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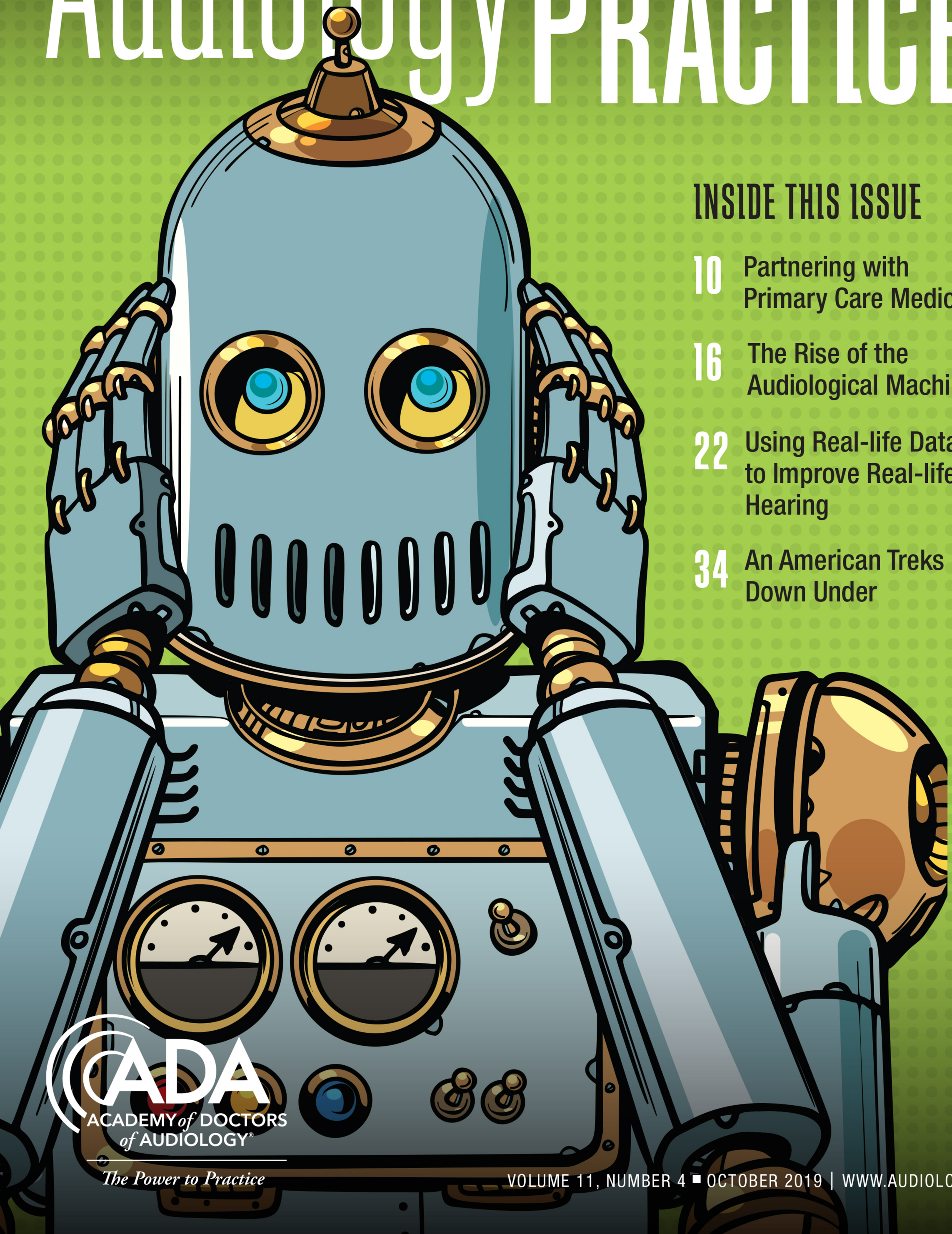
Audiology PRACTICES



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The Power to Practice

VOLUME 11, NUMBER 4 ■ OCTOBER 2019 | WWW.AUDIOLOGIST.ORG

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Features

Contact Your Legislators!

Urge them to support the **Medicare Audiologist Access and Services Act** (H.R. 4056/S. 2446)

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The Medicare Audiologist Access and Services Act of 2019 (H.R. 4056/S. 2446) will remove unnecessary barriers, allowing patients to receive appropriate, timely, and cost-effective audiologic care. This legislation can improve outcomes for beneficiaries by allowing direct access to audiologic services and streamlining Medicare coverage policies so that audiologists can provide the full range of Medicare-covered diagnostic and treatment services that correspond to their scope of practice. The legislation would also reclassify audiologists as practitioners, which is consistent with the way Medicare recognizes other non-physician providers, such as clinical psychologists, clinical social workers, and advanced practice registered nurses.

Support the future of audiology!
Contact Congress today and express your support for H.R. 4056/S. 2446.

Visit chooseaudiology.org/support and contact your congressperson today!

HOW TO REACH US

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The Academy of Doctors of Audiology is dedicated to leadership in advancing practitioner excellence, high ethical standards, professional autonomy, and sound business practices in the provision of quality audiological care.

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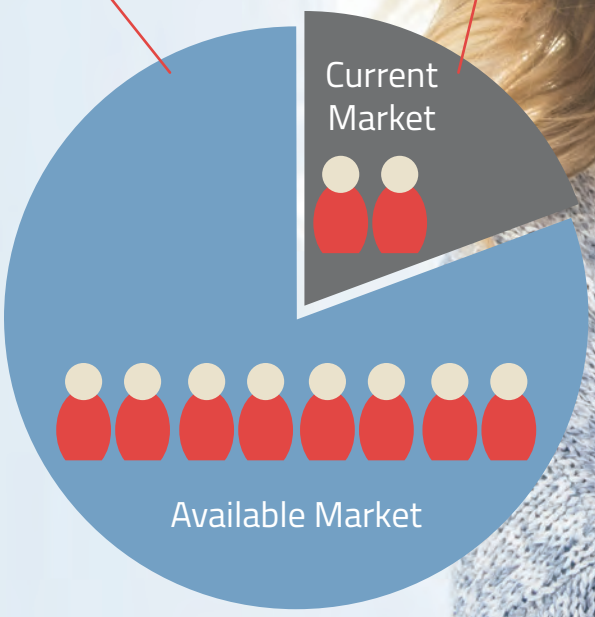

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*As reported in Hearing Health Care for Adults: Priorities for Improving Access and Affordability National Academics of Sciences Engineering and Medicine

Ram Nileshwar, Au.D.

Move the Needle and Move Audiology Forward by Supporting the Medicare Audiologist Access and Services Act

From the historic founding of ADA in 1977 with autonomous practice as the primary goal, through "transforming audiology to a doctoral profession with Au.D. as its distinctive designator" in 1988, to recent legislative initiatives such as 18X18 and the Audiology Patient Choice Act, ADA has been relentless in its pursuit of Professional Autonomy, a core Mission and Vision tenet of ADA.

The **Medicare Audiologist Access and Services Act** (H.R. 4056/S. 2446) or MAASA, a unique and distinctive collaborative legislative initiative involving ADA, AAA, and ASHA, seeks to amend Title XVIII of the Social Security Act to reclassify audiologists as Practitioners for the purpose of furnishing audiology services under the Medicare program and to enable Medicare beneficiaries to have their choice of audiologist.

H.R. 4056 was introduced by Rep. Tom Tice (R-SC), Rep. Matt Cartwright (D-PA) and eight other bi-partisan co-sponsors in the U.S. House of Representatives on July 25th, 2019. The Senate companion bill was introduced in the U.S. Senate on September 9, 2019 by Sen. Elizabeth Warren (D-MA) and Sen. Rand Paul (R-KY). The legislation has, thus far, enjoyed strong bi-partisan support, including from original co-sponsors, Senator Sherrod Brown (D-OH) and Senator Roger Wicker (R-MS).

The passage of MAASA will require a concerted and continuing effort on the part of every audiologist in the United States. To that end, ADA has developed multiple resources to help audiologists learn more about, advocate for and donate for the passage this legislation.

1. ADA is organizing Lobby Day on Thursday, November 14, 2019 on Capitol Hill, ahead of the commencement of AuDacity 2019. I strongly encourage every audiologist including ADA members, non-members and students to attend Lobby Day on Capitol Hill. Please visit www.audiologist.org to view a webcast about ADA Lobby Day Basics: The Who, What, Where, When, Why, and How and to register to attend Lobby Day.
2. Please visit www.chooseaudiology.org to learn more about MAASA, download talking points, and to use Congressional Connect to write to your legislators and encourage them to support MAASA.
3. Your generous donations are critical and will undoubtedly help in passing MAASA and moving a big step closer to Professional Autonomy for Audiology. To donate to this important endeavor, please visit www.chooseaudiology.org/donate.

Together, we can achieve the vision of ADA, the objectives that audiology has pursued for decades, and in so doing, create a wonderful future for our patients and our profession. In the meantime, I hope to see you all at ADA Lobby Day.■

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HRS2019AA

Brian Taylor, Au.D.

Clinical Judgments and Patient Centered Care

Audiologists agree that a commitment to patient centered care is a valuable part of ethical practice guidelines. Exactly how patient centered care is defined and implemented, however, is subject to considerable debate. A good place to start the discussion of how patient centered care is implemented in the clinic is by examining the process of how clinical judgments are made by providers during a routine hearing aid evaluation. Unlike diagnostic audiometry, which relies on accurate and precise execution of a standardized test battery, the hearing aid evaluation process tends to vary by a remarkable degree across providers. There is no universally accepted approach to conducting a hearing aid evaluation and, given the number of patient variables, the process will probably never by as standardized as the diagnostic hearing assessment. Granted, by its very nature, the process of selecting and fitting hearing aids is inherently messy, fallible and unpredictable. It is more art than science, and rightly so. There are dozens of variables, many completely unrelated to the auditory system that influence the decision-making process. These variables include the individual's motivation, self-confidence, and financial considerations – factors that cannot be objectively measured very easily.

During any routine hearing aid evaluation process when the patient and provider are determining candidacy for hearing aids, performing a communication needs assessment and making decisions about hearing aid features needed by the patient, several highly subjective judgments are made. These judgments, undoubtedly, are influenced by the experiences, education level and biases of the provider who is conducting the evaluation. Because it is such a subjective process, who is conducting the evaluation often matters more than what tests and procedures the provider is conducting during the appointment.

By taking a page from clinical psychology and using scaling questions that address patient perceptions of their condition and their willingness to treat it, rather than focusing so much attention on the results of the hearing assessment, audiologists can add some scientific rigor to an otherwise highly subjective interaction. As audiologists Carly Meyer and Louise Hickson demonstrate in their new book, *Patient and Family Centered Speech Pathology and Audiology*, recently published by Theime Press, highly subjective judgments made during the hearing aid evaluation process can be turned into slightly more objective knowledge, which, in turn, can be used to build a stronger emotional bond with patients. At the end of the day, the hearing aid evaluation is indeed a messy, fallible …. human process, but with a few new wrinkles provided by Hickson and Meyer, it also can be a slightly more objective process that remains engaging for the patient. ■

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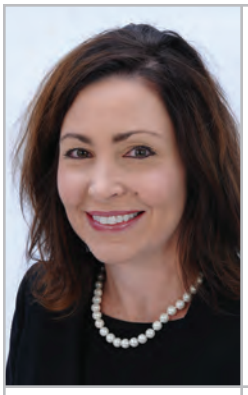

AuDvocating for AuDiology: Lobbying Basics

Preparing to meet with a legislator or their staff for the first time can be daunting. Whether you are coming to Capitol Hill for ADA Lobby Day on November 14th or planning to meet with your U.S. Senators and Representatives closer to home to advocate for the Medicare Audiologist Access and Services Act (MAASA) (H.R. 4056/S. 2446), the following 5 tips may be useful as you make the case for Medicare modernization.

1. Be prepared.

- Review the MAASA issue summary and key talking points. ADA staff are available to assist you with any questions about the information.
- Research the issues that matter most to your legislators (usually available on their official website and searchable through Congress.gov). Determine if there is any alignment with MAASA and their interests that could be mentioned during the meeting.
- Practice your pitch ahead of time. Your presentation should be as simple and concise as possible. Avoid complex clinical terminology and be sure to include specific examples about how existing Medicare policies pose barriers to for your Medicare patients and how MAASA will improve access to care. Make sure to include a formal request for the legislator to co-sponsor the bill.
- Put together a packet of resources to give each person with whom you are meeting. These leave-behind documents will be a useful reference for your legislator and their staff. Visit www.chooseaudiology.org to download the issue summary, a state fact sheet, and other useful resources.

2. Be patient.

- Scheduling a meeting with your legislators will take some time, particularly if you are inviting them to tour your office. Their schedules are often in flux and the meeting may have to be rescheduled or canceled at the last-minute. Don't take this personally—be as flexible as possible in scheduling (or rescheduling).
- When you arrive at a legislator's office be prepared to wait.

3. Be polite.

- Quite often, when you visit a Congressional office you will meet with a staff member and not the legislator. This is quite common and should not be viewed negatively. Legislative assistants and policy staff have a tremendous amount of influence in determining issues of priority and

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Partnering with Primary Care Medicine to Serve Those with Four Common Chronic Conditions

by Robert Tysoe

It is well known that several lifestyle-related, co-morbid conditions increase the likelihood of adults acquiring hearing loss. Of course, some of these co-morbid conditions such as normal aging, noise exposure from personal listening devices and the workplace, and contact with ototoxic agents are clearly recognized by academically trained clinicians. Most audiologists are well versed in the epidemiology and underlying physiology of these conditions and therefore are comfortable discussing their implications with patients and physicians. These common chronic conditions associated with gradual hearing loss are often uncovered during a routine case history and certainly warrant careful clinical consideration. .

Other prevalent co-morbid conditions, however, because most do not have a direct causal link to hearing loss, often fly under the radar during a routine assessment with an audiologist, yet their presence in a patient's history are cause for concern. The most prevalent conditions include a history of smoking, cardiovascular disease/hypertension, and diabetes mellitus (Type II diabetes). Collectively, these four conditions affect about half of the adult population in the U.S. In fact, these conditions are so prevalent in a primary physician's practice, that it is easy to forget their impact on daily living. Each day, primary care physicians interact with individuals who have one or more of these conditions. And, it is likely many of the licensed medical professionals, conducting a case history or examining these individuals, do not fully appreciate the probability of hearing loss in individuals with these conditions. Nor do they appreciate the impact that the hearing loss may have on the individual's quality of life.

Audiologists, given their role within the healthcare system, are uniquely equipped to combat the effects of hearing loss in individuals with a history of smoking, cardiovascular disease/hypertension, and Type II diabetes. Through accurate and precise audiometric testing and clear, concise communication with referring physicians, audiologists can make a substantial difference in how patients with these conditions communicate with loved ones, friends, and colleagues. However, effectively partnering with primary care medicine, requires audiologists to gain a deeper understanding of the prevalence and risks associated with these four common, chronic conditions.

It is generally accepted that individuals with a history of one or more of these conditions should have an annual hearing screening, beginning in young adulthood. Hearing loss reduces health-related quality of life and access to health care. Minimizing the effects of these co-morbid conditions, through hearing loss prevention and management programs, may produce substantial public health benefits and improve the overall quality of life for the person wracked with these conditions.

Given the prevalence of each condition and their deleterious effects on the individual, it is imperative for audiologists to partner with physicians, as well as other licensed healthcare professionals, to raise awareness of the role audiology plays in minimizing the impact hearing loss has on quality of life in individuals with the three common conditions.

DIABETES AND PRE-DIABETES—120 MILLION US ADULT PATIENT LIVES

In the United States today, one out of every two adult patients who walk through a physician's door is either diabetic or pre-diabetic. Diabetes has been proven by the National Institutes of Health (NIH) to be an independent risk factor for hearing loss, which occurs at more than twice the rate in patients who are diabetic versus those who are not diabetic, (21.3% versus 9.4%), and a 30% increase in hearing loss in the pre-diabetic patient compared to individuals who have normal metabolic function (Gupta, et al 2019). Additionally, obese patients, which comprise nearly 40% of the U.S. adult population or 93 million Americans, have twice the incidence of hearing loss versus patients who are not obese (Fransen et al 2008).

According to Gupta et al (2019) Type II diabetes is considered a lifestyle-related disease, often caused or exacerbated by modifiable risk factors, which ultimately influence the risk and incidence of hearing loss in this patient population. Risk factors include being overweight, an unhealthy diet, and a lack of exercise can lead to elevated blood sugar, or hyperglycemia. This may result in damage to the micro-circulation and eighth cranial nerves of the inner ear, leading to hearing impairment.

