></td>
</tr>
</tbody>
</table>

*Scope of practice is defined by state audiology licensure law.
any legislation that would allow audiologists to independently diagnose or treat medical conditions associated with hearing loss.”

Let’s consider these concerns and other potential concerns voiced by our otolaryngology colleagues.

Undermine the Overall Hearing Health-Care Team

There is no evidence to support that direct access to audiology undermines hearing health care or increases risk for morbidity or mortality or missed diagnosis. The burden of proof is based on the preponderance of the evidence.

In a 2010 Mayo Clinic study, audiology and otolaryngology investigators examined the safety of audiology direct access for Medicare patients complaining of hearing deficits (Zapala et al, 2010). The electronic medical records of 1,500 Medicare-aged patients were reviewed, including test results, impressions, and management plans from audiology and otolaryngology departments. Data revealed no discrepant treatment plans recommended by audiologists compared to otolaryngologists in more than 95 percent of the cases. Further, no case was associated with significant mortality or morbidity. According to an otolaryngologist investigator, in 78 percent of the cases, only audiology services were necessary.

Outside of Medicare, many patients do have direct access to audiology, including our nation’s Veterans (since 1992), federal employees including members of the U.S. Senate through the federal employees health benefit plan, and many private insurance companies. No published data

<table>
<thead>
<tr>
<th>EAR PATHOLOGY</th>
<th>PREVALENCE</th>
<th>CASES/1,000,000</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otitis Media</td>
<td>4.5%</td>
<td>44,989</td>
<td>Lin et al (2009)</td>
</tr>
<tr>
<td>Ménière’s Disease</td>
<td>0.19%</td>
<td>1900</td>
<td>Alexander and Harris (2010)</td>
</tr>
<tr>
<td>Otosclerosis</td>
<td>0.06%</td>
<td>560</td>
<td>House and Cunningham, 2005</td>
</tr>
<tr>
<td>Sudden Hearing Loss</td>
<td>0.02%</td>
<td>200</td>
<td>Rauch (2008)</td>
</tr>
<tr>
<td>Vestibular Schwannoma</td>
<td>0.002%</td>
<td>17</td>
<td>Tos et al (2004); (Kshetry et al, 2015)</td>
</tr>
</tbody>
</table>

*Adapted from Zapala et al. (2010) and updated.
demonstrates that direct access to audiological services has any negative consequences for patient safety. Also, this legislation would not deny patients the option of seeing their physician first.

Hearing and Balance Disorders Require Physical Exam by a Physician

Hearing loss and balance disorders are medical conditions that have been managed by audiologists for decades. However, the vast majority (>90 percent) of hearing loss in the Medicare population is sensorineural (SNHL) related to noise exposure and age-related factors (Hoffman et al, 2017). Of course, hearing loss is not inevitable, rather a person’s genetics, medications, health status, and lifestyle contribute to SNHL with age.

Ear-related medical pathologies that are life threatening are low (see TABLE 2 from Zapala et al, 2010). Ultimately, the prevalence of such disorders is rare, which is why the Food and Drug Administration (FDA) in 2016 recommended removal of physician medical clearance for hearing aids.

In taking this step, the FDA cited a report by the National Academies of Sciences, Engineering, and Medicine (2016) that concluded...

“after weighing the rareness of the medical conditions, the incidence of hearing loss in adults, the widespread need for hearing health...”
Opinion Editorial: Otolaryngology and Audiology in a Direct-Access Future

care, and wide use of the medical waiver, there was no evidence that the required medical evaluation or waiver of that evaluation provides any clinically meaningful benefit.”

Concerns for medical pathologies such as a vestibular schwannoma (prevalence 0.002 percent or 17 per 1 million—Kshettry et al, 2015) or idiopathic sudden hearing loss (prevalence 0.02 percent or 200 per 1 million—Rauch, 2008) may be warranted, but the symptoms are commonly audiological in nature and well recognized by audiologists.

For example, audiology standards of practice guidelines and training regarding sudden hearing loss dictate referral to an otolaryngologist/physician (ASHA, 2018; Academy, 2012). The treatment options for these rare events are limited.

Yet, the new guideline on the management of sudden hearing loss published by the AAO-HNS indicates that commonly used steroid treatment is optional, as there is limited data for efficacy in randomized placebo-controlled trials (Chandrasekhar et al, 2019).

The recommendation of a medical evaluation does not adequately recognize audiologists’ training in hearing and balance anatomy and physiology, pathophysiology, differential diagnostics, treatment, counseling, and clinical decision-making.

Audiologists receive extensive didactic and clinical experience in recognizing the need for medical referral, including FDA and AAO-HNS referral recommendations (Steiger, 2005; Zapala, 2008; Zapala et al, 2010). Medical-referral consideration and competency is a required accreditation component for the Council of Academic Accreditation (CAA) and Accreditation Commission for Audiology Education (ACAE).

In contrast, most primary-care physicians (PCPs) complete a handful of lectures on hearing and balance anatomy/physiology, pathologies, and a possible two-week rotation or one-month clerkship in otolaryngology, if of interest for residency.

PCPs do receive substantial training in general areas of medicine and see hearing and balance issues in other rotations, but specific training on hearing and balance is limited, which may relate to low referrals to audiologists and otolaryngologists for hearing complaints.

Mahboubi et al (2018) reported that only 27 to 33 percent of patients with a complaint of hearing loss who visited physicians were referred to an audiologist or otolaryngologist.

No published data demonstrates that direct access to audiological services has any negative consequences for patient safety.
Other surveys reveal that only 14.6 percent of adults with hearing loss had a hearing screening performed by their PCP (e.g., tuning fork or whisper test) (Kochkin, 2009) and only one-fourth of PCPs were aware that cochlear implants can help restore or enable hearing in deaf children and adults (Wu et al, 2013).

Of the approximately 10,500 practicing otolaryngologists in the United States, only a small portion have obtained board certification in otology/neurotology (Hughes et al, 2016; Gantz, 2018). The rarity of serious ear disorders and surgical treatments for ear disorders has resulted in a workforce analysis that suggests a 10 to 15 percent oversupply of neurotologists/otolaryngologists in the United States (Vrabec, 2013).

Common and treatable ear complaints that do not require specialty training, such as otitis media, can be handled by most general otolaryngologists. Further, approximately 30 million Americans over 60 years of age have hearing loss (Goman and Lin, 2016) that is not medically treatable; this corresponds to nearly 70 percent of the 44 million Medicare beneficiaries. Patient safety is paramount, but so is patient burden, time, and cost. Others have highlighted that the need for an unnecessary physician visit for referral to audiology also

**TABLE 3. Red Flags for Referral to Physician**

<table>
<thead>
<tr>
<th>RED FLAGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perforation of eardrum or discharge/infection</td>
</tr>
<tr>
<td>Ear pain</td>
</tr>
<tr>
<td>Ear trauma or deformity</td>
</tr>
<tr>
<td>Sudden or rapid onset of hearing loss or aural fullness</td>
</tr>
<tr>
<td>Pulsatile tinnitus/myoclonic tinnitus/concerning unilateral tinnitus</td>
</tr>
<tr>
<td>Vertigo or significant history of falls</td>
</tr>
<tr>
<td>Conductive hearing loss, conductive pathology, or unexplained abnormal tympanometry</td>
</tr>
<tr>
<td>Significant asymmetrical hearing loss or asymmetrical speech recognition</td>
</tr>
<tr>
<td>Progressive or fluctuating hearing loss</td>
</tr>
<tr>
<td>History of ear-related disease or genetic condition</td>
</tr>
<tr>
<td>Concern for other medical pathologies: facial asymmetry, numbness, ataxic gait, headaches/migraine, difficulty speaking/swallowing, other dizziness, diplopia, and other neural deficits/concerns</td>
</tr>
</tbody>
</table>
has significant cost implications (Freeman and Windmill, 2018).