Data collected by the National Institutes of Health in 2008 suggested that hearing loss may be an under-recognized complication of diabetes and an important public health problem. Two important studies link diabetes to hearing loss:

1. In a 2008 study conducted by the National Institutes of Health (NIH), diabetic participants were found to be more than twice as likely to have mild to moderate hearing loss than those without the disease. The occurrence of high-frequency hearing loss was more prevalent in diabetics (54%) than in non-diabetics (32%).
2. A meta-analysis published in the Journal of Clinical Endocrinology & Metabolism in 2012 supported NIH's previous findings. This study analyzed results from 13 studies involving more than 20,000 participants. The study concluded that diabetics were more likely to have hearing loss than those without the disease, regardless of their age.

Based upon these findings, it is a sound practice for physicians to direct diabetic and pre-diabetic patients to an audiologist for a routine and periodic hearing screening. This "common soil" description of diabetes complications is well illustrated in *Heart in Diabetes: A Microvascular Disease* (Laasko 2011).

THE NICOTINE-ADDICTED SMOKER, FORMER SMOKER, CURRENT SECOND-HAND SMOKER, AND FORMER SECOND-HAND SMOKER—48 million US ADULT PATIENT LIVES

Any individual, who has a history of smoking or being exposed to second-hand smoke, warrants the attention of an audiologist. Given the prevalence of hearing loss in those exposed to smoking, the patient intake form should include a question about whether the patient is a current smoker, former smoker, current second-hand smoker, or former second-hand smoker. It is important to assess whether family members or others in the family's social circle, have exposed the patient to second-hand smoke for any period of time.

The American Heart Association (AHA) documents approximately 4000 different chemicals in cigarette smoke. There is evidence linking exposure to two of the chemicals, nicotine and carbon monoxide, with hearing loss (Chang et al 2016). Nicotine is a highly addictive, ototoxic, vaso-constrictor that causes tissues to become hypoxic, leading to angiopathies (small vessel disease), caused by tissue ischemia, tissue necrosis, and ultimately end organ diseases. This tissue damage manifests as hearing loss, heart disease, stroke, neuropathy, retinopathy, and micro-circulatory impairment.

Nicotine has been used as the active ingredient in pesticides by the agricultural industry, particularly in the tobacco industry. When sprayed on tobacco leaves that are hand-harvested for cigars, the nicotine is rapidly absorbed through the skin, distributed systemically, causing workers to become violently ill in the fields. Nicotine is highly toxic to humans – 40 mg, about a teaspoonful, of concentrated nicotine may cause an adult to die of respiratory arrest within five minutes; 10 mg of concentrated nicotine is reported to cause a child to expire of respiratory arrest within five minutes. There are no known antidotes.

The audiologist's role should be to advise patients that no level of active smoking or second-hand smoke exposure should be considered "safe"...

The carbon monoxide in cigarette smoke, like nicotine, is absorbed systemically through the alveoli in the lungs, sublingually, (under the tongue), and after travelling up the Eustachian tube into the middle ear. Premature cellular death results because of tissue hypoxia – low oxygen levels. It should be noted that carbon monoxide interferes with the red blood cells mission of delivering oxygen and nutrients, to metabolizing cells. Without oxygen, cell metabolization cannot take place, and the vicious cycle of cellular starvation, ultimately resulting in end-organ disease is compounded by the insidious effects of carbon monoxide.

According to Lyons (1992), 40% of a cohort of infants exposed to secondhand smoke failed initial hearing tests. Exposure to secondhand smoke was associated with a 4.9 times increase in the prevalence of hearing deficits, and 75% of the cases of hearing loss were statistically attributable to exposure to secondhand cigarette smoke.

The Irish government's response was to ban cigarette smoking in public places. Notably, airlines and bars were first on the list, and it expanded to cover all of Ireland. They could not ban smoking in people's homes because of privacy issues. The movement to ban smoking in public places was taken up by over two dozen countries around the world. The reason that we do not smoke in public places in the United States is because of the Irish audiologist, Lyon's, ground-breaking research that proved exposure to second-hand smoke causes hearing loss at unacceptably high levels.

Additionally, Langone Medical Center in New York, has documented that teens exposed to secondhand smoke tested with hearing loss at almost twice the incidence as those teens not exposed to secondhand smoke. Perlman et al (2016) found that 80% of hearing-impaired teens unaware they had hearing loss until tested. It is easy to imagine the poor test scores in school, the impaired psycho-social development, social withdrawal, and depression that may have also been an unwanted presence in these innocent teen's with hearing loss.

After sharing these findings with primary care physicians, the call to action by all audiologists must include provision of baseline hearing evaluations, with a routine annual follow up for all current smokers, former smokers, current passive smokers, and former passive smokers.

Audiologists can provide patient education materials for the physicians, medical assistants, and other clinic staff, that instruct patients on why a hearing evaluation is necessary. The audiologist's role should be to advise patients that no level of active smoking or second hand smoke exposure should be considered "safe", and help to lower the burden of tobacco use by educating and advising their patients regarding the benefits of smoking cessation on hearing preservation (Fabry et al, 2011).

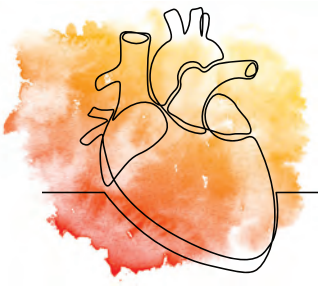
HYPERTENSION AS A FACTOR ASSOCIATED WITH HEARING LOSS —70 MILLION US ADULT PATIENT LIVES

About 70 million American adults (29%) have high blood pressure, which equates to one of every three adults. Only about half (52%) of people with high blood pressure have their condition under control. Another one in three American adults has prehypertension – blood pressure numbers that are higher than normal, but not yet in the high blood pressure range. High blood pressure costs the nation $46 billion each year. This total includes the cost of health care services, medications to treat high blood pressure, and missed days of work. This is data collected by the United States' Center for Disease Control (CDC) and found on-line at CDC 24/7 Saving Lives, Protecting People.

This vein of research, archived by the CDC, reminds is that the human body depends on a proper supply of oxygen and nutrients in order to maintain its function, and such supply depends on the functional and structural integrity of the heart and blood vessels. Hypertension, the most common vascular disorder, may facilitate structural changes in the heart and blood vessels, including the microstructures of the inner ear.

High blood pressure may cause inner ear damage which may, in turn, cause progressive or sudden hearing loss. This pathology of the circulatory system may directly affect hearing in several ways. One of the vascular physio-pathological mechanisms described is the increase in blood viscosity, which reduces capillary blood flow and ends up reducing oxygen transport, causing tissue hypoxia and cellular death of the micro-cilia in the cochlear and the neurons in the eighth cranial nerve, thus causing hearing loss. Moreover, arterial hypertension may cause ionic changes in cell potentials, thus causing hearing loss (Marchiori, et al 2006).

According to Marchiori, et al 2006, there is a significant association between hypertension and hearing loss. Hearing loss in the population under study suggests that hypertension is an accelerating factor of degeneration of the hearing apparatus due to aging. Notably, the results in this research, through evidence of association between hypertension and hearing loss, open the doors for collaboration between audiologists, otologists and cardiologists to ensure those with hypertension and pre-hypertension have their hearing monitored annually.



CARDIOVASCULAR DISEASE – 80 MILLION US ADULT PATIENT LIVES

Cardiovascular disease (CVD) is a class of diseases that involve the heart, or blood vessels. Cardiovascular disease includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack). Other cardiovascular diseases are stroke, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, atrial fibrillation, congenital heart disease, endocarditis, aortic aneurisms, peripheral artery disease, venous thrombosis, cerebrovascular disease, renal artery stenosis, and microvascular disease.

Cardiovascular diseases (CVD's) are the leading cause of death globally. Coronary artery disease (CAD's) and stroke account for 80% of CVD deaths in males, and 75% of CVD deaths in females.

Risk factors associated with CVD include age, tobacco use, physical inactivity, excessive alcohol consumption, unhealthy diet, obesity, family history of cardiovascular disease, raised blood pressure (hypertension), raised blood sugar (diabetes mellitus), raised blood cholesterol (hyperlipidemia), psychosocial factors, poverty, and low educational status. Some of these risk factors such as age, gender, or family history are immutable, however, many important cardiovascular risk factors are modifiable by lifestyle change, social change, drug treatment, and prevention of hypertension, hyperlipidemia and diabetes.

Population-based studies show that atherosclerosis, the major precursor of cardiovascular disease begins in childhood. Further research of atherosclerosis in youth demonstrated that intimal lesions appear in all the aortas and more than half the right coronary arteries in youths aged 7-9 years. The data cited here were published in 2009 by the U.S. Preventive Services Task Force.

Notably, Friedland, et al (2009) indicated a significant association between low-frequency hearing loss and cardiovascular disease. When controlling for age, hypertension, diabetes, smoking, and hyperlipidemia, low frequency presbycusis was significantly associated with intracranial vascular pathology such as stroke and transient ischemic attacks. Significant associations were also seen with peripheral vascular disease, coronary artery disease, and a history of myocardial infarction.

Thus, according to the findings of this study, the audiogram pattern correlates strongly with cardiovascular and peripheral arterial disease and may represent a red flag for those at risk for CVD. Patients with low-frequency hearing loss should be regarded as at-risk for cardiovascular events, and appropriate referrals should be considered.

Low-frequency hearing loss can be thought of as the "canary in the coal mine", with respect to CVD. When a patient self-refers to an audiologist and the patient has a low-frequency hearing loss, this may be a red flag for a referral to a cardiologist, or at minimum, at report back to the primary care physician that hearing assessment results point to a possible cardiovascular condition that warrants further medical work-up.

SUMMARY

Diabetes, cardiovascular disease, hypertension and a history of smoking are four common conditions associated with hearing loss in adults. Given this relationship, primary care physicians and other healthcare professionals who work with individuals who are at-risk for developing these conditions, need to be made aware of the need for scheduled annual hearing tests, conducted by an audiologist. It is the responsibility of the audiologist to be familiar with the science behind these co-morbid relationships and to share this information with their medical colleagues.

It is critical that the audiology profession commit educational resources for the public good, and promote a heightened awareness of the risks associated with untreated hearing loss. By using some of the research cited here, audiologists can share a message, based on scientific evidence, published in peer reviewed journals. The scientifically driven message to primary care physicians and other licensed medical professionals obligates them to refer at-risk patients to audiologists for hearing assessments. Concurrently, self-referred patients with a history, or presenting with audiometric test results, consistent with one of the four common co-morbidities or four common chronic disease states listed here, it is the responsibility of the audiologist to make the necessary referral to a physician who is qualified to conduct the appropriate medical evaluation and make any necessary further referral. ■

Robert Tysoe *is the owner of Hearing Healthcare Marketing Company in Portland, Oregon. He can be contacted at robert.tysoe@netzero.net.*

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Continued from page 9

positions for members of Congress. Most of these staff members are in their mid-to-late 20s. Do not make the mistake of treating these bright, passionate young people dismissively. Treat all staff members with respect and assume that they have decision-making authority or are key influencers on the issues being discussed.

- No partisanship! Your party affiliation and political views may be vastly different from the legislator from whom you are seeking support for the bill. However, MAASA is a non-partisan issue that has achieved strong bipartisan support. Refrain from any partisan discourse or complaining about how your legislator has handled other issues. Maintain a positive dialogue about the benefits of MAASA.
- If your legislator or his/her staff raise concerns about MAASA or express doubt about supporting the bill, don't argue. Remain positive and offer to follow up with additional information that may help the legislator more fully understand what MAASA will accomplish or clear up any confusion or misinformation. Make a note of any concerns raised during the meeting and report back to ADA staff. We will be glad to assist.

4. Be brief.

- Congressional meetings are typically 15 minutes from start to finish. Be prepared to make your initial MAASA pitch in less than five minutes, so that there is ample time for questions.

5. Be honest.

- You are the expert on hearing and balance care. Be candid (but kind) about the challenges that current Medicare policies impose on your patients and your practice and your rationale for the need for MAASA to alleviate those issues.
- Throughout the course of the meeting, legislators and staff may ask you questions that you are not prepared to answer. This is quite common. The best approach is to document the question, to be direct about not knowing the answer and to offer to follow-up by email with more information (if you offer to follow-up, be sure to do so in a timely manner). ADA staff will be glad to assist you in gathering any information that you may need to respond.

Other Tips for Successful Congressional Meetings

- Dress professionally, but comfortably. Business attire is preferred. If attending multiple meetings (ADA Lobby Day, for example), wear comfortable shoes as you will walk a great deal throughout the day.
- Bring plenty of business cards. Most Congressional offices will collect a business card from each person in attendance for the meeting. You may also leave an additional card with each staff person.
- Send a follow up communication after each meeting. Plan to collect a business card from each staff person in attendance at the meeting. Send an email thank you and/or a hand-written thank you within one week of the meeting. Be sure to also include any follow-up information that you promised to provide.■

The Rise of the Audiological Machines

by Aaron C. Jones, Au.D.

What is intelligence? Its definition is elusive but certainly includes reference to the activities of processing, reasoning, and learning. One definition was provided by Gottfredson and a group of 52 academic experts:

> *"Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—'catching on', 'making sense' of things, or 'figuring out' what to do."* (1994, p. A18)

Clearly, intelligence is something we associate with the brain, but increasingly people use the term *artificial* intelligence (AI). Data show that popularity of the Internet search term "artificial intelligence" has more than doubled in the last 10 years (Google Trends, 2019). We see frequent references to AI in popular culture, and it is a technological basis for thousands of entrepreneurial ventures (*The AI 100: Artificial Intelligence Startups That You Better Know*, 2019). With this increasing societal and occupational interest, AI is bound to make inroads into the hearing care industry, which means that audiologists need to be aware of it.

ARTIFICIAL INTELLIGENCE

What is AI? Simply put, AI is aptitude, demonstrated by a computer, for a task normally accomplished by a brain. It uses mathematical models, which are systems of equations that produce desired outputs for specific inputs, to mimic brain function through processing information, reasoning based on that information, and learning from it. Models are developed and trained using input data that typically have patterns and are labeled. In other words, AI involves using systems of equations trained with real-world data to automatically produce, in a brain-like way, desired outputs for new inputs.

The term "artificial intelligence" was coined in 1955 (McCarthy, et al., 2006). In their proposal, McCarthy and his team conjectured that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." Its idea dates back to the automatons of Greek mythology.

Over the years, AI has been depicted as enabling the automation of intellectual and physical human tasks. Depictions have ranged from utopian to dystopian. Utopian ones like the movie *Robot & Frank*, where a man gains both a friend and an accomplice in a robot, nurtured the idea that AI may ultimately assist humans in our daily activities and professions (Schreier, et al., 2012). At the other end of the spectrum, dystopian depictions like the film interpretation of Isaac Asimov's novel *I, Robot* have fueled fears that AI may someday replace humans in our professions (Proyas, 2004). Although often depicted in the context of robots, AI does not require them. Robots themselves are not AI but they can be functionalized by it. Even without using AI, robots can perform defined tasks based on sensor data. The use of sensor data to trigger a computational decision is not AI.

Recently a computer scientist and former Chief Scientific Officer of Baidu, which is one of the largest internet and AI companies by revenue in the world, said that tasks a person can do with no more than one second of thought may be automated with AI now or in the near future (Ng, 2017). This suggests that some audiological tasks today may be ripe for automation with AI.

AI and automation have, in fact, already affected audiology. For example, screening audiometry has been automated, without using AI, as demonstrated by the Welch Allyn AudioScope®. Some manufacturers use AI to improve hearing instrument performance or to automate audiological tasks like fitting fine tuning. As audiologists we are increasingly faced with AI terminology but, even though it has become a part of our lexicon, that terminology is often misunderstood and misused. Furthermore, our own lack of AI awareness and fear—fueled by dystopian depictions in media—have made us susceptible to marketing hype.

BUILDING BLOCKS

Fear and uncertainty are natural human responses when faced with a complicated topic like AI. Fortunately, AI is comprised of building blocks that may be more easily understood in isolation, especially when they have familiar real-world examples. Today, the AI building blocks of computer vision, natural language processing, and machine learning frequently appear individually or together in everyday and healthcare applications.

Computer vision

Biological vision is the process of detecting light with the eyes, transmitting neural representations of light to the brain, processing those signals, and perceiving them. We typically refer to the resulting perception as 'vision'. With vision, humans can describe the content of a scene or image and recognize similar ones.

Computer vision is a building block of AI and is the analog of biological vision. With computer vision, mathematical models are trained to recognize specific types of digital images. Features and patterns, contained in those images, are used to train mathematical models so that they may be used to recognize similar visual features and patterns in other images. Early examples include optical character recognition (OCR) where a computer recognizes a handwritten letter of the alphabet and converts it to an ASCII (American Standard Code for Information Interchange) one, to be used in word processing and other computer applications. Other familiar uses of computer vision include object, fingerprint, retina, and facial recognition.

Natural language processing

Biological language processing involves detecting, transmitting, processing, and perceiving spoken or written communication. In the case of speech, the ear functions for detection whereas in the case of written communication, the eyes do the job. In both cases, we are processing morphology, syntax, semantics, and pragmatics.

Natural language processing (NLP) is another building block of AI. It is the analog of biological language processing. In the case of NLP, mathematical models are trained to

recognize specific acoustic or textual representations of language. Familiar applications of NLP include transcription and translation. It can be combined with computer vision, specifically OCR, to transcribe text, if necessary translate it, and finally generate a text or speech output.

Perhaps of more audiological interest, however, NLP may be used to transcribe speech. It commonly does this with automatic speech recognition (ASR). Functional application of NLP with ASR is dependent on one or more language models and an acoustic model. A language model, which is sometimes called a statistical language model, estimates the probabilities of specific strings of words occurring in a language. It predicts the next word in a phrase based on the word or words before it.

Due to the complexity of a language that includes millions of possible strings of words, a model represents only a subset of it. A language model often simulates, with high accuracy and precision, just one topic of conversation. Speaking rate, age, gender, accent, dialect, slang, and other language variables challenge accurate and precise ASR. Robust language models require training sets with thousands of audio samples—and if language translation is required, then high fidelity is required for both the source language and the target language.

In addition to the language model, a robust acoustic model is necessary for robust ASR. Distance, noise, and reverberation are important variables to consider with ASR, just as they are with biological language processing. ASR that works across a broad range of acoustic environments was undoubtedly trained with data acquired using different microphone distances, different background noise, and different room acoustics.

Machine learning

Biological learning is the process of acquiring knowledge. It comes through exposure to new data and it begins before birth; pre-natal learning has been demonstrated and specifically language learning has been found to begin as early as the last 10 weeks of pregnancy (Moon, et al., 2012). We learn throughout life with exposure to new information and experiences.

Machine learning, which is another building block of AI, is the analog of biological learning. It is the ability of a model to evolve with new data. Supervised machine learning is most common type, where a human labels new data in a training set and correlates it with the specific output to train models. An example is user preference learning. Unsupervised machine learning is the other type. In this case, models recognize natural patterns in unlabeled data. Deep learning is a specific class of machine learning whereby features of input data are extracted in layers more like the process of feature extraction in the ascending auditory system.

Machine learning, which is another building block of AI, is the analog of biological learning. It is the ability of a model to evolve with new data.

Machine learning, computer vision and NLP are commonly used building blocks of AI. It all sounds futuristic, but individually and together they have applications that are increasingly pervasive in our lives. We encounter them in our homes, on our mobile devices, and even in the audiology profession.

EVERYDAY APPLICATIONS

In cities around the United States, it is becoming common to see self-driving cars. Technologies from autonomous vehicles are being offered in mass-production cars; parking assist, braking assist, and lane control are just a few. We are even seeing overflow of these technologies into the transport trucking and boating industries. An industry has quickly emerged for AI-enabled autonomous vehicles that includes the entire stack from sensor development to services.

Related but more relevant applications for audiology include transcribers and translators, virtual personal assistants (VPAs), and chatbots. These AI applications have been in existence for years and are already making a splash in our industry.

The ability of AI to produce a text or speech output for a given text or speech input is compelling in audiology. These text-to-speech, speech-to-text, text-to-text, and speech-to-speech applications are already here with automatic captioning and subtitles for telephone communications and broadcast media. As digital processing and storage technologies advanced, mobile apps of AI-enabled transcription and translation proliferated.

Transcription and translation apps like Google Translate and SayHi Translate from Nuance Communications may be used on our existing mobile devices, with or without a wireless network. Their accuracy and precision are, as previously discussed, dependent on language and acoustic models. Google may perform more robustly for consumer topics while SayHi, which was trained using doctor dictations, may perform better when the discussion includes healthcare terminology. AI-enabled tools like these allow us to better overcome communication barriers, using our existing mobile devices.

There are even dedicated translation devices that serve a similar purpose for specific use-cases. The ili device from Logbar, which uses ASR to produce a Japanese or Mandarin speech output from English speech, is one example. It was trained for a travel application and, therefore, is most accurate with topics like shopping, dining and navigating.

While ASR may be used as a basis for transcription and translation, it may also be used to enable a virtual personal assistant (VPA). The most commonly used VPA is Siri, which Apple claims is used monthly on over 375 million devices in 21 languages across 36 countries (Cook, 2017). VPAs like Siri and Alexa, from Amazon.com, use ASR to convert voice commands and questions to text before producing a corresponding output. VPAs can add a meeting to your calendar, find a recipe, play a song, and more.

ASR also serves as a basis for so-called chatbots with which you can interact via Internet or phone. Many companies already use chatbots to triage incoming customer service calls. Simply type or state your question and a get an answer by interacting with a chatbot that leverages a language model to determine its most appropriate answer. If you phone customer service these days, you may never actually speak with a real person. Instead, you might speak with a chatbot.

Multiple building blocks of AI can be used together in an individual application. In one implementation, computer vision and NLP together detect states of emotion or confusion more robustly than either building block can do on its own (Amer, et al., 2014). Similarly, computer vision may be used to detect visemes, which are fundamental facial cues that map to one or more phonemes, in order to improve the accuracy of AI for speech-in-noise beyond the performance limitations of ASR (Potamianos, et al., 2012).

HEALTHCARE APPLICATIONS

Although AI is most common with everyday applications, it is finding its way into the healthcare industry. Today, AI has found applications in disease prediction, diagnostics, and management. Prognos is using AI to predict disease from big data. Ginger is using it to assess mental health. Sensely is using AI to direct insurance plan members to resources, and for remote monitoring of chronic illnesses like congestive heart failure and chronic obstructive pulmonary disease. Arterys is using computer vision to analyze medical images and drive diagnoses. These are but a few examples. The list goes on and on.

AI is being applied in the audiology profession, too. Application of computer vision is in a particularly early stage, but at least one product is under development that leverages it for automated, otoscopic diagnosis of common middle ear disorders. More mature in its audiological application, NLP has been used with both Cloud and mobile apps. Microphones on connected hearing instruments provide a means by which a user can remotely access a VPA, transcribe, and translate. It is important to note that, like non-audiological applications, hearing instrument applications of ASR have their limitations—distance, noise, reverberation, dialect, accent, jargon, speech rate, and more—due to the challenges of training language and acoustic models, as previously described.

Looking closer at the AI building block of machine learning, two notable applications have surfaced in the hearing aid industry. The first application is hearing instrument fitting fine tuning, based on user preferences and behaviors. The second application is acoustic classification, to inform automatic changes of hearing instrument sound performance.

User preference and behavior learning

In the course of a hearing instrument fitting, fine tuning is traditionally performed in-clinic, based on classical methods of validation: aided speech testing, questionnaires and inventories like the International Outcome Inventory for Hearing Aids (IOI-HA), and face-to-face discussion. Modern methods of hearing aid validation, leveraging teleaudiology

and ecological momentary assessment, are gaining traction with some manufacturers (Timmer, et al., 2018).

Another approach to fitting fine tuning is to use machine learning in hearing instruments or their mobile app, for user preference and behavior learning. The idea is that a hearing instrument fitting may be allowed to evolve, without involving an audiologist, based on user preferences for volume and sound performance in different listening environments. User preference and behavior learning has been implemented by multiple hearing instrument manufacturers. This puts a modest amount of control in the hands of hearing aid wearers, which may be a double-edged sword. Ideally, the use of machine learning in this way improves user satisfaction. However, in reality, it could sometimes lead to under-amplification for users with strong preference for listening comfort.

Acoustic classification

Modern hearing instruments automatically switch programs, based on changes in listening environments that are acoustically classified by the hearing instruments. This automaticity sometimes obviates the need for manual user adjustments, but how do these acoustic classifiers work?

"Automatic classifiers sample the current acoustic environment and generate probabilities for each of the listening destinations in the automatic program. The hearing instrument will switch to the listening program for which the highest probability is generated. It will switch again when the acoustic environment changes enough such that another listening environment generates a higher probability." (Hayes, 2019)

Some manufacturers use machine learning to develop their acoustic classifiers in order to better distinguish between listening environments. Using a training set of many audio clips from different listening environments, acoustic classifiers learn to better differentiate between environments that are remarkably similar, and even trick people who have normal hearing thresholds. Accurate acoustic classification is the basis for automatic sound performance that hearing aid users may prefer (Rakita and Jones, 2015; Cox, et al., 2016).

AUDIOLOGICAL MACHINES

What might the future hold for AI in the audiology profession? Clear applications of computer vision, NLP and machine learning are surfacing. Together these and other AI building blocks support automation of some audiological tasks. Pure-tone and speech audiometry, and perhaps assessment of central auditory processing, are strong candidates for near-term automation. Furthermore, with applicability to primary care and otolaryngology, we may see routine use of computer vision to diagnose middle and outer ear disorders. In the more distant future, computer vision may be used for viseme recognition to supplement and improve speech recognition in noisy environments; although privacy concerns, digital memory, and battery life remain obstacles.

NLP is pervasive. Companies like Apple, Amazon.com, Google, Nuance Communications, and Baidu continue to mature language models and acoustic models, thereby commoditizing transcription, translation, VPAs, and chatbots. We may leverage these models to caption and subtitle in challenging listening environments, where people struggle most. In addition, we may see implementations of NLP within hearing instruments rather than on mobile phones, assuming that latency and battery life barriers can be overcome. NLP innovations seem likely to focus on speech-in-noise improvements and further integration with mobile phones.

AI will continue to inform acoustic classification. As acoustic models mature, we may expect to see hearing instruments automatically identify even more listening environments and adjust sound performance accordingly. Also, with machine learning, our understanding of user preferences and behaviors should improve over time. With this improvement, AI-mediated fitting fine tuning is likely to become more efficient and effective, thereby decreasing the need for hearing aid follow-up appointments.

AI is enabling automation of audiological tasks, but it is not something to fear. AI is unlikely to replace audiologists. Some tools may even help audiologists thrive amid the rise of the machines. Counseling is one crucial aspect of audiology that seems beyond the near-term reach of automation. While VPAs may leverage language and acoustic models to function in simple use cases, and emotion detection may mature to reliably recognize extremes, the empathetic top-of-license counseling provided by audiologists ensures job security. Complex decision-making, based on subtle cues among a highly variable spectrum of patients, will keep audiologists in clinical practice for years to come. ■

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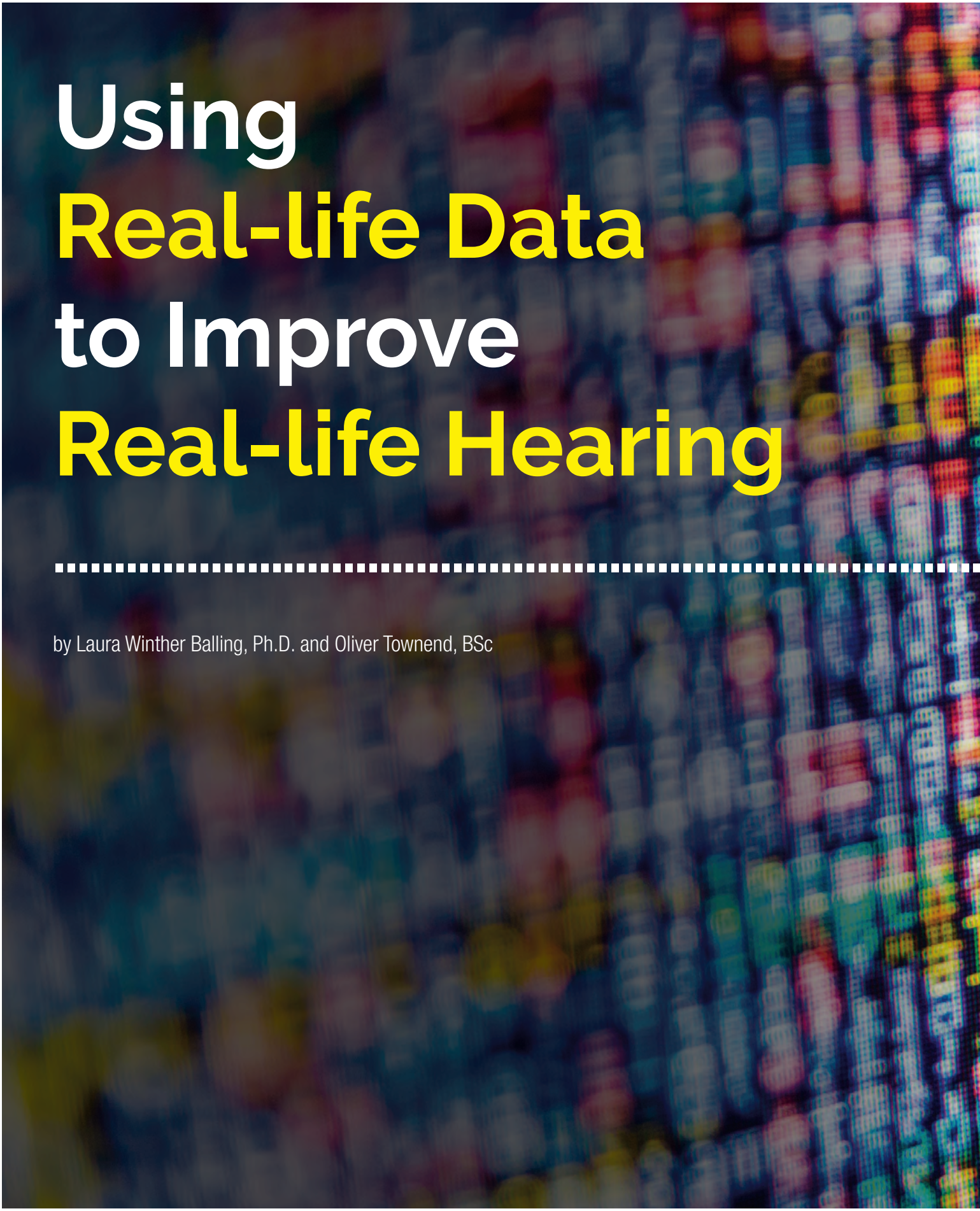
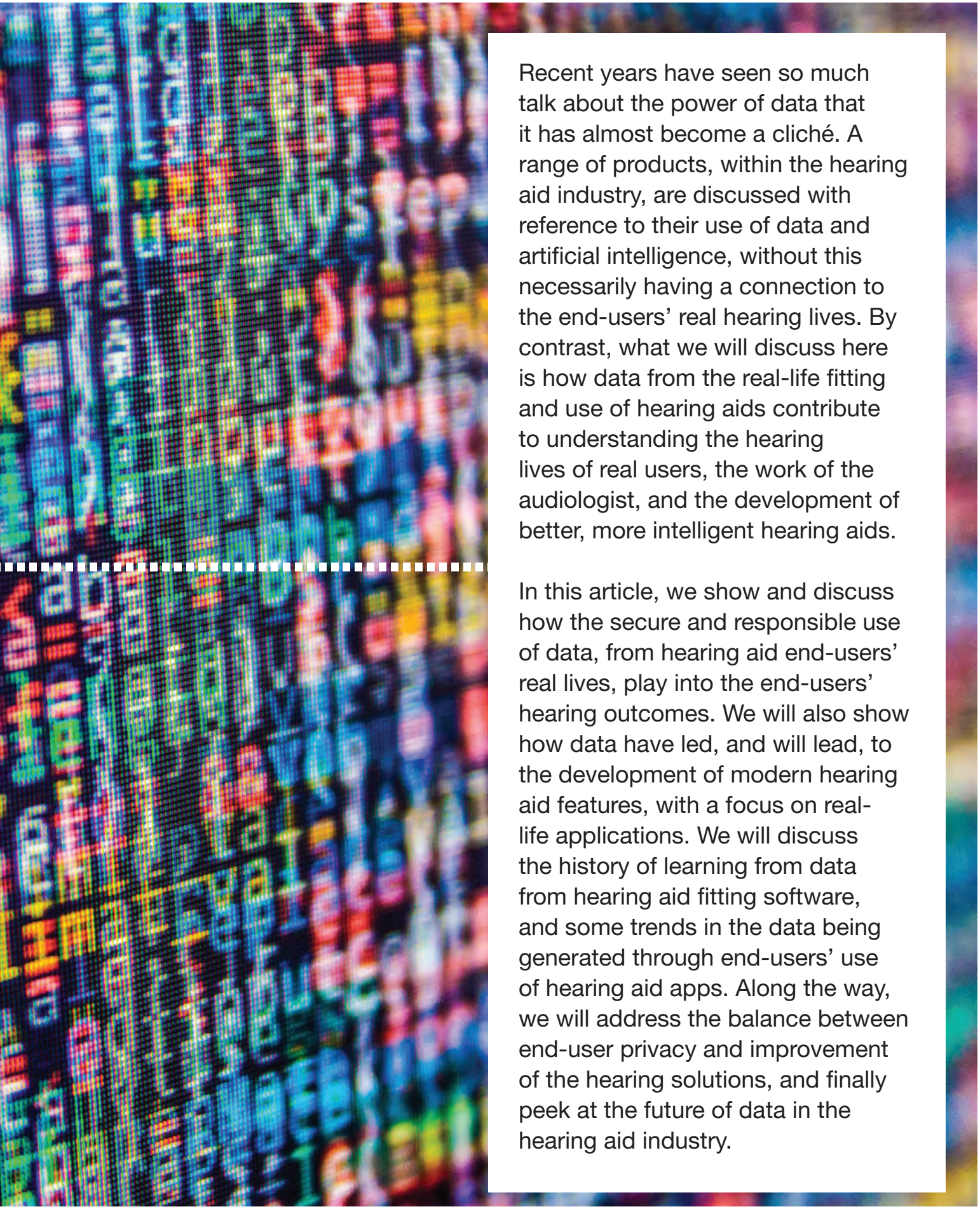