Lack of medical concerns for hearing loss and greater concern for untreated loss led to the passage of the Over-the-Counter (OTC) Hearing Aid Act of 2017, signed by the president on August 18, 2017. The OTC act requires the FDA to create and regulate a category of OTC hearing aids for adults with self-diagnosed mild-to-moderate hearing loss. So, you can go to Walmart to purchase hearing aids, but Medicare will not pay for you to see a graduate-trained audiologist for evaluation and management without a medical referral?

Direct access to audiologists is well supported by advanced audiology training, limited medical ear pathologies, minimal risks for compromised patient safety, inconsistent referrals from PCPs to audiologists or otolaryngologists for hearing-related complaints, and recognized cost savings.

Note: This is not meant to undermine the rigor of training and importance of our otolaryngology and PCP colleagues. When surgery for treatable ear disease is an option, otolaryngologists are incredible assets to the hearing and balance team. PCPs serve a critical role in health maintenance. However, the prevalence of medically treatable ear disease is very low compared to the very large population of persons with non-medically treatable SNHL. Direct access to audiology poses minimal risk and a more direct pathway to otolaryngology when needed.

AAO-HNS Opposes Legislation That Would Allow Audiologists to Independently Diagnose or Treat Medical Conditions Associated with Hearing Loss

The proposed legislation does not provide any expanded scope of practice, such as pharmacological or surgical treatment for ear disorders
or pathologies. Audiologists will simply be able to provide diagnostics for hearing and balance disorders, recommend non-medical treatment for these disorders (e.g., hearing aids, assistive listening devices, training, and follow-up), and make physician referrals when medically necessary.

The opposition to independently diagnose is a null point because, under our scope of practice, audiologists can already provide independent diagnosis of hearing loss and balance dysfunction and receive reimbursement by third-party payers including Medicare.

MAASA would not expand the audiology scope of practice or allow audiologists to independently diagnose or treat medical conditions outside our already state-defined scope of practice. Further, audiologists are not seeking designation as a physician. The legislation would recognize audiologists as practitioners consistent with nurse practitioners, clinical psychologists, and clinical social workers, and consistent with the audiology academic and clinical training.

Can audiologists handle such a responsibility? Yes. Audiologists already directly serve privately insured, federally insured, out-of-pocket, and Veterans Affairs patients. The literature supports that audiologists are trained to recognize necessary medical referrals. Even the FDA recognizes that delayed treatment of hearing loss with amplification and other audiological intervention outweighs the risk of missing life-threatening, ear-related disease. In addition, since 2008, CMS has already assigned audiologists the responsibility of determining medical necessity of diagnostic testing for Medicare beneficiaries.

In the United Kingdom, adult patients have direct access to audiology for hearing complaints in lieu of requiring otolaryngology referral. This pathway is well-supported in the literature. Two studies examined audiologist referrals for magnetic resonance imaging (MRI) to rule out retrocochlear pathology in cases of asymmetrical hearing loss and in tinnitus (Dawe et al, 2017; Fraser et al, 2015).

In these studies, audiologists streamlined the identification of retrocochlear pathology without compromised safety or efficacy. Similar results were observed with tinnitus patients who were referred directly to audiology (Davis et al, 2012).

In the United Kingdom, the majority of patients are referred by general practitioners with strict guidelines for otolaryngology referrals. Nonetheless, the U.K. system shows, that for most patients, audiologists can recognize red-flag symptoms (Table 3) and audiologists make appropriate medical referrals.

**Advantage Otolaryngology**

Otolaryngology colleagues might benefit from patient direct access to audiology. Most hearing and balance complaints are not medically treatable. For example, cochlear implants (CIs) are reserved for populations with severe to profound hearing loss; however, less than 1 percent of older adults meet CI candidacy guidelines (Lin et al, 2012). Even so, prior to implantation, many insurance companies require a trial period with traditional amplification.

Otolaryngologists are highly trained in performing surgeries and managing complex cases. Managing patients with gradual onset of untreatable SNHL and tinnitus is not effective use of their expertise. Streamlined practices, with direct access to audiology, could lead to cost savings for the patient and potentially improved practice and availability.
for otolaryngologists to perform surgery and higher-level services.

Conclusion

Otolaryngologists and audiologists serve important roles in hearing and balance health care. The audiologists’ pursuit of direct-access and practitioner status is not an effort to expand their scope of practice or disrupt an otolaryngologist’s role in hearing and balance health care.

The changes in the CMS definition of an audiologist would not allow audiologists to perform ear surgery or prescribe medications. The changes would simply allow patients direct access to audiology services without unnecessary burdens on the health-care system or the patient. Most hearing issues in the Medicare population are not medically treatable, go untreated, or eventually make their way to an audiologist after a series of referrals (a rationale for the FDA excluding the requirement for a medical waiver for hearing aids).

Even at that point, the services provided by an audiologist, outside of diagnostic evaluation with physician referral, are not covered by Medicare. Ultimately, the only change MAASA would likely bring is improved access and coverage of non-medical care for hearing loss and balance complaints.

Christopher Spankovich, AuD, PhD, MPH, is an associate professor and vice chair of research in the Department of Otolaryngology and Communicative Sciences at the University of Mississippi Medical Center in Jackson, Mississippi. He is also an associate editor for Audiology Today and www.audiology.org.

DISCLAIMER

This article represents the opinions of the author and not those of the American Academy of Audiology.

Postscript

The purpose of this article is to address concerns for patient safety and scope of practice in regard to the Medicare Audiologist Access and Service Act. The cost savings of direct access to audiology is an additional supporting factor that has been outlined by others (see Freeman and Windmill, 2018; Freeman and Lichtman, 2005; Dobson and DaVanzo, 2012).
Opinion Editorial: Otolaryngology and Audiology in a Direct-Access Future

HR 4618, “The Medicare Hearing Aid Act of 2019,” is a bill that seeks to amend the Title XVIII of the Social Security Act to provide coverage for hearing aids under Medicare Part B for patients with severe to profound hearing loss. The act recently passed the House. Without the recognition of audiologists as practitioners, there would be no providers to provide this benefit to Medicare recipients because the bill states that physicians and practitioners can bill for the devices and services. Physicians are always included, but audiologists do this work.

References

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FUTURE HUB

FEATURE PRESENTATION

Navigating the Future Together: Gaining a Clear Vision of Goals
Thursday, April 2, 4:00–5:00 pm

Moderated by Karl Strom, Chief Editor, The Hearing Review, this session will feature insights into the future of the field from top manufacturer CEOs.

Presenters: Brandon Sawalich, President, Starkey Hearing Technologies; Gary Rosenblum, President, Oticon; Eric Timm, President and CEO, WS Audiology US Wholesale; Tom Woods, President, ReSound; and Sandy Brandmeier, President, Sonova USA

APRIL 1–3, 2020 | www.AAAConference.org | New Orleans

*Held in conjunction with AAA 2020.
Across the country, the rising cost of tuition for audiology programs continues to permeate every decision a student and professional makes. This conversation is nothing new to us. Depending on whether the students attend a private or public university and have in-state or out-of-state residency, they take on an average of $10,000 a year for in-state tuition at a public university and up to $50,000 a year for tuition at a private university. Graduate school loans may take more than 30 years to fully pay off while maintaining a comfortable lifestyle. Students are desperate to find ways to decrease this burden, especially during their final externship year. Some students will only seek out paid externships, others may find a second job, and some might do both. Students and professionals alike are acutely aware of these financial concerns.

Audiology programs are reacting to the rising cost of student debt by offering creative solutions to lower costs in the final year, which can be broadly categorized as below.

**Full-Time Student Status**

Many programs are having externs maintain full-time status due to the several advantages it provides to students. Externs with full-time status maintain access to many student benefits, such as university student health insurance and scholarships. Unfortunately, this means students are paying full tuition and fees to their university, which they likely won’t visit until graduation.