Using Real-life Data to Improve Real-life Hearing

by Laura Winther Balling, Ph.D. and Oliver Townend, BSc



Recent years have seen so much talk about the power of data that it has almost become a cliché. A range of products, within the hearing aid industry, are discussed with reference to their use of data and artificial intelligence, without this necessarily having a connection to the end-users' real hearing lives. By contrast, what we will discuss here is how data from the real-life fitting and use of hearing aids contribute to understanding the hearing lives of real users, the work of the audiologist, and the development of better, more intelligent hearing aids.

In this article, we show and discuss how the secure and responsible use of data, from hearing aid end-users' real lives, play into the end-users' hearing outcomes. We will also show how data have led, and will lead, to the development of modern hearing aid features, with a focus on real-life applications. We will discuss the history of learning from data from hearing aid fitting software, and some trends in the data being generated through end-users' use of hearing aid apps. Along the way, we will address the balance between end-user privacy and improvement of the hearing solutions, and finally peek at the future of data in the hearing aid industry.

The History of Learning from Data

For many years, individual audiograms and hearing aid settings have been recorded, initially on paper, and kept at the clinical level. Sometimes, end-users would keep a written hearing diary of their daily use, including problems they faced with hearing. This could be used with their audiologist to assist in rehabilitation with amplification. The quality of these data and how they were used varied, but this is an early example where real-life data could assist hearing rehabilitation. When datalogging capabilities were achieved by the hearing aids themselves, it was a leap into the future, compared to what had come before.

Datalogging is a recording function that resides inside the hearing aid, recording multiple statistics about hearing aid use in the real world. This datalogging function was initially as simple as collecting statistics on 'hours of use' and 'time spent in each program'. The mid-2000s brought advancements in the datalogging function, for the first time recording both long-term and short-term data. The long-term datalogging showed, in addition to statistics on time of use, the percentage of time the wearer had been in a particular listening environment.

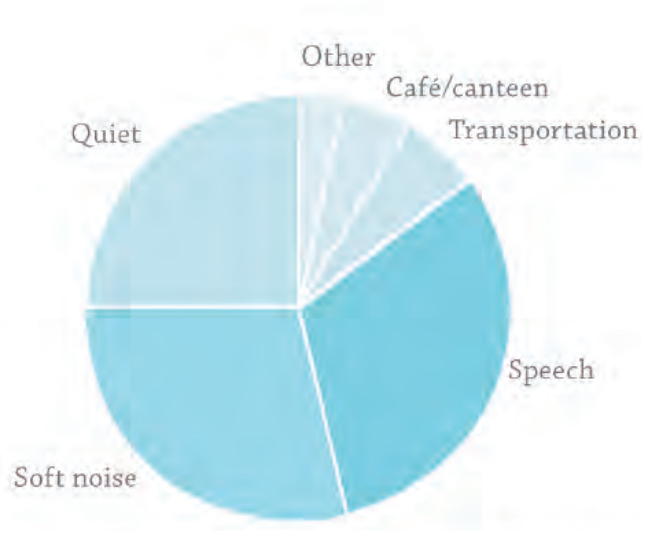


Figure 1. Pie chart showing percentage of time end-user spent in each environment, as classified by the hearing aid.

Hearing aids such as the Widex Inteo, for example, could also make a short data recording of the external environment. This feature was able to capture acoustic information, possibly when the end-user was having difficulties, to help the audiologist understand what was happening and, in turn, counsel or make hearing aid adjustments (Kuk & Bulow, 2007). Now, objective real-life data could be used in the clinic to assist and improve fitting and rehabilitation. Today, datalogging continues to facilitate analysis of listening environments and to link usage patterns to sound classes the end-user spends time in to enrich clinical decisions and rehabilitation.

As is common with apps on your PC or phone, anonymous usage data are gathered and shared with the software developer to assist in bug fixes and improvements. These data contain no personal data from either end-users or audiologists. These data assist in making design improvements and fixes to the software to continually provide incrementally better products. Hearing aid manufacturers use data throughout the whole product development process, from defining a feature to designing it and improving it after it has been released to market. When a feature is considered for an upgrade, data are gathered to assess how the feature is used, and to identify where changes could be made to create a better user experience. One example involves changes to personal program-saving in the Widex EVOKE app. Data analysis identified that end-users were finding it difficult to save a personal program, so the design was changed to make it more user friendly.

Future Uses of Compass GPS Data and Data Consent

Besides anonymous data about how GPS is used, other data could be useful for developing future hearing aid technologies. However, these data points may not always be completely anonymous, and therefore, consent must be given to share them. The usefulness of data should always be weighed against people's right to privacy. The General Data Protection Regulation (GDPR) is the most important change in data privacy regulation in 20 years (European Commission, 2019). While it is an EU regulation, its reach is felt worldwide, and it must be followed by any organization operating within the EU or with EU citizens. GDPR makes the rules very clear on consent to gather and use data, the right to access data and the right for data to be forgotten. GDPR applies to any data that can be identified as belonging to an individual where that individual can be linked to the data. Even though a hearing aid manufacturer does not know an individual's name or date of birth, it is sometimes possible that data collected could be identifiable. For example, Widex believes an audiogram is a fingerprint for the ear and could therefore be identifiable.

In order to protect the individual's privacy, while enabling them to share data with Widex, a secure and encrypted data exchange was set up, and Widex introduced an additional data consent stage in GPS.

Many people enjoy the feeling of giving something to help others: financial donations to a charity, volunteering time, or donating blood. Similarly, hearing aid manufacturers are often contacted by end-users who would like to share their experiences to help others, through feedback on their products and by participating in research. Consenting to share fitting data from GPS is another way that end-users can give data to help others. To ensure that data are always secure and protected, most hearing aid manufacturers maintain high standards in the security and encryption of data, and only allow access to a select few employees, with specific tasks related to these data. Data are pseudonymized and withdrawal of consent is possible at any time. One example of how collective data have been used to give back improvements to users of Widex's products is from the machine learning feature, called SoundSense Learn.

Data From Real-Time Machine Learning

Most hearing aid manufacturers use real-time machine learning in their hearing aids. However, it is difficult to provide one broad-based example of the use of machine learning, because each manufacturer implements machine learning in a different way. Therefore, we will focus on one implementation strategy. SoundSense Learn (SSL) is a feature in the EVOKE app, which uses machine learning that allows end-users to successfully adjust their hearing aids. However, these data may be enriched if the end-user consents to linking the EVOKE app data about the personal programs they create with SSL to their hearing aid fitting session in Widex GPS. Real-Life Insights (RLI), discussed later in more detail, shares consented data from the end-user's EVOKE app with their audiologist back in the clinic.

SoundSense Learn enables end-users to adjust their hearing aid sound in situations where they are not entirely satisfied with the automatic settings in the hearing aid. Such situations arise because, although modern hearing aids adjust to the acoustic environment in an intelligent way, they cannot always predict the end-user's specific intention in a specific situation, making personal adjustments relevant. SoundSense Learn uses a machine-learning algorithm that asks end-users to listen to a series of pairwise A-B comparisons of different gain settings, adjusted via three bands, to uncover the desired settings in a given listening situation. When the settings are found, they can be used in the moment, and may be saved as personal programs for future use in the same or similar environments.

Here, data come into play in many ways: SoundSense Learn was developed based on data (Nielsen et al. 2014). SSL operates using data in the form of responses from the end-user. Finally, SoundSense Learn generates data itself, including: the final settings, usage, situations, and intentions associated with the individual SoundSense Learn program. These data are of interest to researchers, tasked with improving the products, and to audiologists who want to improve patient satisfaction. It is this final aspect that we will discuss further.

Widex EVOKE with SoundSense Learn was introduced in the spring of 2018. In the fall of 2018, company researchers were able to explore the gain settings and usage of SoundSense Learn programs that end-users created in the EVOKE app (Balling & Townend 2018). The lack of patterns or clusters of settings (Fig. 2) indicates that end-users need a sophisticated tool, like SoundSense Learn, to reach all these highly individual settings. When asked, most end-users responded that they found that SoundSense Learn helped them in specific situations and that they would recommend SoundSense Learn to others (Balling, Townend, Switalski 2019).

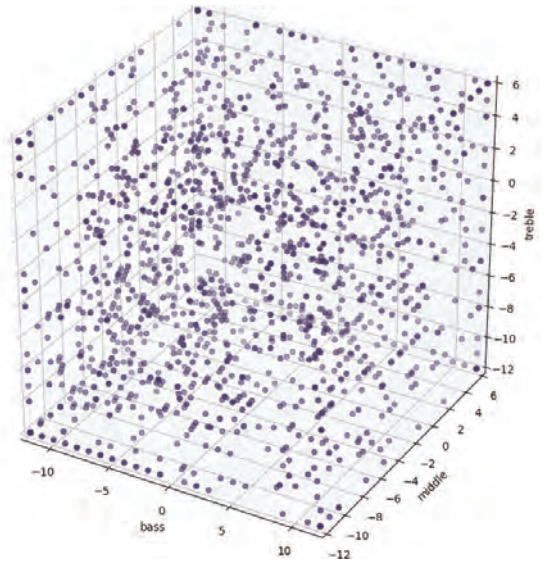


Figure 2. SSL adjustments in the three frequency bands in a sample of 1,860 personal programs (Balling et al. 2019). Each dot represents a unique program; darker colors indicate overlapping programs

These data drove improvements to SoundSense Learn, as they also contained all the A-B comparison settings used along the way. The data enabled developers to fine-tune the machine-learning algorithms to identify the ideal settings for the individual end-user faster and more efficiently. Deep analysis of choices of comparisons made by the algorithm over thousands of sessions was very fruitful. This work meant that the efficiency of the algorithm increased significantly. Figure 3 illustrates the maximum number of comparisons to identify ideal settings, in a given situation. The comparisons or iterations of the algorithm (x-axis) are plotted against the progress to 1.0 (y-axis), indicating that the algorithm has reached full convergence, i.e. the result is as close to the intention of the end-user as possible. SoundSense Learn version 1.1, in red, needed 17 comparisons (median) to converge. In green, we show the improved version (1.2) needing, on average, as few as 12 comparisons for the same result. Also, of note, is the initial speed of convergence: within five comparisons we can see SoundSense Learn version 1.2 reaching around .75 convergence. In practical terms, this means most end-users experienced improvements in just a few comparisons.

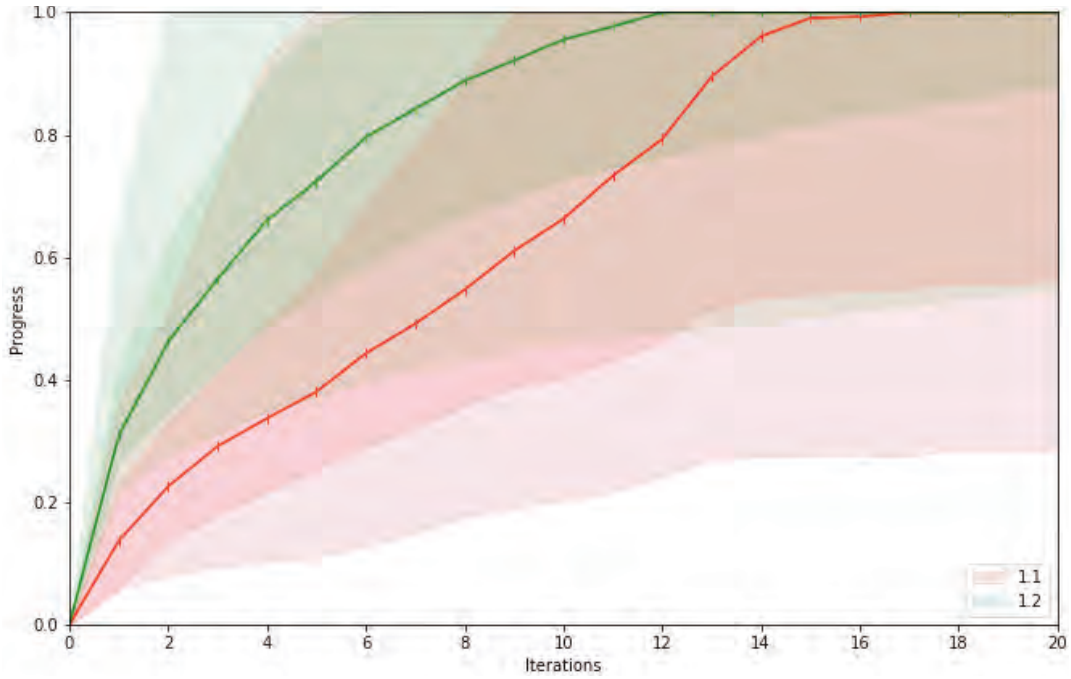


Figure 3. Progression of SSL towards the optimal setting as a function of the number of iterations/comparisons made. It shows both the median performance (i.e. the typical user) and the areas covering 50% and 95% of users. SSL v1.1 is shown in red; SSL v1.2 is shown in green (improved).

SoundSense Learn version 1.3 (released Feb 2019) adds questions on situation ('Where are you?') and intentions ('What is your hearing goal?'), which the end-user answers before starting the A-B comparisons. Both questions are answered from a range of pre-defined answer options. The different situations and intentions and their distributions, shown in figure 4, are based on a sample of 13,813 SoundSense Learn programs created by 5,448 end-users. We see in 'Situations' that most of the programs – almost 50% – are created at home, with other situations more evenly distributed. The dominance of the home setting is probably partly driven by this being the dominant situation for this user group (Jensen et al., in press), many of whom are likely to be retired. It is possibly also due to it being easier to create SoundSense Learn programs in a home situation than in other, more dynamic, settings. Looking at 'Intentions', we see that conversation, TV, noise reduction, and music constitute the majority of the intentions indicated by end-users. Interestingly, conversation is the most frequently indicated intention, reflecting the importance of the ability to communicate in everyday life. This occurs, despite the fact that performing the A-B comparisons in a conversation setting is likely more difficult than, for instance, when listening to media.

An additional aspect that is interesting to explore, in order to understand SoundSense Learn end-users' auditory realities, is the combination of situations and intentions. Figure 5 shows four groups of situations (home, work, restaurants and noisy venues, and transport) and the top five intentions in these situations. There is variation in the prominence of the different intentions across the different situations, which is further evidence of the wide variety of situations in which personalization of sound is relevant. This is thus in line with the variation of gain settings (Fig. 2), indicating substantial variation in the sound profiles that

different end-users prefer in different situations. Figure 5 also shows that the intentions chosen in the different situations are generally in line with what we could expect, with, for instance, TV being a major intention in home settings but not elsewhere, focus being more frequent at work, and conversation and noise reduction being common in restaurants and other noisy settings.

Although the distribution of situations and intentions in the SoundSense Learn data is generally in line with what we know about the auditory reality of hearing aid end-users (Jensen et al. 2019 in press), there are at least two characteristics of the

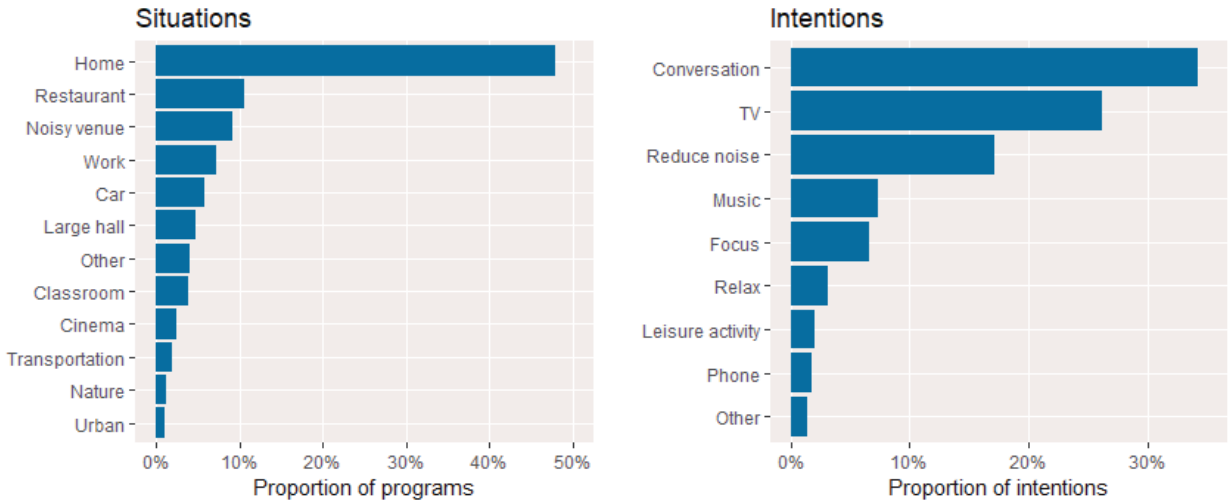


Figure 4. The distribution of programs with respect to situation (left) and of intentions as a proportion of the total number of intentions (right). n = 13,813 unique programs.

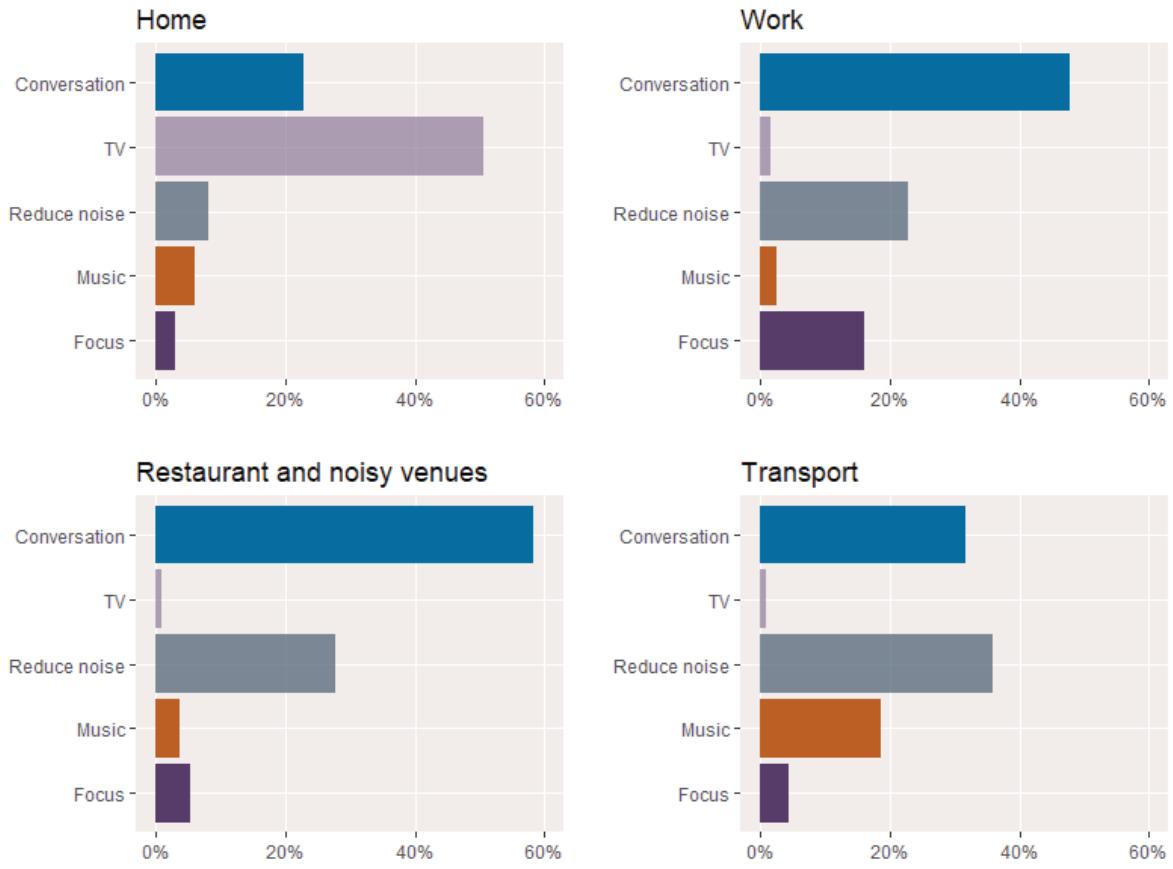


Figure 5. The percentage of different intentions subdivided for four major groups of situations

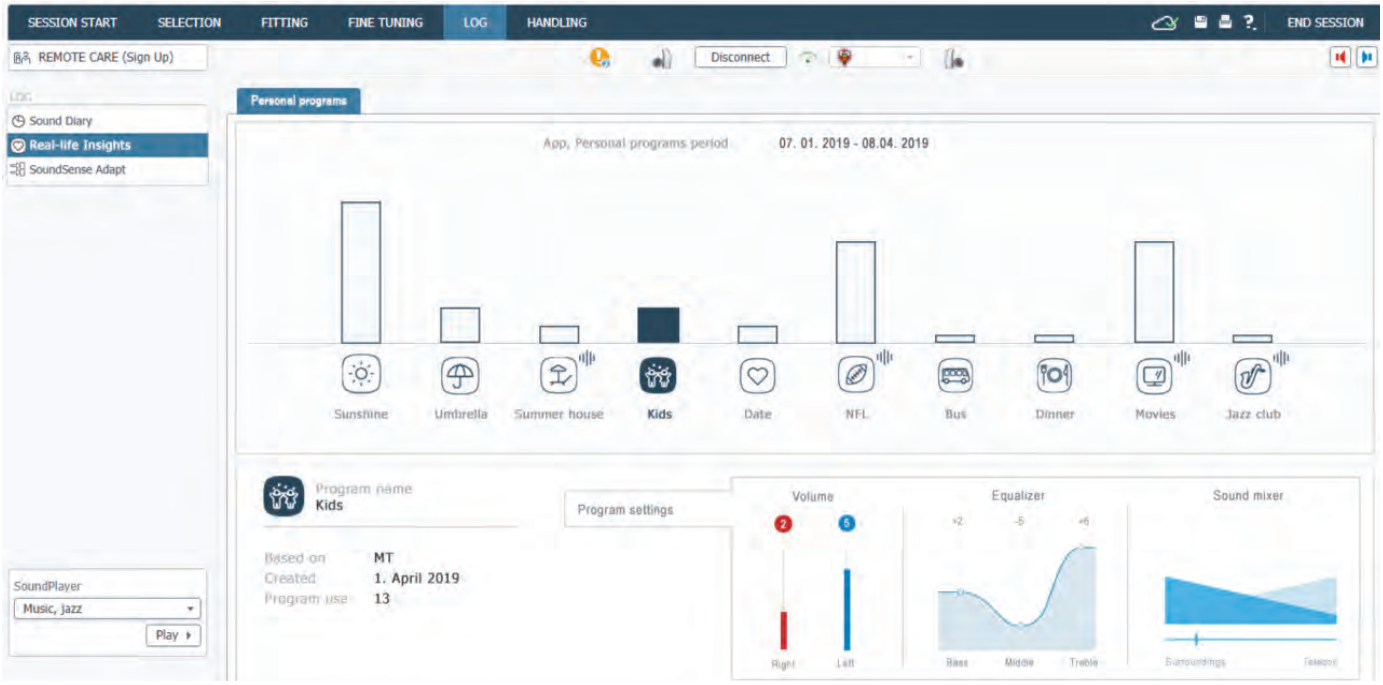


Figure 6. GPS v.3.4 (screen shot subject to change). Real-Life Insights display includes personal programs created, names and icons of programs, date of creation of program, number of times used and corresponding program settings.

SoundSense Learn data that must be taken into account in our interpretation. SoundSense Learn programs are generally constructed and used in situations that are, in some way, not entirely satisfactory to the end-user. This means that they potentially represent only a subset of all the situations in which hearing aids are used—even though the subset that they represent is likely to be situations difficult for hearing aid end-users and therefore of central interest to hearing aid development. We should also consider that SoundSense Learn may not be suitable for all end-users or for all situations; for example, the phone intention is likely to be underrepresented in these data, compared to real life, given the difficulty of conducting A-B comparisons while also keeping a telephone conversation going.

While these data do help us understand the auditory realities of end-users, the primary purpose in collecting them is concrete development, rather than more abstract academic understanding. The knowledge we gain about end-users' preferences for the different situations and intentions serves as input in the continued development of SoundSense Learn.

Real-Life Insights

Another central line of development is getting the audiologist into the loop of information about the personal programs that their patients create. Until now, audiologists have not had direct access to information about personal programs created by end-users within their care. In GPS version 3.4, information on personal programs will, with end-user consent, be included in the hearing-aid log that the audiologist can inspect. Real-Life Insights (RLI) realized the ambition that this information can form a basis for understanding an end-user's real-life hearing and act as input for counselling. Additionally, trends in settings across personal programs may be used for more general adjustments of the hearing-aid settings. Overall, RLI aims to enrich and strengthen the relationship between end-user (patient) and audiologist, with data-driven insights delivered in a user-friendly and informative display (Fig.6).

RLI is not, as with the other data exchanges discussed in this article, possible without explicit consent being given to access those data. As one example, Widex always ensures high levels of encryption and secure movement of data. As shown in Figure 7, specific consent is needed in all data exchanges. Each exchange has a corresponding consent for any possible data connection between Widex, audiologist, and end-user.

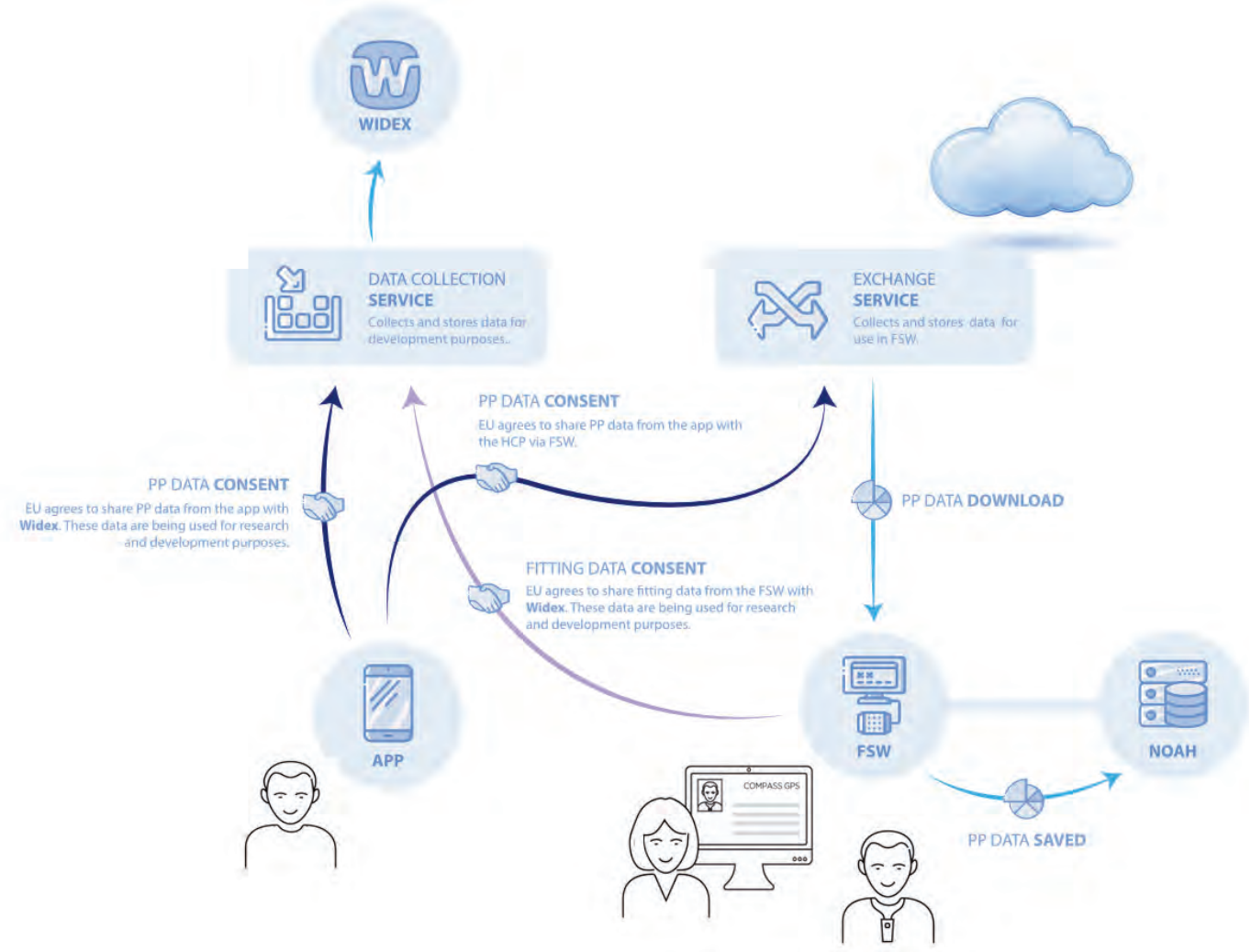


Figure 7: Connection map of consent and data: each connection needs a corresponding consent, between Widex, HCP and End-User (EU). PP = personal program. FSW = fitting software.