Some programs have discounted or eliminated the university fees (gym, activity fees, etc.), recognizing the situation of final-year externs. Other universities still require
full-time students to pay fees, regardless of whether or not they can use campus amenities.

### Clinical Fees Only

Some programs only require students to pay for what they are using during their final year of school: clinic. The obvious benefit of this structure is to the students’ bank accounts and/or loans, as the student is required to pay less money to the university. Unfortunately, this can have unexpected disadvantages, including limitations in accessing university benefits, health insurance, and scholarships.

It may also impact student loan status, as the student is not considered a full-time student. Some universities recognize these limitations and have negotiated with their administrations to allow externs to be considered “full-time,” despite the reduction in tuition due to the unique audiology education continuum.

### Tuition Reduction

Other programs have used a standardized tuition reduction. One four-year program cuts tuition in half for its externs, while a three-year program reduces tuition by two-thirds. Some programs require a fee of approximately $2,000 a year or semester to maintain financial status with the university. Any financial reduction is a relief to the student extern, in comparison to paying full price.

These are just some of the creative ways in which programs are attempting
to make tuition more palatable and debt more manageable for off-campus externs. There are likely many other solutions in testing that should be shared with the academic community at large for the benefit of both students and programs.

To the clinical sites hosting, educating, and paying final-year externs: thank you for the essential service you are providing to the audiology community. Many externs are under a significant amount of financial stress when entering their final-year educational experiences.

Between tuition required at their home university and moving/living expenses at their externship site, students are often overwhelmed by the situation facing them their final year. With this in mind, there are several non-financial modifications an externship site could consider to provide flexibility for their extern.

1. **Allow flexibility in required hours.**

   Consider offering externs a flexible schedule to allow for extra responsibilities. Results of the 2018 Externship Survey conducted by the Student Academy of Audiology (SAA) found that 22 percent of externs have a second job (Lewis et al, 2019).

   The flexible schedule could be accomplished by lengthening certain clinical days (such as a 10- or 12-hour day) to allow for flexibility on other days (such as off completely or early on one day). While every extern may not opt for a non-traditional schedule, offering flexibility shows mindfulness and may also provide additional appointment times for patients.

   Keep clinical hours reasonable. Externs surveyed in 2018 revealed they worked an average of 40–49 hours per week, with some externs reporting more than 50 hours a week. While externs are there to be immersed for the culmination of their educational experience, working more than 40 hours a week can be extremely limiting to students who require another job and may also lead to increased student burnout.

2. **Evaluate responsibilities that may require out-of-clinic time to complete.**

   When delegating clinical projects or tasks, evaluate the roles of each team member and their current responsibilities within the clinic. Externs are often tasked with duties outside standard patient care and charting responsibilities. These often include opening booths in the morning, biologic checks and calibration, cleaning equipment in the evening, and checking in hearing aids, etc.

   These seemingly simple clinical tasks could be difficult for the extern to accomplish during the day and may require after-hours time for satisfactory completion. Thus, it is crucial to consider the extern’s current responsibilities before adding additional tasks.

3. **Make clinical projects and research optional.**

   Many externship sites have opportunities to participate in clinical research or clinical enhancement projects. While exciting for some students, these can serve as a burden to others.

   Clinical sites could consider flexibility in student research or project requirements.
Instead of requiring an independent research study to be completed during the externship, allow for partner research or a clinical enhancement project, such as organizing an everyday process instead.

4. **Gauge student load from their university.**
   Many universities require their students to participate in at least one online course during their externship year. Usually, these courses are grand rounds or case-based discussion courses and do not provide too much load to the extern. However, some students are required to take content courses or complete research/capstone projects during their final year, which can significantly affect externship responsibilities. Being aware of your extern’s requirements from the university may shift your expectations as a clinical supervisor.

**Conclusion**
The externship year provides valuable professional experience to enhance the academic and clinical skills learned throughout the graduate school experience. Tuition costs during the final-year externship often present a barrier to this learning experience, as some externs are forced to maintain a second job or live minimally to account for tuition and living expenses. Externship sites can consider flexibility with requirements, hours, and responsibilities to enable students to complete necessary requirements outside of the clinic. Professional well-being is vital for optimal success in any clinical environment, especially for student externs.

**DISCLAIMER**
This article represents the opinions of the authors and not those of the American Academy of Audiology.

Stephanie Tittle is the current president-elect of the Student Academy of Audiology (SAA) and a third-year student at the University of Texas at Dallas.

Liz Fuemmeler, AuD, the immediate past president of the SAA, is an audiologist at Hearing and Balance Specialists of Kansas City in Lee’s Summit, Missouri.

Amanda Demas is the current chair of the SAA Communications Committee and a second-year student at Washington University in St. Louis.

**References**


The National Health Interview Survey found that approximately 10 percent of U.S. adults had experienced tinnitus in the 12 months previous to the survey (Bhatt et al, 2016; Shargorodsky et al, 2010). This article reviews codes useful when providing tinnitus services. For clinical guidance, the interested reader is directed to the American Academy of Otolaryngology Head and Neck Surgery Clinical Practice Guideline for Tinnitus (Tunkel et al, 2014). Although tinnitus services and devices are billed to a variety of payers, this article focuses on guidance for filing claims for Medicare beneficiaries and appropriate coding based on procedures chosen at the discretion of the clinician.


The following diagnostic procedures are commonly used by audiologists in audiologic assessments for patients with tinnitus.

All codes presented in this section assume binaural procedures; if only one ear is tested, usage of the -52 Reduced Services modifier is recommended. As a reminder, under the description for 92557—Comprehensive

<table>
<thead>
<tr>
<th>CPT CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>92557</td>
<td>Comprehensive audiometry, threshold evaluation and speech recognition (92553 and 92556 combined)</td>
</tr>
<tr>
<td>92567</td>
<td>Tympanometry (Impedance testing)</td>
</tr>
<tr>
<td>92550</td>
<td>Tympanometry and acoustic reflex threshold measurements</td>
</tr>
<tr>
<td>92570</td>
<td>Acoustic immittance testing, includes tympanometry (impedance testing), acoustic reflex threshold testing and acoustic reflex decay testing.</td>
</tr>
<tr>
<td>92587</td>
<td>Distortion product otoacoustic emissions; limited evaluation (to confirm the presence or absence of hearing disorder, 3-6 frequencies) or transient evoked otoacoustic emissions, with interpretation and report</td>
</tr>
<tr>
<td>92588</td>
<td>Distortion product-evoked otoacoustic emissions; comprehensive diagnostic evaluation (quantitative analysis of outer hair cell function by cochlear mapping, minimum of 12 frequencies), with interpretation and report</td>
</tr>
</tbody>
</table>

By Richard Tyler, Anna Marie Jilla, and Susan Von Dollen
CODING AND REIMBURSEMENT

MEASURE #134: PREVENTATIVE CARE AND SCREENING: SCREENING FOR CLINICAL DEPRESSION AND FOLLOW-UP PLAN

Definition: For practitioners participating in the MIPS program, patients undergoing 92625: Assessment of tinnitus should complete a standardized depression screening tool. If applicable, a follow-up plan should be established and may include referral to a practitioner who is qualified to diagnose the condition and/or additional evaluation.

CPT CODE | DESCRIPTION
---|---
92625 | Assessment of tinnitus (includes pitch, loudness matching, and masking)

Positive screen for clinical depression using an age-appropriate standardized tool and a follow-up plan documented

Negative screen for clinical depression using an age-appropriate standardized tool, follow-up not required

Documentation stating patient has active diagnosis of depression or has diagnosed bipolar disorder by a physician or mental health professional, screening not required

Screening for clinical depression using an age-appropriate standardized tool not documented, patient not eligible/refuses to participate

No documentation of clinical depression screening using an age-appropriate standardized tool

Positive screen for clinical depression using an age-appropriate standardized tool documented, follow-up plan not documented, reason not specified

+ Denominator exception (partial points awarded toward quality score)
* Performance standard not met

For more information on scoring and reporting of MIPS measures, readers are encouraged to review resources from the Centers for Medicare and Medicaid Services (CMS) website (CMS, 2020).

Audiometry, threshold evaluation, and speech recognition—all four components (air- and bone-conduction pure-tone testing, speech-recognition threshold, and supra-threshold word discrimination) should be completed.

For more specific coding information for acoustic reflex threshold measurement (included in 92550: Tympanometry and acoustic reflex threshold measurements and 92570: Acoustic immittance testing) and appropriate use of 92587: Distortion product otoacoustic emissions, limited evaluation and 92588: Distortion product otoacoustic emissions, comprehensive diagnostic evaluation, the reader is directed to the Coding and Reimbursement section of the Academy’s website, www.audiology.org (American Academy of Audiology, 2019).

Tinnitus Evaluation

Measurements of tinnitus can be useful to document its presence, to demonstrate the need for counseling, and to guide and monitor progress with treatment options such as sound therapy. Tinnitus assessment is encompassed by one code, 92625: Assessment of tinnitus. As with other audiology procedure codes, 92625 is a bilateral code and usage of the -52 Reduced Services modifier is recommended for unilateral testing.

Voluntary or mandatory quality reporting through the Merit-Based Incentive Payment System (MIPS) program may also require the use of additional components in tinnitus assessment. Some patients can have strong emotional reactions to their tinnitus (Tyler and Baker, 1983), including depression (Langguth et al, 2011). There is a quality measure associated with a billed 92625: Assessment of tinnitus, MIPS Measure #134. Detailed information on MIPS reporting for 2020 can be found in the January/February 2020 issue of Audiology Today (Kovar, 2020).
**Tinnitus Diagnosis**
The current ICD-10 code set provides two classifications: tinnitus and pulsatile tinnitus. Subjective tinnitus can be perceived only by the patient. Objective tinnitus can be perceived by the patient and the examiner.

**Tinnitus Management**

**Hearing Aid Evaluation, Dispensing, and Fitting**
An exhaustive review of codes used in hearing aid evaluation, dispensing, and fitting is outside of the scope of this resource. The interested reader is directed to the Academy’s Guide to Itemizing Your Professional Services (American Academy of Audiology, 2014).

**Non-Covered Services and Devices**
Medicare does not cover audiological treatment options for tinnitus such as hearing aids, sound therapy devices, tinnitus maskers, tinnitus treatment, or counseling. These items and services should not be billed to Medicare for reimbursement.

In the event that a claim needs to be submitted for denial or the patient requests that the claim be submitted to Medicare, the -GY modifier (Item or service statutorily excluded, does not meet the definition of any Medicare benefit) must be used with any codes used for tinnitus treatment. For more information on the use of modifiers when billing Medicare, the reader is directed to the September/October 2019 issue of Audiology Today (Frank and Jilla, 2019).

**Conclusion**
In comparison to the 30 million Americans with hearing loss, 50 million Americans report tinnitus. The addition of tinnitus evaluation, diagnosis, and management provides an opportunity to help more patients by mitigating the effects of this disorder. Additional articles on adding tinnitus to your practice are provided by Tyler et al (2008) and Turiff (2017).

Richard S. Tyler, MSc, PhD, is a clinical audiologist and psychoacoustician and currently the director of audiology in the Department of Otolaryngology at the University of Iowa.

Anna Marie Jilla, AuD, PhD, is a postdoctoral research fellow at Johns Hopkins University in Baltimore, Maryland.

Susan Von Dollen, AuD, is an audiologist with the Children’s Hospital of Philadelphia in Philadelphia, Pennsylvania.

**References**


<table>
<thead>
<tr>
<th>ICD-10 DIAGNOSIS CODES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>H93.11 Tinnitus (right ear)</td>
<td>A perceived sound in the absence of an external sound that can be described as a ringing, clicking, whooshing, crickets, radio static, etc., and can be subjective or objective in nature</td>
</tr>
<tr>
<td>H93.12 Tinnitus (left ear)</td>
<td></td>
</tr>
<tr>
<td>H93.13 Tinnitus (bilateral)</td>
<td></td>
</tr>
<tr>
<td>H93.19 Tinnitus (unspecified ear)</td>
<td></td>
</tr>
<tr>
<td>H93.A1 Pulsatile tinnitus (right ear)</td>
<td>A perceived sound that coincides with the heartbeat</td>
</tr>
<tr>
<td>H93.A2 Pulsatile tinnitus (left ear)</td>
<td></td>
</tr>
<tr>
<td>H93.A3 Pulsatile tinnitus (bilateral)</td>
<td></td>
</tr>
<tr>
<td>H93.A9 Pulsatile tinnitus (unspecified ear)</td>
<td></td>
</tr>
</tbody>
</table>


2019 was a busy year in the area of advocacy—and 2020 shows no sign of slowing down.

In 2019, the Academy came together with the Academy of Doctors of Audiology (ADA) and the American Speech-Language-Hearing Association (ASHA) to draft text, secure congressional champions, and lobby additional support for the Medicare Audiology Access and Services Act of 2019 (H.R. 4056, S. 2446)—otherwise referred to as the “joint audiology bill.” This legislation would grant audiologists “practitioner” status in Medicare, remove the physician-order requirement, and allow audiologists to provide and be reimbursed for diagnostic and treatment services. Since its introduction, this legislation has attracted support from both sides of the aisle.

At the end of 2019, the Academy worked with congressional staff to get Medicare “practitioner” status and “treatment services” added to a Medicare hearing aid bill. This bill was ultimately included in H.R. 3—the House drug-pricing package—that passed the full House of Representatives on December 12.

What Do We Expect to Happen in Congress in 2020?

What will happen next to H.R. 3?

Given the sharp partisan split between the House and the Senate, most commentators do not expect the legislation to pass the Senate in its current form. The Republican-controlled
Senate is working on its own version of “drug-pricing reform” legislation, in hopes of passing something comparable on the issue as the 2020 elections loom.

At this time, none of the Senate proposals include a hearing benefit. There is the possibility that the Senate could pass its own version of drug-pricing reform and the House and Senate could strike a deal. This situation is very fluid and will be dependent on the ever-shifting dynamics among the House, the Senate, and the Administration.

Is the “Joint Audiology Bill” Still Active?
H.R. 4056 and S. 2446 are both still alive and well. The Academy will continue to lobby on these bills and actively seek opportunities to add all or some of the essential components of these measures to other must-pass pieces of legislation.

A number of factors speak positively to the chances of passage. The audiology community is united behind this legislation—with the Academy, ADA, and ASHA continuing to work together to garner additional support. In addition, members of Congress are eager to find relatively non-controversial health-care issues that would enable them to demonstrate their ability to work in a bipartisan manner. Finally, the Administration issued an Executive Order at the end of 2019 that directs the Department of Health and Human Services to “propose reforms to eliminate Medicare requirements that limit non-physician providers from practicing to the full extent of their education and training”—a sentiment that dovetails with the provisions of the joint audiology bill.

What About OTC Hearing Aids?
Following the passage of the Over-the-Counter Hearing Aid Act of 2017, the Food and Drug Administration (FDA) began work on regulations to implement this new law. Proposed regulations are expected to be released in the first quarter of 2020. These proposed regulations will be open for public comment, with the goal of being finalized by the end of 2020. The Academy will be reviewing them closely, comparing the provisions with the recommendations provided by the stakeholder consensus paper (developed by the Academy, ASHA, ADA, and the International Hearing Society), and drafting comments to the FDA.

Member Engagement in Advocacy
With all of the activity expected in the year ahead, it is important—now more than ever—for Academy members to get involved in advocacy.