Conclusion

The use of real-life data in audiology has come a long way since hand-written, end-user diaries and has a long future ahead. Hearing aid manufacturers are beginning to use real-life data to benefit end-users and audiologists. For this future to be possible, trust and respect for data are essential. ■

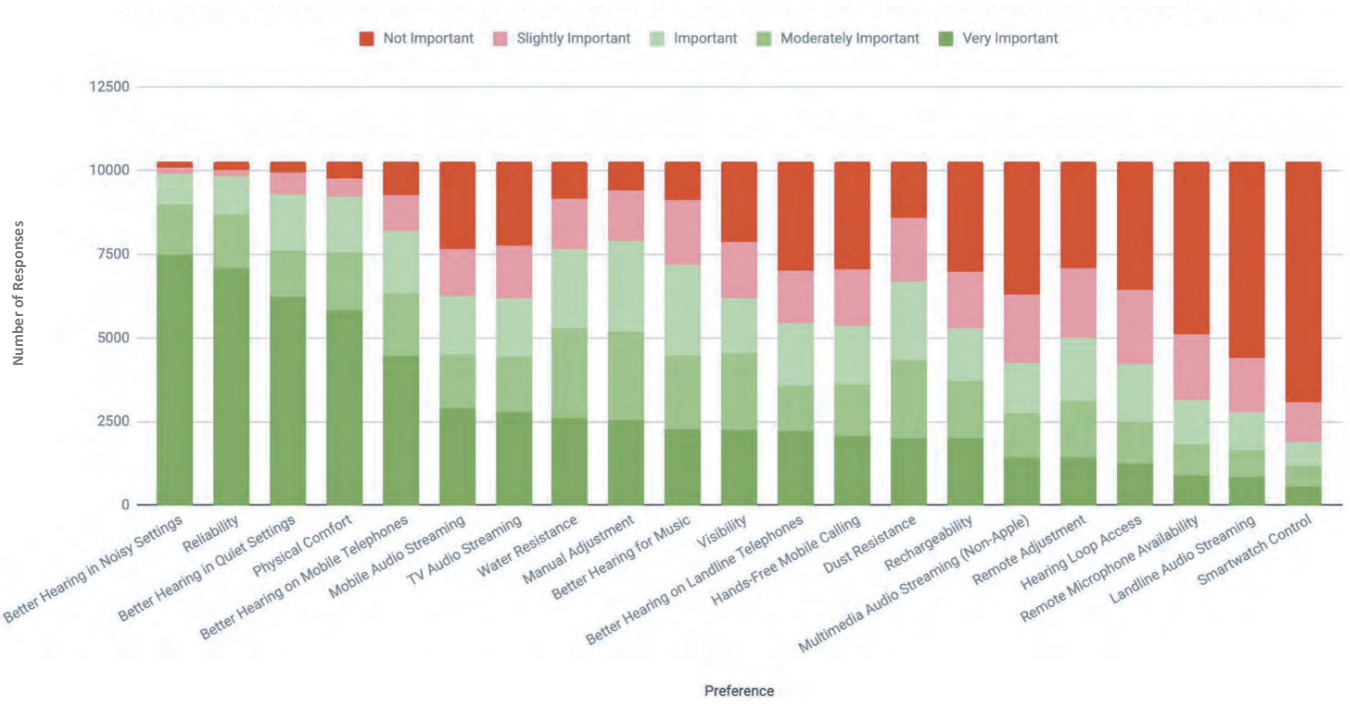
Laura Winther Balling *holds a PhD in psycholinguistics and has done extensive research on spoken and written language comprehension. She now works as an Evidence and Research Specialist at Widex.*

Oliver Townend BSc*. Hons Audiology, University of Bristol. Previous clinical roles at Charing Cross Hospital, London, UK lead him to work for hearing aid manufacturers in European and Asian/Pacific markets. He currently works as a Senior Audiological Specialist for Widex.*

Continued on page 52

Go Figure

The Most Desirable Features Consumers Want When Purchasing Hearing Aids



The data shown in this Figure was compiled by Dr. Abram Bailey, founder and owner of Hearing Tracker.com, a website that helps consumers find and rate hearing aids and professional services. The Figure was posted on social media by Dr. Bailey in July 2019 and given the immense sample size (over 10,000 respondents) and relevant information, it captured the attention of many clinicians.

Note that the survey asks consumers to rate their preferences, not what they think is important or necessary, for successful hearing aid use. Although it's a subtle difference, asking consumers to rate their preferences gives us an unfiltered look at what consumers desire from hearing aids. Even a glimpse of the data shown in this Figure suggests a primary role of the clinician is to educate the individual about what hearing aid features are likely to contribute to their long-term success – even when those features might not be preferred by the consumer - *after* a comprehensive assessment has been completed. After all, what a consumer might prefer is not always what is most likely to enable the individual to receive optimal hearing aid benefit.

Since the data in the Figure is applicable to clinical practice, but did nott have any commentary supporting it when it was posted on social media, we contacted Dr. Bailey and asked him to elaborate on the data he collected and compiled in the Figure.

AP: *Please tell us about why and how you collected this data?*

AB: In 2018, Hearing Tracker launched a software engine that attempts to match hearing aid consumers with specific hearing aid models and accessories, based on each consumer's specific hearing needs and listening priorities. In order to provide meaningful product recommendations to an individual consumer, the matching engine gathers information using a 24-question survey, which asks the consumer to rate the importance of outcomes like an "improved ability to hear friends and family in noisy environments" and an "ability to access audio broadcasted by hearing loops." Since the engine was launched in mid-2018, more than 10,000 consumers have completed the survey.

AP: *Let's examine the top four most preferred consumer preferences on the left side of the Figure. Why do you think those four attributes were rated to be, on average, the most preferred?*

AB: Better hearing in quiet and in noise, product reliability, and physical comfort seem to be the most universal priorities for those that take our survey. This really is an unsurprising finding in that these four attributes really underscore what a hearing aid should provide, at minimum, to allow the product to provide baseline hearing assistance and be wearable (comfortable) on an ongoing basis (reliable).

AP: *Now, let's look at the right side of the Figure. Why do you think attributes such as landline audio streaming, hearing loop access and smartwatch control were by and large rated to be much less preferred?*

AB: Let me provide a little context on these attributes. In our survey, we provide helpful tips next to each question to ensure consumers are sufficiently educated before providing an importance rating. As an example, on our question about hearing loop access, we provide the following tip: "A built-in hearing aid telecoil is required to pick up audio broadcasted by hearing loops. Hearing loops are often installed in auditoriums and other meeting places." So, why doesn't this hint lead consumers to rate "ability to access audio broadcasted by hearing loops" as important? I have been told that learning about a hearing loop and experiencing a hearing loop are two entirely different things, and so it doesn't really come as a surprise to me that most consumers don't see the benefit after reading this brief explanation of the benefits. I think the same logic applies to remote microphones being ranked as lower priority for most consumers. As audiologists, we understand the value of telecoils and remote microphones for improving speech understanding, but sometimes it can be difficult to make our patients understand these benefits without experiencing the benefits first-hand. Therefore, one take-away for clinicians might be to conduct a demonstration of these features for patients who could benefit from them.

Regarding landline audio streaming and smartwatch control, my guess is that these priorities fared poorly due to either being connected to devices that are either going out of fashion (landlines) or being connected to devices that haven't found mainstream market appeal yet (smartwatches). Another hypothesis for landline audio streaming is that the benefit is (like hearing loop access) too esoteric for the average consumer to understand. Or maybe the respondents simply haven't experienced poor hearing on a landline with hearing aids. Prospective hearing aid users probably have no idea what to expect from the phone, and many experienced hearing aid users can use the landline successfully thanks to technologies like telecoil induction and binaural audio streaming.

AP: *There are a few attributes such as mobile audio streaming, TV streaming and rechargeability in which there are roughly equal numbers of respondents rating the attribute important compared to not important. Please explain what it means for clinicians.*

AB: Intake surveys are an important tool, and I think in today's world, it's more important than ever to understand your patients' listening needs, hearing priorities, and accessory needs prior to making any hearing aid recommendations. Taking the example of rechargeability, clinicians need to know when to recommend rechargeable hearing aids based on circumstances like poor vision or poor dexterity, but I also think it's important to educate each patient (regardless of obvious need) on the pros and cons of rechargeable hearing aid technology to allow them to be active participants in the hearing aid selection process. Our survey shows that you can make no assumptions when it comes to technologies like rechargeability, so the clinician should never assume that these fantastic new technologies are for everyone.

AP: *What are your thoughts on the best way clinicians can use this information with respect to selecting and fitting hearing aids?*

AB: The information from our matching engine shows that consumers are not alike in their preferences. Some preferences can be considered almost a given: who doesn't want to hear better in quiet and in noise with their new hearing aids? But other technologies are polarizing, and it pays to identify your patients' priorities through targeted patient-centered care. I think the results of our survey also suggest that clinicians may want to spend additional time educating and counseling on topics like hearing loops and remote microphones before accepting a patient's lack of willingness to benefit from such technologies.

AP: *How might consumers use this information when seeking to purchase hearing aids?*

AB: I'm not sure how these results are beneficial to consumers, other than maybe validating a consumer's preferences, or indicating where a consumer may need to investigate their own assumptions about some technology that they have already written off. My suggestion to consumers is to take the survey, learn from our educational question format, and take a moment to try to understand our provided rationale for the hearing aid matches we make. For each feature or accessory that the engine recommends, justification is provided within the context of the consumer's own hearing priorities. These justifications were painstakingly composed to help provide further education as to how specific hearing aid technologies are relevant to the hearing priorities of each individual consumer. ■

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AN AMERICAN TREKS DOWN UNDER, PIONEERS BLENDED SERVICE MODEL

by Ryan O'Clair, Au.D. and Brian Taylor, Au.D.

One of the benefits of traveling outside the United States to give lectures is the opportunity to meet thought-provoking clinicians. Ryan O'Clair, a young American audiologist living in Brisbane is no exception. I met Ryan last May at the Australian College of Audiology (ACAud) National Congress meeting.

Ryan is full of enthusiasm for audiology, and it just so happens that he stands at the vanguard of innovative service delivery methods. He practices at Blamey Saunders Hears, a chain of retail locations scattered throughout Australia that blend on-line service delivery with traditional brick and mortar clinics. Given its geographic expanse and relatively sparse population, Australia is probably the ideal place to launch this blended approach to hearing care. But as a growing number of people receive healthcare services via the internet, this market is expected to grow in the U.S. If you're an American audiologist, there's a good chance that soon you'll be orchestrating a substantial amount of patient care remotely, using some combination of the World Wide Web, Wi-Fi and smartphone-enabled apps. Ryan's experience indicates that many patients, to use his phrase, like to receive their hearing care in more than one lane. To learn more about these lanes, you can read below.

Over a pint of Australian Pale Ale at Ryan's favorite microbrewery in New South Wales, called the Grifter Brewing Company, I recorded this interview with him.

BT: Hi Ryan. Tell us about yourself.

RO: *Sure! I was born in Iowa, raised in Colorado, and went to college in Oregon. My clinical doctorate degree (AuD) is from Pacific University, near Portland OR. I've been in Australia for 3-plus years practicing audiology. I love audiology, I love sound, and the Australian birdsong down under is unreal.*

BT: How did you end up practicing in Brisbane?

RO: *Throughout graduate school at Pacific University, Australia was continually referenced for its advancements in audiology and hearing health care. With the National Acoustic Laboratory, the Australia Hearing Hub, the invention of the cochlear implant, and all of the outstanding research coming out of the University of Queensland (UQ), Australia was frequently mentioned in some way or another in the classroom. If you stop and think about it, there's a lot of useful audiology research that pours out of this country.*

Although I'd found an outstanding gig in the US at a world-class audiology practice in the states, opportunities for recently minted audiologists are pretty expansive, The allure of adventures internationally began to develop.

I found a mysterious job post for clinical work with opportunities for community education, and research and development, located in the heart of the Sydney's central business district (within walking distance from the Sydney Opera house). Simultaneously, while considering this position, a lecture by Dr Frank Lin piqued my interest. His lecture outlined his concerns for individuals with hearing loss and how the current field of audiology needs to re-focus its efforts to better meet the needs of many adults with age-related hearing loss.

Be it kismet or coincidence the more I learned about this Australian hearing aid company, the more I realized they had created solutions to the exact challenge's Dr Frank Lin had shared.

I accepted the job offer, made the leap, crossed the ocean to Sydney Australia where I lived for a year and a half. Then, I moved north to warmer beaches, and opened the Brisbane branch of Blamey Saunders Hears, a stone's throw from UQ. This August, we celebrated our 2-year anniversary of the Brisbane clinic's opening.

BT: You mentioned your practice, Blamey Saunders Hears. Tell us more about them and your role within the organization

RO: *Blamey Saunders Hears (BSH) is an Australian hearing aid company and is leading the way in teleaudiology. The two founders of BSH, Professor Peter Blamey and Dr Elaine Saunders worked with Cochlear Corporation for roughly 15 years and developed several patents and technology.*

Motivated by a profit-for-purpose mentality they marketed their inventions (sound algorithms found in hearing aids, telephones and headsets) and attracted a team of like-minded audiologists and engineers. Ultimately, they created their own hearing aid company.

Geographically, Australia is parallel in size to the USA, with substantially less population by comparison. As you'd imagine with a country of this geographic expanse, there are areas without access to hearing aid services.

By creating their own teleaudiology company, BSH's range of services is considerable. Well, it's essentially unlimited, as long as an individual has access to a phone or internet provider (as a reference point, we have clients who live on islands off the coast of Madagascar).

The overall philosophy and commitment of the company is to create innovations by breaking down barriers to hearing healthcare. Primarily through affordability, accessibility, and technology (very similar to what Dr Lin's lecture said needs to change). For my role in the organization, I function as a clinical audiologist and help people in a traditional clinic, online, and I also travel to remote locations.

BT: Describe the on-line hearing test and your triaging process?

RO: *From a clinician's perspective, one of the most striking things that BSH has created is the Speech Perception Test (in-house we call it the SPT).*

The SPT is a clinically validated hearing test that uses words instead of pure tones. It's more than just speech audiometry or a counselling tool. It's a hearing test and it is also how we fit our hearing aids (our devices are digitally programmed via words instead of the pure tones from an audiogram).

As the SPT hearing test is using words at a conversation level, instead of looking for the softest audible thresholds, there are considerable advantages to this approach. For example, the test can be conducted remotely as it is not looking for thresholds, but speech comprehension. Interestingly, the test is determining not only how individuals hear the parts of speech, but also how they mishear words.

The test is comprised of 50 consonant-vowel-consonant words of some 30+ randomized word lists. And the test is regularly conducted in our clinics and online.

You asked how we triage. The results of the word test (the SPT) are an aspect of how we direct clients through our channels of communication.

While the SPT is not a pure tone threshold, expressed an audiogram, the SPT result and the pure tone threshold do visually parallel one another (e.g. low frequency and high frequency, vowels and consonants). The SPT result corresponds to pure tone thresholds. For example, a moderate-severe audiogram results in a poor SPT score and a milder loss on the audiogram usually corresponds to a better SPT score.

Like many speech-in-noise tests, used clinically, the SPT is both a difficult and fascinating test. It's one of the things that really caught my eye when I joined the team. I encourage other audiologists to check it out online.

BT: That's interesting. I am curious about more traditional types of audiometric tests you may conduct. What speech in noise tests do you use and how do you apply a patient's score to the hearing aid selection process?

RO: *In our traditional clinics we have an Australian version of the QuickSIN. It's effectively parallel to the QuickSIN used in North America with the same kind of sentence structure, except it's sporting the Aussie accent.*

From BSH's perspective, we're encouraged to counsel beyond the audiogram. As a crew we're mindful that individuals hearing 'within normal limits' on the audiogram may still have considerable difficulty processing speech or hearing when background noise is present.

As an aside and anecdotal story that I'm quite fond of hones in on the company's perspective…

Professor Blamey and Dr Saunders once put on an impromptu skit they created at a local audiology workshop. Dr Saunders played the role of "Travel Agent" and Professor Blamey played the role of "Overworked Businessman" looking for a vacation.

Overworked Businessman arrived and communicated to the Travel Agent, "I'm overworked and I would like a vacation" to which the Travel Agent replied, "I don't know if you need a vacation just yet-- we're gonna do a series of tests to verify this first."

The Agent puts the Businessman through all sorts of challenging tests, measurements, bar graphs, finally replying, 'I've decided you could use a vacation.'

BT: Let's talk more about Blamey Saunders Hears' blended approach to care. Could you describe your blended approach?

RO: *I'd love to explain it. In the blended model, we will help individuals with hearing loss in whatever mode they desire to receive care. That means we help people directly online (remote care), we help people in a more of a traditional clinic (face-to-face), and we help people in temporary clinics, too. Let me explain what I mean by a temporary clinic.*

Our team travels quite a bit creating mini pop-up clinics we call Link clinics. We'll book out a particular location (in a library, or local community center), and any individual in the area that would benefit from our help will make an appointment and see us on that day.

Now what's interesting about the whole blended model is that individuals go between lanes. Meaning a person may purchase online, have difficulty at some point and then come directly to the clinic. Or vice versa. Someone is outside of the normal service area, may come to the clinic initially for the face-to-face approach then transition to more of an online role for support. And, when needed, they can see us again at a local pop-up clinic.

Our clients (patients) are continually going back and forth in the blended model, it's not one pathway. As an example, I've seen the same individual in Sydney, Brisbane, and Surfer's Paradise. The blended model gives patients more choices on how they want service delivered to them.

A blended model means that the company is readily available to be in different places, depending on the individuals who are requesting services. And that's one of the strengths of the model, is that we can help people wherever they are located or how they want to be helped.

BT: What are some of the key factors that tell you a patient/client needs a face-to-fact visit with an audiologist?

RO: *Well it's a method of triaging in which we start with an intake form that's comparable to the CEDRA (Consumer Ear Disease Risk Assessment --a recently developed tool, using machine learning principles that allows consumers to ascertain their risk for ear disease). We conduct case histories, gauge levels of complexity of clients, and provide feedback on our concerns when needed.*

In Australia, the healthcare appears to be quite accommodating, cost effective, and approachable. It makes triaging with medical professionals fairly easy from my experience, even when requesting additional otoscopy in a remote location prior to updating a clinical appointment.