ACTIVITIES AT AAA2020 + HEARTECH EXPO
This year’s meeting will feature some exciting new sessions designed to arm members with actionable skills to advocate for the profession. The Advocacy in Action session will offer hands-on activities designed to enable members to hone their advocacy “elevator speech,” learn effective messaging techniques, and practice going “head to head” with opposing viewpoints. The State Showcase session (previously known as the State Fair) will feature an exciting new format providing an overall look at state initiatives, an opportunity for networking, state spirit presentations, and awards.
VOLUNTEER OPPORTUNITIES

Make sure to look for opportunities in 2020 to get involved in advocacy volunteer positions. The Academy has multiple advocacy-related committees that focus on federal government affairs, state relations, coding and reimbursement, the Academy’s Political Action Committee (PAC), and practice policy. To find out more, watch for the “Call for Volunteers” communication coming in March from the Academy.

The Academy is committed to growing the Grassroots Advocacy Network this year and encourages all members interested in advocacy to register online to become a member of the network. This year, members of the Grassroots Advocacy Network will have access to regular, more detailed information about “behind the scenes” Academy activity on the advocacy front, as well as breaking news.

Susan Pilch, JD, is the Academy’s senior director of government relations.

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VISIT www.audiology.org and apply between April 1 and May 6.
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A SAMPLING OF THIS YEAR’S EXCITING PROGRAM*

Audiology Career Enhancement: Gender Speak, Gender Science
Tammy Hughes
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Hearing Aids in Review
Catherine Palmer, PhD; Gus Mueller, PhD; and Robert Turner, PhD

From OTC to 3PA: Understanding the Pros and Cons of New Sources of Revenue for the Audiology Practice
Noel Crosby, AuD; Soriya Estes, AuD; Kelli House, MA; Gyl Kasewurm, AuD; and Paul Pessis, AuD

Grand Rounds: Amplification
Jodi Baxter, PhD

Hidden Hearing Loss and Processing Speech-in-Noise:
What Audiologists Need to Know and Practice Now
Bharath Chandrasekaran, PhD; and Edward Lobarinas, PhD

Learn More and Register Today!

*Topics, presenters, and timing of sessions are subject to change. Visit www.AAAConference.org for updated information.
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Jodi Baxter, PhD

Hidden Hearing Loss and Processing Speech-in-Noise: What Audiologists Need to Know and Practice Now
Bharath Chandrasekaran, PhD; and Edward Lobarinas, PhD

First-Time Attendee Orientation
Wednesday, April 1, 12:00–12:45 pm
Join us for an overview that will help you make the most of this incredible experience.

AAA Foundation After Party
Wednesday, April 1, 7:30–9:00 pm
Held after the Celebrate Audiology Opening Reception, the Foundation After Party is the place to be on Wednesday night. Cocktails, music, feathers, beads, and masks — join in the revelry of Mardi Gras!
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Riverboat Dinner Cruise
Friday, April 3, 6:00–9:00 pm
Step on board the Paddlewheeler Creole Queen Riverboat and cruise with us down the Mississippi River, while experiencing the sights and sounds of America’s busiest port.

Membership Meeting
Saturday, April 4, 7:00–8:00 am
Hear more about the Academy’s initiatives, advocacy efforts, and decision-making process. Also, interact with Board members and have Academy leaders answer your questions.

Learn More and Register Today!
*Topics, presenters, and timing of sessions are subject to change. Visit www.AAAConference.org for updated information.

Connect with Colleagues and Leaders.
The members presented in this issue of *Audiology Today* are nominees for the president-elect and three member-at-large positions on the Academy’s Board of Directors.

One of the nominees for president-elect will be elected by the general membership to serve a three-year term (one year as president-elect, one year as president, and one year as past president) beginning October 1, 2020, and ending September 30, 2023.

Three of the candidates for the member-at-large positions will be elected by the general membership to serve a three-year term, beginning October 1, 2020, and ending September 30, 2023.

The 2020 American Academy of Audiology election of new board members will be held from April 6, 2020, through May 8, 2020, immediately following AAA 2020 + HearTECH Expo, the Academy’s annual conference.

All Fellow members with an electronic address in the database will be sent an e-mail linking them to our election website. Please note the election website is separate from the Academy website. The link you receive in the e-mail is unique and can only be used by the member receiving the e-mail. Once used, the unique link is disabled.

It is anticipated that the new board members and the new president-elect will be announced in late May/early June 2020.

Expanded biographical information, position statements, and short videos are available on the election and Academy website, www.audiology.org. Voting for the leadership of the Academy is an important privilege of membership for Fellows of the American Academy of Audiology.

You are encouraged to vote and let your voice be heard!
Serving for the profession is what I’ve done my entire career. I have dedicated a significant amount of my time to serving the profession and audiologists. Serving on the board is the highest level of service to the profession. The amount of time and dedication required is a significant commitment, but serving in this capacity is so rewarding.

When I previously served on the Academy Board of Directors, I knew that the work we were doing advanced the profession. We made thoughtful and deliberate decisions that brought the profession forward. Not everyone is willing to dedicate long phone calls at night, travel to meetings, and practically take on a second job on top of their everyday job; but for me it is rewarding knowing that I’m busy improving the profession for audiologists now and for the future.

I’ve wanted to serve as president as long as I can remember in audiology. For me, the presidents have been individuals who have given the most to the profession. They have been the ones who have had to take the heat, make the tough decisions, give the most amount of time... and I feel this commitment yields the greatest reward in knowing you did the most you could for your colleagues and patients. I want the opportunity to show that I’m a good leader and I can make decisions with the Executive Committee and the Board of Directors that will improve the quality of our organization and the profession as whole.

I was fortunate to serve on the Academy Board while tremendous work was being done to restructure the organization to build future capacity for success. We spent many hours analyzing every aspect of the organization, holding every component under a microscope and asking whether each resource was being utilized and each decision was being made in a way that would directly support the Academy’s mission to create value for its members...
and to advance the profession of audiology. The answers we found were not always easy or clear but piece by piece we strengthened the foundation of the organization, steered the direction of a new course, and when I rotated off the board I was confident we had done all we could to optimize the organization's capacity. It has been fulfilling to watch the enhanced capability of the Academy to collaborate, promote its mission, and effect change.

Member-at-Large

I am interested in serving on the board, as I believe that this is the time for our profession to push harder for autonomy and amplify for our advocacy efforts. I am very happy to see the three organizations working together for federal legislation that elevates the value of audiology, but I want to help the Academy be seen as the professional leader moving forward and building on this momentum. Our services and expertise are extremely valuable and there are less of us to meet the need of the public with future forecasts calling for even more of a shortage. This means that we have to make the public aware of who we are and how we benefit them so that we can more easily persuade our elected officials to support our legislation. I have the passion, experience, and commitment to help make a difference and drive home the preferred futures of the Academy.

Our annual conference is the largest gathering of audiologists in the world and I would like to help it grow using my experience as a key planner for both the Texas and Louisiana Academy of Audiology Conferences. I am not afraid to advocate for the profession and have been successful in recruiting audiologists who grow membership as well as become future board members.

Jennifer Bobo, AuD
Key Account Manager
Widex, Inc.

BS: Communication Disorders, 1993, University of Texas at Austin
MS: Communication Disorders, 1995, University of Texas at Dallas
AuD: Doctor of Audiology, 2008, George S. Osbourne School of Audiology
After 15 years in the profession, I have come to a place where I want to give back to my field in meaningful ways outside of the realm of clinical practice and research. A call to service is not one I have taken lightly. With the ever-evolving landscape for our profession on both the state and national level, I have actively sought out ways to impact forward movement for audiology through service. At the state level, I have volunteered through my state audiology organization, first as sponsorship chair and now as president-elect. Much of the work that needs to be done is at the state level, but national initiatives are necessary as well. Through my work as the chair of the Academy’s Health-Care Relations Committee, I have been able to meaningfully contribute to several processes aimed at increasing the visibility of audiology as the home of hearing and balance care to referring providers. I believe becoming a contributing member of the Academy’s Board of Directors is the next logical step in my personal goal of engaging in service to our profession.

Serving on the Academy Board is a large undertaking for any professional. Despite the commitment, serving on the board now would allow me to contribute to audiology’s future and its position at the end of my career. Large changes in our field take decades and I want to be part of determining the changes that will affect my entire career.

As a new professional, I have a unique point of view on current issues, not yet colored by history. It allows me to look at ongoing problems with a fresh perspective and see solutions potentially overlooked due to years of division. As a young leader in the field, it falls on me to represent the voice of young professionals in audiology. In the history of audiology, the people who made substantial changes typically were not ready to retire; change has often started with professionals in their 20s and 30s, starting out with ideas, dreams, ambitions, and plans on how to leave audiology better than they found it.
My interest in serving on the Academy Board comes from more than 30 years of experience as an audiologist, and nearly as long as an advocate for the work and the autonomy of this profession. After serving on a number of Academy committees, including Government Relations, Standards, State Network, and Education, I have seen the operation of the Academy from many perspectives that I would like to continue, develop, and expand. I have seen the Academy advance its professional scope and its political reach. I have seen it struggle without ever losing its perspective or sense of diplomacy. I’ve also seen it complement and compromise for the betterment of the profession of audiology.

The future of the profession of audiology is bright and complex with a growing scope of work that is manifold. To guide and shape this work requires many professional perspectives and experiences to best advance the Academy’s goals. It is my interest in participating in the development and stabilization process of the Academy that has encouraged me to serve on various academy committees, and now to expand that interest as a participant in these activities as a member of the board.

The profession of audiology is facing a changing landscape. We see increased market penetration for hearing technology while simultaneously experiencing decreased reimbursement for our clinical services. We are at a time in our profession where we can define who we are and the standard of clinical care we practice. This redefining will require a continued focus on innovation and clinical research to drive evidence-based practice and to position our profession as leading experts in hearing health care. It starts with our graduate programs and the recruitment of young researchers and extends to how we advocate for the profession and influence policy change. I am honored to be nominated as a potential member-at-large for the Academy and would draw from my varied clinical and research experience and leadership to date to help guide the Academy and its diverse membership through these turbulent times.
We are in a critical time for the future of audiology and I want to help. It is easy to sit on the sideline, but I would rather be in the trenches and try to contribute to solutions. We cannot become stagnant as a profession and must vigorously pursue advanced standards of practice (how and what we do) in the evaluation and management of hearing loss and balance disorders. For example, technology has allowed for significant advancements in diagnostics, amplification, and implantable devices which allow for more personalized management. We must be leaders on these advances.

However, technology also brings challenges such as artificial intelligence (AI) and machine learning (ML) that may negate some of the routine clinical practices of today. All areas of health care are susceptible to these changes. Advanced imaging integration with electronic medical records may predict or even diagnose disease, replacing the function of a radiologist. Advanced robotics with near perfect precision could replace the hands of a surgeon. Yet, these technologies will never replace the words of encouragement, empathy, and human touch. Hearing loss and balance dysfunction disrupt the connection and enjoyment of human interaction.

With foresight and focus on best practices, audiology will be enhanced by AI, not replaced. But, we must continuously advocate for our unique skills and define our role in these pursuits. I hope during my time on the board to help navigate these challenging times and help shape what the future of audiology can be.
JOIN YOUR COLLEAGUES AND FRIENDS AS WE HONOR THESE INDIVIDUALS

The Academy Honors and Awards Banquet, generously sponsored by Phonak, will take place on Thursday, April 2, 7:00–8:30 pm, at AAA 2020 + HearTECH Expo in New Orleans, LA. This event will recognize some of the great minds in the profession. Tickets for the banquet are $65 per person and $30 for students. Tickets are available through the AAA 2020 online registration system. For more information, contact hfinney@audiology.org.

Honors of the Academy Award
Awarded to one audiologist and/or one non-audiologist for his or her exceptional support of the field of audiology and/or the patients we serve by focusing on issues that directly affect the profession and/or consumers with hearing loss and balance disorders. The recipient shall have made notable contributions in one or more of the following areas: outstanding clinical practice and/or patient care, teaching or mentoring; advocacy; research; and/or exceptional service to the profession of audiology.

Paul Pessis, AuD
Paul Pessis, AuD, is the owner and founder of North Shore Audio-Vestibular Lab. He is also an instructor at Rush University and a sought-after speaker on private practice and coding and reimbursement issues. Dr. Pessis has additionally served on the Academy Board of Directors and as president of the Academy.
Dr. Pessis’s wisdom and foresight assisted in the creation of the Academy’s Coding and Reimbursement Management Committee, the Academy’s Practice Policy Advisory Council, the Academy’s involvement in audiology code development and valuation via participation in the CPT (Current Procedural Terminology) Editorial Panel and RUC (Relative Value Units Update Committee) processes, and the representation of the profession with the Centers for Medicare and Medicaid Services (CMS).

Always, at the forefront of his efforts is his belief in audiology as an autonomous profession deserving of professional reimbursement. Dr. Pessis’s leadership and persistence ensured a successful petition to garner audiology seats at both the AMA CPT and RUC Health Care Professionals Advisory Committees (HCPAC), for which he serves as the Academy’s RUC HCPAC representative.

He is the sole audiology representative to the Hearing Instrument Manufacturer’s Software Association (HIMSA) Board, an international board composed of the six hearing aid company leaders and has served on the Board of Directors for the Accreditation Commission for Audiology Education (ACAE).

From creating standards for new professionals to his role in maintaining appropriate valuation of the diagnostic services we provide, Dr. Pessis’s leadership spans all realms of the profession. The Academy is pleased to bestow its 2020 Honors of the Academy to Dr. Paul Pessis, in recognition of his significant contributions to the field audiology.

Jerger Career Award for Research in Audiology
Awarded to an individual for innovative research contributions in the field of audiology/hearing and balance sciences and whose work has groundbreaking impacts on the field and/or practice of audiology.

Linda J. Hood, PhD
Linda J. Hood, PhD, is the quintessential audiologist and hearing scientist, having made significant contributions to both clinical and basic science research over her 40-plus year career. After earning her PhD at the University of Maryland, College Park, she completed a three-year National Institutes of Health (NIH) post-doctoral fellowship at the Kresge Hearing Research Laboratory studying auditory anatomy and physiology.

Over the course of her academic career, she has held faculty positions at the Louisiana State University Departments of Otolaryngology, Communication Disorders, Neuroscience, and Genetics, before taking her current position as a faculty member in the Department of Hearing and Speech Sciences at Vanderbilt University.

Dr. Hood has published more than 50 peer-reviewed articles in top audiology and medical journals. She is an outstanding scholar and clinician scientist who has provided foundational insights into the diagnosis of auditory disorders and their genetic bases. Her research in the areas of hereditary hearing loss, novel assays of afferent and efferent neural function, and the clinical diagnosis and management of auditory neuropathy spectrum disorder have had a lasting and meaningful impact on the profession of audiology.
She has been consistently funded by NIH and is currently modeling auditory responses and behaviors in pre-term infants. In addition, Dr. Hood has been an active research mentor to many future investigators, including her leadership on the NIH-National Institutes on Deafness and Communication Disorders (NIDCD) Developing Research Careers in the Hearing Sciences training grant for AuD students.

As a founding member of the American Academy of Audiology, Dr. Hood is also a dedicated leader in the profession of audiology. She has held multiple leadership roles including past-president for the American Academy of Audiology, the American Auditory Society, and the International Society of Audiology.

Dr. Hood’s nominators describe her as a “giving mentor” whose “strong expertise,” “strength and perseverance,” and “passion and enjoyment of our profession” clearly demonstrate the indelible impact she has had on her colleagues and the profession of audiology.