Also, the Speech Perception Test has its own approach to triaging. If individuals fall outside of a degree of range (e.g. someone who has severe to profound hearing loss), additional information will be required.

The biggest determining factor, for a requirement for a face-to-face appointment, is usually the clients themselves making the request. While they are aware that a lot of help can be conducted remotely, many still prefer to meet with an individual face-to-face.

BT: In contrast, what is the typical profile of a patient/client that could purchase hearing devices on-line without a face-to-face visit with an audiologist?

RO: *Behind the scenes of the company there's a great deal of effort to make things as effortless as possible for the client. The whole system is designed to be intuitive and easy to use, from the initial point of contact on our website, to the ongoing follow-up.*

Experienced hearing aid users tend to be strong candidates for the blended model. From an experienced hearing aid wearer's perspective, they know what to expect, they have insights, have already participated the clinical experience, so they're usually better able to self-manage their condition. Experienced hearing aid wearers are, therefore, the primary examples of individuals who are great for receiving remote care, delivered on-line.

Additionally, stereotypically, engineers are drawn to on-line care. They've investigated the company, seen our accolades, and examined the device specifications. They tend to be bold and committed to this direction per their own decision.

Individuals who seek the freedom to self-direct their care are drawn to this concept as well. We refer to these kinds of clients as Do-It-Yourselfers. They're the clients who scour the internet for a pair of cables and a HiPRO box. They're the individuals at a hearing aid fitting who communicate, "I wish I had this software at home."

Finally, family members of first-time hearing aid users are also good candidates to receive remote care via the web. It's an opportunity to purchase the devices and receive care in a comfortable and non-confrontational manner.

Now, from my perspective, which may deviate from the company's, individuals that purchase directly online tend to be well read and researched. In my experience, a lot of academics are drawn to our company due to our publications and awards.

BT: Describe the process for someone who does buy hearing devices online from you. Does that person have access to a clinic visit if needed?

RO: *For BSH, there's a continual level of communication between clients and the clinician. We're constantly communicating directly via phone calls, online chats, e-mails, screen-shares, or our version of what's effectively Google Hangouts/Skype/Facetime.*

Purchasing online (via this model at least) doesn't mean clients go without any form of follow-up or support. There's a perception of online that means non-contact and that's not the case at all. This isn't a fit and forget model.

And because of the way that the model works, clients have access to more than one individual; a whole team of individuals with professional and academic backgrounds and skillsets are essentially on-call to help a person when or if they request it.

Now, for that moment when a remote appointment requires a face-to-face visit with an audiologist, that's readily available, too. That's why we travel and help people in our mini-clinics. Using me as an example, I live in Brisbane but I also regularly travel the Sunshine Coast and the Gold Coast. I travel from Noosa to Byron Bay and frequently visit Surfer's Paradise.

Occasionally I head to drier climates a bit out west too. It's a bit of an audiology adventure really.

BT: For those that buy online and do eventually need a visit with an audiologist, what are the most common problems they encounter and how do you address those problems?

RO: *For the individuals that request a face-to-face appointment, it's sometimes as simple as a physical fit issue. We do a lot of video work to help guide clients, but sometimes it's merely an incorrectly twisted tube or wire that prompts an in-house appointment.*

But the majority of the time, what individuals are really looking for is reassurance. It's the confidence and the coaching. It's the counselling. It's the expertise.

They're seeking the expert on hearing loss and hearing aids….and they want that human interaction that can only be delivered face-to-face.

BT: I'm guessing your hearing aid fitting and follow-up process might be different than what is done in the US. Please tell us about how you conduct a typical hearing aid fitting appointment and what you do during follow-up appointments for a new client over their first 6 months of hearing device use.

RO: *The fitting and follow-up processes in Australia are pretty on par with the US. I'd say best practices are best practices regardless of where in the world you are located (at least from my experience being in US vs. Australia).*

Follow-up is similar with the blended model, with the added caveat that clients can get additional access via remote support whenever needed.

Of note, and not to get too side-tracked, but an exceedingly unique aspect of BSH hearing aids is that we do not use Wide Dynamic Range Compression (WDRC) for our hearing aid fittings. It's a completely different system and protocol called ADRO. ADRO (which stands for Adaptive Dynamic Range Optimization) is another one of many patents and inventions created by Professor Blamey.

For research-minded folk, if you dig deep into the literature and the specifications of different types of technology (hearing aids, cochlear implants, headsets…), you may find ADRO (e.g. Plantronics).

ADRO is a different fitting philosophy than WDRC with the primary goal of keeping sounds acoustically audible and comfortable at all times (a.k.a if sound is too loud, make it softer--if sound is too soft, make it louder).

In layman's terms, and to create a helpful visual analog, ADRO 'crops' sound to the most important and pertinent parts of the soundscape around us. Meaning, it keeps the critical parts of the soundscape within a sweet spot at all times for the listener.

While it isn't a linear hearing aid, the sounds produced by the devices continue to maintain a linear relationship (a 1:1 ratio throughout). As opposed to compression (which we know distorts sound), the sounds produced by ADRO are more reflective as to what they actually are acoustically. This is partly why so many experienced hearing aid users are enamored with the sound of the BSH devices.

BT: Thanks for the overview of ADRO, I know that's been around a while, and it's worth mentioning that ADRO processing is also used in the hearing aids dispensed in Sam's Club and Wal-Mart through the Lucid Hearing chain. Let's move back to how you deliver care. What are the client advantages of the blended model you use?

RO: *With a blended model, there are so many routes and pathways that clients can follow, they essentially begin to carve out their own hearing healthcare journey. They're not locked into one lane for support. They can e-mail, call, pop-by a brick and mortar clinic, schedule a virtual appointment, or meet us at a temporary clinic, depending on their own location and schedule.*

They have access to support and the freedom to receive help however they so choose.

Also, because they're communicating with us as a team, full of different personalities and skillsets, they get to hear reinforced messages in new ways. I've found that audiologists all have their own particular insights, stories, and scripts, and sometimes it can be helpful to hear similar messages with a new voice.

Plus, the concept that clients can receive support without even leaving their own home, is appealing. It creates a pretty relaxed environment for an appointment, when the client is able to sit in their living room or at the kitchen table, sometimes with a loved one as we go through the process of troubleshooting remotely.

BT: What are the clinician advantages of the blended model?

RO: *Teleaudiology extends a clinician's level of outreach. We're no longer limited by location. If a client is motivated and the clinician is up for the adventure, then with technology, creativity, and patience, successful teleaudiology becomes a reality, no matter the distance.*

Settings can be adjusted in real-time. Troubleshooting can occur instantly, and help can be provided wherever and whenever individuals are willing to meet.

BT: Anything else you'd like to share about your love of audiology?

RO: *I love audiology! And teleaudiology. This is an exceedingly exciting time to be involved in the profession, for all the reasons we have been discussing.*

I keep hearing the lyrics to Bob Marley's Redemption Song

'Have no fear for atomic energy, none of them can-a stop-a the time'

Audiology is a technologically-driven field and there are real opportunities to create change in positive and meaningful ways.

We all got to pick our quests and I'm proud to be an audiologist.

Saving the world one ear at a time. ■

Ryan O'Clair, Au.D. *is a clinical audiologist at Blamey Saunders Hears, a chain of Australian hearing clinics. He can be reached at ryan.oclair@blameysaunders.com.au*

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KEYNOTE SESSION

Hearing Loss and Dementia

Esther Oh, M.D., Ph.D., Associate Professor of Medicine, Psychiatry and Behavioral Sciences and Pathology at the Johns Hopkins University School of Medicine

The goal of the session is to learn about the inter-relationship between hearing loss and dementia in various clinical and research settings. Dr. Esther Oh is an. Her areas of clinical expertise is in evaluation and management of memory disorders. She has an extensive experience in evaluating memory disorders in older adults with multiple chronic diseases, and takes and integrative approach in the treatment of memory disorders. Dr. Oh also serves as the associate director of the Johns Hopkins Memory and Alzheimer's Treatment Center.

FEATURED SESSIONS

Marketing to the Active Aging Consumer

Jeff Weiss, President & Chief Evangelist Officer, Age of Majority

Marketers are missing the largest business opportunity by virtually ignoring active aging consumers who control over 70% of the wealth and account for 40-50% of consumer spending across most categories. Yet marketers are only spending 5-10% of their budgets to market to this group, choosing instead to spend 5 times more against the younger millennial group who account for less than 20% of all consumer spending. In his presentation, Jeff Weiss will highlight the opportunity in targeting active aging consumers, defining who they are and what makes them tick. He will reveal the Dirty Dozen Myths associated with aging and crush the myths and break the stigma and stereotypes attached to older consumers. Finally, he will share advice and practical tips on how to best find, reach and engage the Active Aging consumer.

Living Longer and Living Better: Technology and Well-being for an Aging Population

Lisa D'Ambrosio, Ph.D., Research Scientist, MIT AgeLab

At the AgeLab, Dr. D'Ambrosio directs and participates in numerous different research projects around understanding and supporting longevity. Her research focuses on questions around decisions that impact later life, including decision-making around financial planning and preparedness, caregiving and wellbeing, transportation and mobility, and technology use and adoption. In this session, participants will learn about how increased longevity has results in changing demographics in the US, creating a new longevity economy and a consumer market of older adults whose demands and expectations around their aging differ from those of previous generations.

THURSDAY, NOVEMBER 14, 2019					
8:00 AM - 4:30 PM	**Lobby Day**				
5:30 PM - 7:00 PM	**Opening Reception in Exhibit Hall**				
FRIDAY, NOVEMBER 15, 2019					
7:00 AM - 8:00 AM	**Breakfast in the Exhibit Hall**				
8:00 AM - 8:30 AM	**Welcome & President's Address:** Ram Nileshwar, AuD				
8:30 AM - 9:30 AM	**KEYNOTE PRESENTATION: Hearing Loss and Dementia** - Esther Oh, MD				
9:30 AM - 10:00 AM	**Break in the Exhibit Hall**				
10:00 AM - 11:30 AM	**Providing Exceptional Patient Experiences to the Aging Boomers and Gen X:** Randy Baldwin, VP of Marketing, Specialty Marketing, CareCredit				
11:30 AM - 1:00 PM	**Lunch in the Exhibit Hall**				
1:00 PM - 2:00 PM	**Marketing to the Active Aging Consumer:** Jeff Weiss				
2:00 PM - 3:00 PM	**Living Longer and Living Better: Technology and Wellbeing for an Aging Population:** Lisa D'Ambrosio, PhD				
3:00 PM - 3:30 PM	**Break in the Exhibit Hall**				
3:30 PM - 5:00 PM	**The Wellness-Illness Continuum: Serving Older Adults At Every Point Along the Way** - Panel				
5:15 PM - 6:15 PM	**ADA Member Business Meeting**				
6:15 PM - 8:00 PM	**Special Event in the Exhibit Hall**				
SATURDAY, NOVEMBER 16, 2019					
7:00 AM - 8:00 AM	**Breakfast in the Exhibit Hall**				
7:00 AM - 8:00 AM	**Mastermind Networking Breakfast** *(active and interested Mastermind group participants only)*				
8:00 AM - 9:30 AM	**TIER 1: Managing Patient Anxiety, Ambivalence and Lack of Awareness of Hearing Loss: An Audiology/Psychology Collaboration Part 1** David Citron, PhD Shari Eberts, M.B.A. Michael A. Harvey, PhD	**Achieving Financial Success with a Managed Care Program**	**Delight Your Patients & Differentiate Your Practice: Instant Custom Molds Hands-on Workshop** William Diles, MA	**TIER 1: A Changing Standard of Care: Incorporating Treatment with Implantable Hearing Devices in a Private Practice Setting Part 1** Michele Fusco, MA	**Student Track** *Sponsored by Starkey*
9:45 AM - 11:15 AM	**TIER 1: Managing Patient Anxiety Part 2** David Citron, PhD Shari Eberts, M.B.A. Michael A. Harvey, PhD	**Moving the Needle: The Process of Creating Audiology State Licensure Laws for a New Millennium** Kim Cavitt, AuD	**Creating an Effective Physician Outreach Marketing Process** Tom Tedeschi, AuD Robert Tysoe Stacy O'Brien, AuD, FAAA Mary Ann Nikander, AuD Nicole Pavol	**TIER 1: A Changing Standard of Care Part 2** Michele Fusco, MA	**Student Track** *Sponsored by Starkey*
11:15 AM - 12:30 PM	**Closing Lunch in Exhibit Hall**				
12:30 PM - 1:30 PM	**TIER 1: Latest Advances in Audiological Artificial Intelligence Part 1: Rise of the Audiological Machines** Aaron Jones, AuD, M.S.	**Direct-to-Consumer Healthcare Trends: Maintaining Revenue and Identifying Value Proposition** Amyn Amlani, PhD Rupa Balachandran, PhD	**Precepting: What Practice Owners Need to Know** - featuring a Student Panel	**Collaborative Audiology and Pharmacy Impact on Patient Care** Arifa Qureshi, AuD Imran Qureshi	**Student Track: Owning a General Audiologist Title: How to Embrace Practicing Full Scope in Private Practice** Julie Link, AuD
1:40 PM - 2:40 PM	**TIER 1: Latest Advances in Audiological Artificial Intelligence Part 2: Real Life Hearing - Implications and Opportunities for All** Tiffany Brown, AuD	**Using a Subscription Model to Increase Treatment & Loyalty** Dan Quall, M.S.	**Embrace the Change: a How-To Guide for Dispensing PSAPs in a Clinic** Danielle Frank, AuD	**Adding Tinnitus Management to Your Clinical Practice: Evidence-based Recommendations for Success** Jack Scott, PhD	**Student Track: Current HIPAA Guidelines for Audiology** Amit Gosalia, AuD

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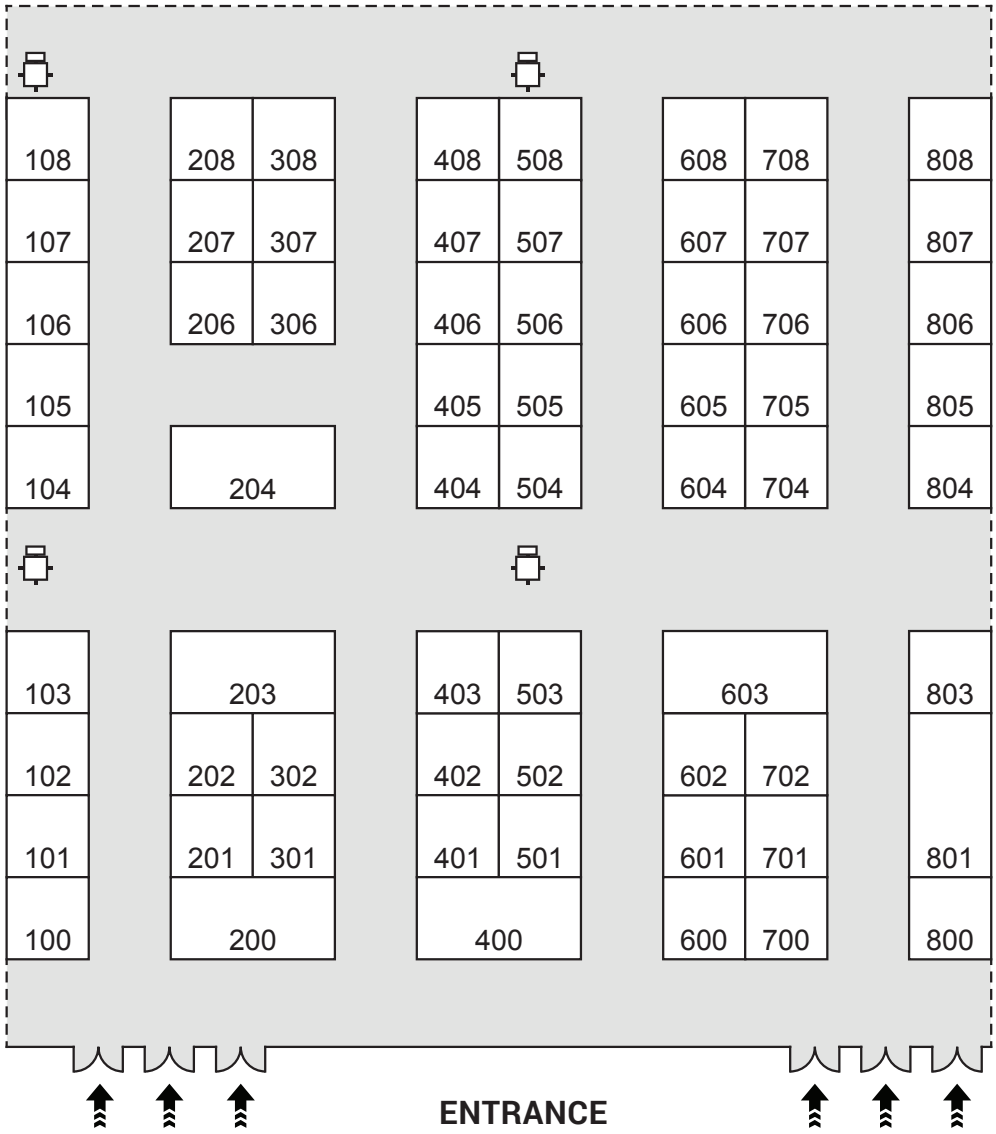

Proposed 2020 Changes to Medicare and Their Impact on Audiology

BY KIM CAVITT, Au.D.