Early-Career Audiologist Award
Awarded to an individual with less than 10 years’ experience who has made outstanding contributions to the profession of audiology. The recipient shall have made notable contributions in one or more of the following areas: outstanding clinical practice and/or patient care, teaching or mentoring, advocacy, research, and exceptional service to the profession of audiology.
David P. Jedlicka, AuD

David P. Jedlicka, AuD, began his graduate studies at the University of Pittsburgh. Since his graduation in 2010, he has made numerous notable contributions to the profession of audiology through his outstanding clinical practice, teaching and mentoring, research, and service.

Dr. Jedlicka currently works at the Pittsburgh VA Medical Center. While at the Pittsburgh VA, he has developed numerous evidence-based protocols for auditory-processing testing and treatment, osseointegrated devices, and hearing aids. He has led 24 quality improvement projects in his department to improve patient care. In addition to his clinical duties, Dr. Jedlicka serves as principal investigator or co-investigator on numerous research projects about real-ear-to-coupler difference, self-perceived hearing loss in Veterans, and other topics.

In addition to his clinical practice and research at the VA, Dr. Jedlicka teaches a lab for audiology students at the University of Pittsburgh. Furthermore, he serves as a mentor for students who are submitting their research to professional conferences, provides customized tutorials and practice sessions for students, volunteers on a grand rounds committee for students, and serves as a clinical preceptor for final-year AuD students. His students comment every year that he goes above and beyond his required teaching duties to ensure that his students are prepared for their careers.

Dr. Jedlicka also volunteers in professional organizations. His extensive service to audiology has included an active role on more than 20 committees, several of which he has served as chair. He is the president-elect of the Association of VA Audiologist (AVAA).

Humanitarian Award

Awarded to an individual who makes significant voluntary and/or philanthropic contributions to underresourced communities through the provision of audiology services, philanthropic development of educational programs, and/or other service-oriented activities. Work that is done in conjunction with the nominee’s employment is usually not considered as being relevant for this award.

King Chung, PhD

King Chung, PhD, uses her expertise and her passion for teaching to tackle different needs in humanitarian audiology. As a professor and audiology program director at Northern Illinois University, she has led students on 11 humanitarian trips and provided hearing services to more than 4,000 underserved children and adults in seven countries/governing regions in the past 10 years.

Dr. Chung's research instincts shine in her collaborations with international colleagues to disseminate the testing results, to increase the awareness of hearing health, and to advocate for better hearing services around the world. Their clinical findings provided key evidence for the high hearing service demand in many communities. Her advocacy also extends her to be a founding coeditor of the column Audiology Without Borders, and the director of best practices of the Coalition for Global Hearing Health.

Additionally, Dr. Chung’s entrepreneurial spirit and her creativity in R&D have resulted in the development of a low-cost calibration system and automatic hearing-test applications for children and adults. With the success of pilot testing in the United States, she received a 2019 Fulbright Scholar Award to...
verify the applications’ efficacy and accuracy in Brazil. These programs will be released soon for public use at a nominal cost.

Outstanding Educator Award
Awarded to an individual who has made significant contributions to audiology through dedication and skill to the education of students of audiology. The individual may be a clinical or academic educator and should be a university lecturer, faculty, or adjunct faculty member of a credentialed AuD/PhD program in the United States.

Elaine A. Mormer, PhD
Elaine A. Mormer, PhD, is an associate professor in the Department of Communication Science and Disorders at the University of Pittsburgh, where she has taught didactic and clinical courses, provided clinical education, and mentored students on research projects. She currently serves as the vice chair for clinical education for the department. In this role, she oversees clinical instruction and clinical placements.

In 2013, Dr. Mormer received the Dean’s Distinguished Teaching Award from the University of Pittsburgh School of Health and Rehabilitation Sciences. She was the co-recipient of the Provosts’ Innovation in Education Award for her role as co-director of an over-the-counter hearing aid certificate program for pharmacy students in 2019.

Dr. Mormer has facilitated continuing education activities on evidence-based teaching, through publications and presentations. In addition, she has served as the course coordinator and annual presenter at the University of Pittsburgh’s biennial Audiology Teaching Conference.

She currently serves as the vice president for clinical education resource development for the Council on Academic Programs in Communication Science and Disorders (CAPCSD). She has worked with the Accreditation Commission for Audiology Education (ACAE) and the Academy’s Academic Program Committee on the annual joint Clinical Education Forum, sponsored by CAPCSD and the Academy.

Marion Downs Pediatric Audiology Award
Awarded to an audiologist for exceptional contributions in pediatric audiology, as an educator, mentor, clinician, advocate, or scientist.

Jessica J. Messersmith, PhD
Jessica J. Messersmith, PhD, has been awarded the Marion Downs Pediatric Audiology Award, which is given to those who demonstrate a commitment to improving the quality of care of pediatric patients. Dr. Messersmith started her career in Nebraska, where she earned her PhD at the University of Nebraska and worked as a research assistant at Boys Town National Hospital. She then moved to the University of South Dakota (USD), where she has been faculty and now department chair. Her research and clinical areas of interest are in cochlear implants, particularly pediatric cochlear implants.

Dr. Messersmith has the desire to ensure that those children getting implants are receiving consistent care, no matter where their care is housed, which is why she also has worked on documents such as the Academy’s Cochlear Implant Guidelines.
At USD, she instructs AuD students in both the pediatrics class and the cochlear implants class, stressing evidence-based assessment and treatment for children with hearing loss. Clinically, she sees cochlear implant patients, particularly children, regularly as part of her academic duties. In addition, she also takes students to serve children who use cochlear implants in the rural and underserved areas of South Dakota, including tribal lands within the state. In addition, she has worked to improve outcomes of the early hearing detection and intervention program in South Dakota.

Clinical Excellence in Audiology Award
Awarded to a clinical audiologist whose dedication and clinical excellence have resulted in improved quality of life for individuals with hearing or balance dysfunction, who has distinguished his or herself through innovation in service provision, superior clinical education, and/or effective efforts to educate and inform the public about the prevention and intervention of hearing loss, dizziness, and/or tinnitus.

Robert M. DiSogra, AuD
Robert M. DiSogra, AuD, has dedicated the majority of his career to promoting an understanding of the pharmacological effects on hearing and balance among audiologists around the world. While teaching at Rutgers University over 25 years ago, he questioned why his patients had clinical complaints of hearing loss, yet their test data showed no evidence of peripheral loss. He then went beyond his clinical practice to initiate an unprecedented review of evidence that identified the influences of

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pharmaceuticals and nutraceuticals on hearing loss and tinnitus.

In a series of publications for audiologists over the past 20 plus years, Dr. DiSogra distinguished his audiology career by identifying over 400 adverse auditory/vestibular side effects related to more than 2,000 drugs. He later developed and taught the pharmacology/ototoxicity distance-learning course while pursuing his own degree at Salus University.

By 2019, 25 AuD programs were offering a dedicated pharmacology course, in part, because of this pharmacological connection to hearing and balance disorders. He is a sought-after presenter at state and national audiology association meetings.

Dr. DiSogra has created a legacy for the field. He recently served on the Academy’s Pharmacology Task Force, which explored the requirements for prescriptive privileges for audiologists.

Audiologists who have used his publications, been his students, or attended any of his presentations have certainly benefited from Dr. DiSogra’s expertise in the field.

Samuel F. Lybarger Industry Award

Awarded to an individual who has made important contributions to research, engineering, or other technological achievements within the field of audiology. He or she should have been, or should be, employed by a company or corporation in the hearing/balance health-care field, but must have made contributions that extend beyond their service to the company by furthering the field of audiology.

Claus Elberling, DSc

Claus Elberling, DSc, is being honored with the Samuel F. Lybarger Industry Award for his numerous contributions through research and engineering in the field of audiology. He began his career in Denmark with an MSc in electronic engineering and a doctor of medical sciences (DSc) from the University of Copenhagen. His early career focused on research in the area of electrophysiology. He developed tools for better testing and interpretation for electrocochleography (ECochG), auditory brainstem response (ABR), auditory steady-state response (ASSR), and otoacoustic emissions (OAEs).

During his career, he worked for Oticon, where he made significant contributions in hearing aid research, development, and fitting, including the development of the first fully digital ear-level hearing aid in the world (DigiFocus). After his retirement from the Oticon Eriksholm Research Centre, he worked as an executive scientist in the Demant Group—especially for Oticon and Interacoustics.

In 1985, he published the first OAE-recordings from a group of newborns. Most recently, his research has focused on the development of chirp stimuli for the testing of newborns and infants.

He has published more than 100 papers in peer-reviewed journals and made numerous international presentations. His contributions to the field of audiology through basic and applied research and his time working in industry have made significant improvements to testing, treatment, and overall patient care.
In April 2020, the American Academy of Audiology launches its newest grant program to support research relative to the prevention and treatment of hearing loss in musicians. The Music and Hearing Research Grant program will support research studies to add to the body of knowledge that will shape best practices in this area of audiology practice. The grant program is sponsored by the American Academy of Audiology Foundation through the generous contribution of Michael Santucci, AuD.

Applications and Review Process

Similar to the Academy’s Research in Hearing and Balance Grant Program, the Music and Hearing Grant Program will be administered by the Academy’s Research Initiatives Committee.

The request for applications (RFA) will go out in April, with a submission deadline of June 30. Submissions may focus on any topic related to music and hearing. A list of suggested topics will accompany the RFA.

All audiologists who are members of the Academy are eligible to apply for a grant of up to $10,000. Members of the Academy’s former Musicians Task Force will offer expert review of the grant applications and the Research Initiatives Committee will use this feedback to inform the selection of one or more projects in the first cycle of the annual grant program.

The call for applications opens in April. Visit www.audiology.org and search keywords “Music and Hearing Grant.”

Expert Support

A unique feature of the grant program will be the availability of Dr. Michael Santucci and others to provide consultation to funded projects. Dr. Santucci is committed to ensuring that the grant program is supporting research that will expand the evidence and literature base to promote best practices. He and other seasoned music researchers offer experience and lessons learned to inform the new research. This consultative component of the
program is consistent with other efforts by the Academy to connect audiology researchers with one another, as seen in the Audiology Research Conference (ARC) and the new event at AAA 2020 + HearTECH Expo, the Grant Review—Speed Dating session hosted by Dr. Nick Reed.

Ryan McCreery, PhD, chair of the Research Initiatives Committee, commends Dr. Santucci for his vision of the significant evidence gap in musician research and his willingness to support research efforts.

“The Academy is fortunate to have Dr. Michael Santucci championing this important area of research,” McCreery said. “His willingness to share his expertise in this area is invaluable to shaping the success of the grant program and the research it funds. His commitment to offering guidance to investigators—not just giving money—will guarantee that the funded research adds substantially to our understanding of the interactions between music and hearing.”

Dr. Santucci has dedicated his career to protecting the hearing of musicians through his own research and development work and promoting best practices in audiology. He is president of Sensaphonics, Inc, a company that manufactures hearing protection/in-ear monitors for musicians. In the audiology community and beyond, he is highly regarded for his work in hearing conservation. In addition to receiving many awards for this work, he also serves as a consultant to the World Health Organization.

Consensus Guidance

The new grant program coincides with the release of the clinical consensus document Audiological Services for Musicians and Music Industry Personnel. Developed by an Academy task force under the leadership of Dr. Santucci, this document offers recommendations and strategies for best practices in preventing hearing loss in musicians and others who work in the music industry. The task force represents individuals with expertise in preventing music-induced hearing disorders (MIHD) who developed recommendations based on scientific evidence, when available, and consensus practice.

These recommendations are on strategies for hearing-loss protection and hearing-protection devices. Although the task force recognizes that exposure to music by others such as concert goers or music venue workers can contribute to hearing loss, the Audiological Services for Musicians and Music Industry Personnel document focuses solely on strategies to address music exposures for musicians and people in the music industry.

Review this newly released document at www.audiology.org and search keywords “Music Industry.”

Dr. Michael Santucci will present aspects of the clinical consensus document as a learning lab at AAA 2020 + HearTECH Expo in New Orleans (www.AAAConference.org). His presentation, Musician and In-Ear Monitors: An Opportunity to Demonstrate Your Doctoring Skills, will be offered on Wednesday, April 1, 8:30–12:00 pm. ☞
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You can find participants featured here in Audiology Today magazine, on our Web site (www.audiology.org), and at Academy events. Consider supporting the companies that support your association.

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For more information about the program, contact Eric Gershowitz at eric.gershowitz@mci-group.com.

Advertiser Index

<table>
<thead>
<tr>
<th>Company</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplivox</td>
<td>22</td>
</tr>
<tr>
<td>ARMV</td>
<td>9</td>
</tr>
<tr>
<td>AudiologyOnline</td>
<td>47</td>
</tr>
<tr>
<td>Auditec, Inc.</td>
<td>79</td>
</tr>
<tr>
<td>BHM-Tech</td>
<td>2</td>
</tr>
<tr>
<td>Cochlear Americas</td>
<td>5</td>
</tr>
<tr>
<td>Ear Technology Corporation</td>
<td>7</td>
</tr>
<tr>
<td>Eoera Inc.</td>
<td>26</td>
</tr>
<tr>
<td>Grason-Stadler</td>
<td>74</td>
</tr>
<tr>
<td>Hamilton CapTel</td>
<td>French Gate Cover</td>
</tr>
<tr>
<td>Interacoustics US</td>
<td>40</td>
</tr>
<tr>
<td>MAICO Diagnostics</td>
<td>12</td>
</tr>
<tr>
<td>Natus, formerly Otometrics</td>
<td>C2, 1</td>
</tr>
<tr>
<td>Oticon, Inc.</td>
<td>C3</td>
</tr>
<tr>
<td>Otodynamics Ltd</td>
<td>59</td>
</tr>
<tr>
<td>Parresia</td>
<td>104</td>
</tr>
<tr>
<td>Prestige Brands, Inc.</td>
<td>11</td>
</tr>
<tr>
<td>RAYOVAC</td>
<td>34, 35</td>
</tr>
<tr>
<td>SHOEBOX Inc.</td>
<td>80</td>
</tr>
<tr>
<td>Signia</td>
<td>52, C4</td>
</tr>
<tr>
<td>Sprint CapTel</td>
<td>54</td>
</tr>
<tr>
<td>Starkey</td>
<td>28</td>
</tr>
<tr>
<td>Ultratec CapTel</td>
<td>64</td>
</tr>
<tr>
<td>Widex USA, Inc</td>
<td>66</td>
</tr>
</tbody>
</table>

Academy Products and Services Index

<table>
<thead>
<tr>
<th>Service</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA 2020 + HearTECH</td>
<td>94, 95</td>
</tr>
<tr>
<td>AAA Foundation</td>
<td>20</td>
</tr>
<tr>
<td>ABA Certification</td>
<td>107</td>
</tr>
<tr>
<td>Academy Corporate Partners</td>
<td>111</td>
</tr>
<tr>
<td>Academy Research Conference</td>
<td>84</td>
</tr>
<tr>
<td>eAudiology</td>
<td>45</td>
</tr>
<tr>
<td>Fellow Up—Membership</td>
<td>10</td>
</tr>
<tr>
<td>HearTECH Expo</td>
<td>82</td>
</tr>
<tr>
<td>JFLAC Call for Applications</td>
<td>93</td>
</tr>
<tr>
<td>SAA Conference</td>
<td>90</td>
</tr>
</tbody>
</table>
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* Ng & Rumley 2019, Oticon Whitepaper
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