CONVERSION FACTOR

The conversion factor is a significant aspect of each Medicare allowable rate. Allowable rates are the sum of the conversion factor, multiplied by each CPT code's Relative Value Unit (RVU) and the geographical adjustment for your community. The 2019 conversion factor is $36.0391. The proposed conversion factor for 2020 is $36.0896, resulting in a potential nominal increase for 2020.

CPT CODING CHANGES

There are significant changes to 92626, 92627 and 92548. These codes descriptions will be changed for 2020, regardless of any Medicare actions as they have been approved by the American Medical Association (AMA). The code changes are:

- 92626: Evaluation of auditory function for surgically implanted device(s),candidacy or post-operative status of a surgically implanted device(s); first hour.
- 92627: Evaluation of auditory function for surgically implanted device(s), candidacyor post-operative status of a surgically implanted device(s); each additional 15 minutes.

The above codes should ONLY be used for candidacy and post-operative evaluation of an implantable auditory prosthetic device, such as a cochlear implant, auditory osseointegrated device, or auditory brainstem implant. These codes should NOT BE BILLED, to any entity, for any other clinical purpose.

- 92548: Computerized dynamic posturography sensory organization test (CDP-SOT), 6 conditions (ie, eyes open, eyes closed, visual sway, platform sway, eyes closed platform sway, platform and visual sway), including interpretation and report)
- 92XX0 (the exact code has not been finalized): Computerized dynamic posturography sensory organization test (CDP-SOT), 6 conditions (ie, eyes open, eyes closed, visual sway, platform sway, eyes closed platform sway, platform and visual sway), including interpretation and report; with motor control test (MCT) and adaptation test (ADT).

MERIT BASED INCENTIVE PAYMENT SYSTEM (MIPS)

The proposed rule seeks to maintain the 2019 low volume thresholds ($90,000 in Medicare reimbursement, providing covered care to 200 or more Medicare beneficiaries and providing 200 or more covered Medicare services). As a result, most audiologists would continue to be voluntary MIPS reporters, with the exception of those working within a Medicare Alternative Payment Model (APM; this is uncommon

in private audiology practices with no medical practice or hospital affiliation). We are seeking clarification though on the impact of MIPS on group practices with greater than 15 eligible providers.

Audiology will be eligible to report on nine total quality measures and will continue to be eligible to attest to clinical improvement activities. The quality measures are:

- Documentation of Current Medications in the Medical Record
- Preventive Care and Screening: Screening for Depression and Follow-Up Plan
- Falls: Risk Assessment
- Falls: Plan of Care
- Referral for Otologic Evaluation for Patients with Acute or Chronic Dizziness
- Preventative Care and Screening: Tobacco Use: Screening and Cessation Intervention

The six measures listed above were available in MIPS in 2019 and were also available in the 2016 Physician Quality Reporting System (PQRS).

- Elder Maltreatment Screen and Follow-Up Plan
- Functional Outcome Assessment
- Falls: Screening for Future Falls Risk

These three measures listed above would be new to audiology in 2020 (if the proposed rule stands). There are no details yet about how these codes will be applied to audiology or to what codes they will be assigned.

Again, as in 2019, ADA strongly advises members to voluntarily report MIPS and complete and attest to the clinical improvement activities. It is important that audiologists educate and familiarize themselves with this program and generate Medicare data on quality and improvement. The goal of this program is to increase the number of participating providers. As a result, this low volume threshold exception could be reduced or eliminated any year. Audiology practices must be prepared. It is these types of activities and programs that differentiate us from hearing aid dispensers and disruptive delivery channels.

ADA will be submitting a comment to Medicare on the proposed rule and its impact on our profession. Please note:

- These changes are proposed and not final. They become final ONLY if maintained in the Medicare Final rule, which typically comes out in November.
- These changes, if finalized, would go into effect on January 1, 2020.

PLEASE CLOSELY FOLLOW THE ADA WEBSITE, E-BLASTS, AUDIOGRAM, AUDIOLOGY PRACTICES AND WEBINAR ANNOUNCEMENTS FOR ADDITIONAL UPDATES AND INFORMATION, ESPECIALLY IN NOVEMBER AND DECEMBER 2019. THIS IS HOW MEMBERS WILL BE INFORMED OF THE FINAL 2020 CHANGES.

If ADA members have further questions or would like to learn more, please contact Kim Cavitt at kim.cavitt@audiologyresources.com or 773-960-6625 (text or call). ■

Dr. Kim Cavitt *was a clinical audiologist and preceptor at The Ohio State University and Northwestern University for the first ten years of her career. Since 2001, Dr. Cavitt has operated her own Audiology consulting firm, Audiology Resources, Inc. She currently serves on the State of Illinois Speech Pathology and Audiology Licensure Board. She also serves on committees through AAA and ASHA and is an Adjunct Lecturer at Northwestern University.*

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HAVE YOU HEARD?

Medicare Audiologist Access and Services Act Introduced with Broad Bi-Partisan Support to Streamline Access to Hearing And Balance Care

The Academy of Doctors of Audiology (ADA) commends U.S. Representatives Tom Rice (R-SC), Gus Bilirakis (R-FL), Matt Cartwright (D-PA), Mike Kelly (R-PA), Ann Kuster (D-NH), Ralph Norman (R-SC), Jan Schakowsky (D-IL), Mark Meadows (R-NC), Brad Schneider (D-IL), and Lisa Blunt-Rochester (D-DE) on the introduction of the Medicare Audiologist Access and Services Act of 2019 (H.R. 4056), and Senators Elizabeth Warren (D-MA), Rand Paul (R-KY), Sherrod Brown (D-OH), and Roger Wicker (R-MS) on the introduction of the Senate companion bill, (S. 2446).

"Seniors who suffer from hearing conditions shouldn't have to jump through hoops to see their preferred audiologist, said Representative Tom Rice. "The Medicare Audiologist Access and Services Act cuts through the red tape to help Medicare patients access quality, affordable care. I will continue to reach across the aisle to find straightforward solutions to health care problems."

Outdated Medicare rules make it more difficult for seniors experiencing hearing loss to get the care they need," said Senator Warren. "Our bill would clear the roadblocks that stand in the way of Medicare beneficiaries, and make audiology services more accessible."

The Medicare Audiologist Access and Services Act (H.R 4056/S. 2446) can improve outcomes and reduce barriers to care by allowing Medicare beneficiaries to seek treatment directly from audiologists if they suspect they have a hearing or balance problem. The legislation will streamline Medicare coverage policies so that audiologists can provide the full range of Medicare-covered diagnostic and treatment services that correspond to their scope of practice. In addition, the legislation will reclassify audiologists as practitioners within the Medicare system, so that they can be deployed more effectively.

"Hearing and balance disorders become more prevalent with age and, if left untreated, pose significant health, social, and financial risks," said Ram Nileshwar, Au.D., ADA President. "ADA applauds Representative Rice and his colleagues for acting to remove impediments to the delivery of efficient, high-quality hearing and balance health care for millions of Medicare beneficiaries across the country."

In addition to achieving broad-based bi-partisan support in Congress, the Medicare Audiologist Access and Services Act has also been enthusiastically endorsed by leading audiology and consumer organizations including ADA, the American Academy of Audiology (AAA), the American Speech-Language-Hearing Association (ASHA), and the Hearing Loss Association of America (HLAA).

"ADA staff and leaders are proud to work alongside our esteemed colleagues to advocate for better access to care for our patients and to ensure that audiologists are classified within the Medicare system in a manner that reflects their extensive training, education, and scope of practice," said Dr. Nileshwar.

There's Still Time to Register for ADA Lobby Day—Don't Miss This Opportunity

On November 14th, 150 audiologists are expected to converge on Capitol Hill to meet with members of Congress to encourage support of the Medicare Audiologist Access and Services Act (H.R. 4056/ S. 2446). ADA There is still time to register—please contact Adam Haley at ahaley@audiologist.org or 866-493-5544 by October 30th.

ADA Now Accepting Participants for Mastermind Groups

ADA is now taking applications for Mastermind Groups. The term "Mastermind Group" is a long-recognized peer-to-peer mentoring concept used to facilitate problem solving using small groups of peers dedicated to helping each other succeed. The Mastermind Group concept was originally introduced by author Napoleon Hill in the early 20th Century.

ADA is pleased to facilitate Audiology Mastermind Groups for its members through its GotoMeeting web platform. Group leaders will be provided access to set up and use the virtual meeting space and each Mastermind group will have complete autonomy. The meetings will be exclusive to the audiologist participants. ADA staff will be available to contact for technical troubleshooting if needed but will not participate in the meetings.

Meeting discussions will be private and confidential to each group. Each Mastermind group will independently determine topics for discussion and the structure and frequency of the meetings. Each group will consist of 8–12 non-competing audiologists. ADA members only.

Please contact Stephanie Czuhajewski at sczuhajewski@audiologist.org for more information.

Drs. Bray and Sjoblad Elected to Serve on the ADA Board of Directors

The Academy of Doctors of Audiology (ADA) is pleased to announce that the following fellow members have been elected to serve on the ADA Board of Directors:

Victor Bray, Ph.D., has been elected to serve as president-elect for the organization. Dr. Bray is an associate professor at Salus University Osborne College of Audiology and holds a Ph.D. degree in Speech & Hearing Science from the University of Texas at Austin.

Stephanie Sjoblad, Au.D. has been elected to serve as a director-at-large for the organization. Dr. Sjoblad is the audiology clinic director and a professor at the University of North Carolina at Chapel Hill. She holds an Au.D. degree from the University of Florida.

Dr. Bray and Dr. Sjoblad will begin their terms on January 1, 2020. Returning to the board in 2020 are the following board members: Deb Abel, Au.D. (President), Ram Nileshwar, Au.D. (Immediate Past President), Audra Brooks, Au.D., Kristin Davis, Au.D., Rachel Magann Faivre, Au.D., and Tim Steele, Ph.D.

▶ Please contact Stephanie Czuhajewski at sczuhajewski@audiologist.org for more information about ADA, ADA membership, and opportunities for advancing your audiology career through involvement with ADA.

INSIGHTS FROM THE OUTSIDE

Exceeding Patient Expectations

The *Insights from the Outside Panel* is a group of doctorpreneurs from multiple healthcare disciplines including dentistry, audiology, ophthalmology and veterinary medicine. Recently, the panel expanded to include practice administrators and office managers – professionals on the front line who are often the ones responsible for guiding the patient from treatment recommendations to acceptance. The newest member to the panel is Michael Cruz, a practice administrator in a rapidly growing dental practice in Las Vegas, Nevada. Michael was busy making a name for himself in the marketing and advertising world when his wife decided to start her own practice about seven years ago. Michael stepped in to help her get the practice off the ground and fell in love with healthcare. And, as he said, he must be doing something right because she hasn't fired him yet. In this column we'd like to introduce you to Michael to learn how he has catapulted growth by applying marketing and advertising principles to his wife's dental practice.

Launching a start-up with no experience in healthcare had to be an exciting challenge for you. Can you share with us what your growth has been and why you think you've achieved this level of success?

MR. CRUZ We have been fortunate enough to grow by leaps and bounds. We started small and have been managing double-digit growth year over year. The reason for our growth is our focus on the patient experience. We look at everything from the patient's perspective – absolutely everything. We are there to care for our patients – and take care of our patients. Here's the distinction: every aspect of their time in our practice has been strategically determined. In marketing and advertising, you are most successful when you surprise, delight and inspire your target audience. For example, we hear a patient talking about having difficulty making a reservation at a popular restaurant. We took care of her, which means we went the extra mile and made that reservation happen for her. From warm blankets to a signature scent (so we don't smell like a dental office), we have literally walked in our patients' shoes.

What out of the box ideas have you brought from your previous career into the practice?

MR. CRUZ When I was in advertising, we always had an end goal in mind. We knew what we wanted to have happen. I think you always have to start with the goal and strategy. One of our goals is to be talked about on social media and to get those amazing reviews and comments. Not just the "I love my dentist," or "had a good experience" kind of comments. We wanted authentic comments that were detailed because they are more impactful and powerful. Why? Because the data says online

reviews are changing the way patients choose their providers. According to the 2018 NRC Market Insights study, 83.3% of people trusted online reviews more than personal recommendations. The study also found 59.9% said they selected a doctor based on positive reviews and 60.8% avoided doctors based on negative reviews. That's why we go the extra mile – because it surprises and delights people and they want to tell others about it. For example, we wanted to show patients our appreciation and we didn't want to do a gift card (too impersonal) or a gift basket. We wanted to do something unique. So we rented out a local theater and were able to do an advanced screening of the blockbuster Avengers movie. We had 300 tickets. We had a game where patients had to take a picture of something related to the Avengers and tag #Deevengers, because our practice name is Dee for Dentist, and post it on social media. If you did, you got two tickets. We packed the theater.

What has been the outcome of these efforts?

MR. CRUZ Attracting and retaining patients! We ask patients why they came to us, and it's really about reviews. With all the really great reviews, we know patients coming in the door have high expectations – expectations we must meet every single time. Of course you can't please everyone, but you can do everything in your power to try.

What advice can you give to anyone wanting to accelerate their growth?

MR. CRUZ Don't reinvent the wheel. Look for people's character, not their job experience. Read a LOT of books. The creative people in marketing and advertising find inspiration literally everywhere. They are always looking for it. I think that's a big piece of advice because you can find inspiration everywhere – from restaurants to retail. Everyone is trying to deliver experiences that stand out and create long-term customer or patient advocates. I even look at window displays for inspiration and ideas to help us enhance our practice environment. Be flexible and change with the market. Social media is a game changer. Don't resist it, embrace it and make it work for you. And keep your eye out for the next big game changer because I guarantee you, one is coming.

Can you share any "missteps" you took so our readers can also learn from your mistakes?

MR. CRUZ Well, I must be doing something right, but still my wife still tries to fire me almost on a daily basis. When we first started off, I had to learn the front office all by myself and I realized that I am certainly not someone you would want to hire for that position. But having experienced it first hand, I know just how critical filling that position with someone qualified is. Of course, there were great ideas we had that didn't produce the great results we expected. But I feel you never fail; you're just given the opportunity to learn. For example, when we opened the practice, we added the CareCredit credit card as a payment option. We just did it because everyone accepts it and they are the market leader. For three years, we didn't really use it. We personally don't use credit much, so we projected this behavior onto our patients and just thought few would want it. Then, a lightbulb went on and we realized we weren't being fair to people. It's up to them how they want to pay and if paying monthly works for their family, then it's the best payment option for them. Our job is to give them every opportunity to get the care they need, not restrict their options.

Do you think healthcare is now your long-term career?

MR. CRUZ No. I think it's my life-long passion. There is really no greater feeling than truly helping someone. I loved advertising, but it's not the same. When someone looks you in the eyes and says, "Thanks, you changed my life," it impacts you. I don't think I will ever get tired of it. ■

THE RISE OF THE AUDIOLOGICAL MACHINES

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Early Career AuD Resources

The Academy of Doctors of Audiology offers a variety of resources for early career professionals.

Early Career Listserv: Subscribers can network and discuss issues facing new audiologists through this email-based discussion forum.

Young Professionals Resources: A collection of resources that will help you in your transition from student to professional.

Mentorship Program: What did you do right? What was harder than you expected? What do you wish you could change? As a recent graduate, you are a perfect candidate to help shape the future of audiology by becoming a mentor! Mentee opportunities are also available.

Visit **audiologist.org/early** for access to these resources and more!

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