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Audiology PRACTICES

The Cochlear Implant Issue

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INSIDE THIS ISSUE:

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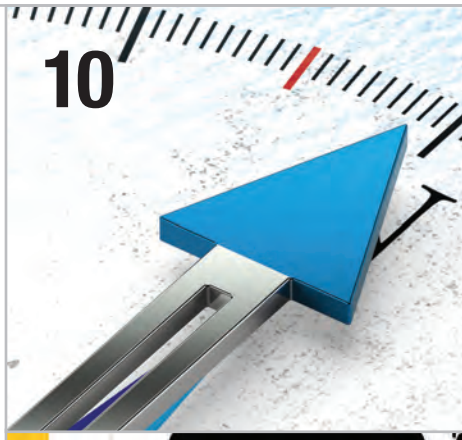

A **5-Step Counseling Protocol** to Connect with Patients and Encourage Hearing Health

By Von Hansen
President, Von Hansen Inc.

As a national trainer for three of the largest hearing aid dispensing companies in the United States, I have observed hundreds of patient evaluations and always felt something was missing. When a patient with severe hearing loss would say upon receiving the recommendation, "I don't think my hearing is that bad," or "I want to think it over," obviously we were failing to communicate in a way that made their hearing difficulties unavoidably clear and evident. I created this 5-Step Counseling Protocol to help hearing professionals better communicate with patients and enhance acceptance of recommended care.

STEP 1

Have the patient take ownership of the appointment.

▶ **DOCTOR:** "So tell me, Mr. Smith, what encouraged you to come see a hearing professional today?"

PATIENT: "It was my wife Mary's idea."

▶ **DOCTOR:** "And what sort of things has Mrs. Smith been saying about the communication between the two of you?"

PATIENT: "She says I don't listen to her and she has to repeat things all the time. But it's impossible to hear her sometimes with all the background noise."

▶ **DOCTOR:** "Do your wife's concerns about your ability to communicate effectively as a couple concern you?"

PATIENT: "Of course, or I wouldn't be here."

▶ **DOCTOR:** "Then given your concern, would it be fair to say that you are not only here for your wife, but also for yourself?"

At this point the patient has no choice but to say yes, thus taking ownership of the visit to your office and their own personal investment.

STEP 2

Help the patient understand what is going on in their daily life around their hearing.

▶ **DOCTOR:** "Mrs. Smith, what have you noticed about the communication between you and your husband?"

WIFE: "He doesn't seem to listen. It's very hard to have an important conversation because he doesn't hear all the salient points. And if I have to repeat myself one more time, I'll scream."

▶ **DOCTOR:** "And how long has communication been difficult between you and Mr. Smith?"

WIFE: "Oh, it has been at least three years."

▶ **DOCTOR:** "Mr. Smith, how long would you say communication has been difficult between you and your wife?"

PATIENT: "Maybe a few months at the most."

Whether it has been three years, three months or somewhere in between, it's important that both parties feel as if you have heard them accurately as you move towards the next step.

STEP 3

Help the patient explain why they have come in NOW.

▶ **DOCTOR:** "Mrs. Smith, you said you've been aware of these communication difficulties for three years — is that right?"

WIFE: "Yes."

▶ **DOCTOR:** "Mr. Smith, you said you've been aware of communication difficulties for only a few months?"

PATIENT: "Right."

▶ **DOCTOR:** "However, Mr. Smith, you did not come in one week ago or one month ago or even a few months ago — what was it about now that made you decide to come in?"

PATIENT: "Well, there just isn't much peace at home and I got tired of fighting over this subject."

STEP 4

Help the patient get at the everyday truth of the difficult listening environments in which they struggle.

▶ **DOCTOR:** "Mr. Smith, besides at home with your wife, what is another difficult listening environment for you?"

PATIENT: "Sometimes it's hard to hear on the phone at work and that creates problems."

▶ **DOCTOR:** "What sort of problems, Mr. Smith?"

PATIENT: "I'm a lumber broker and if I get an order wrong it can cost my company thousands of dollars."

▶ **DOCTOR:** "Are there any other difficult listening environments that come to your mind, Mr. Jones?"

PATIENT: "When I'm with my grandchildren, I don't always hear exactly what they are saying. My daughter tells me they think I don't care and that breaks my heart!"

STEP 5

Summarize the patient's challenges and offer a solution.

▶ **DOCTOR:** "So Mr. Smith, if I could help you hear clearly on the phone at work, communicate with your grandchildren better so they know that you care, and perhaps most importantly, if I could help you on a daily basis communicate with ease at home, would that be the result that you are hoping for?"

PATIENT: "Absolutely."

▶ **DOCTOR:** "Great. Then let me show you and Mrs. Jones how we can help you achieve that result."

Once the patient clearly understands the impact their hearing issues are having in their life and knows the possibilities for improvement, all that is left is to enable them to purchase the hearing instruments that will provide the results they want. Cost is a common barrier to care, so it's important to mention to all your patients the payment options available, including promotional financing that can make it easy for them to fit the cost of hearing technology into their budget and lifestyle.

Von Hansen is a successful businessman, consultant, communications specialist, author, speaker, and an American Conference of Audioprosthology (ACA) instructor. He has been a featured speaker at the International Hearing Society's Annual Convention and at multiple state association meetings. He has also been published in Audecibel Now, The Hearing Professional, Hearing Instruments, Hearing Review, and the Hearing Journal. www.vonhanseninc.com

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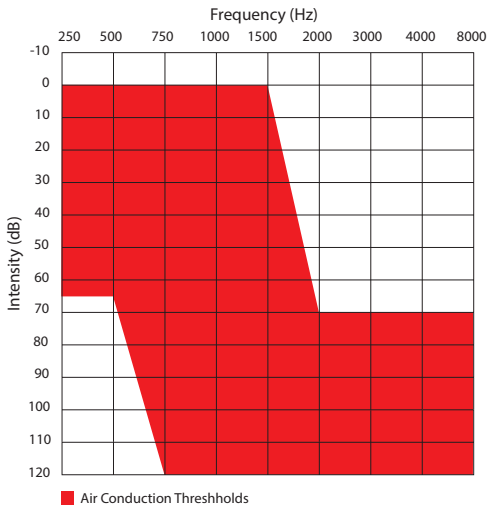
Alicia D.D. Spoor, Au.D.

A Private Practice Clinic Experience in Cochlear Implants

The first time I heard my (now) colleague state that private practice audiologists could be successful cochlear implant centers, I was skeptical. The two things that immediately went through my mind were: 1.) cochlear implants are not profitable, and 2.) the relationship with ear, nose, and throat (ENT) surgeons would not progress beyond the hospital walls. I was sure wrong! In fact, Dr. Kim Cavitt's article "The Original Unbundled Delivery: Auditory Prosethetic Devices" (page 46) and Dr. Brian Taylor's featured article "Changing the Course of Care at the Local Level if Adults with Severe Hearing Loss: Debunking 5 Cochlear Implants Myths" (page 10) address my two initial thoughts.

HISTORY (and future) OF COCHLEAR IMPLANTS

Similar to other technologies that private practice audiologists work with daily, cochlear implants have vastly changed since their introduction by William House, M.D. in the United States in the early 1960s. The first microelectronic, (8) multi-channel cochlear implant is often credited to Med-El Corporation's Ingeborg and Erwin Hochmair and initially implanted in adults with severe to profound hearing loss in the late 1970s. Body worn speech processors were introduced in the 1980s with behind-the-ear (BTE) processors launched in the early 1990s. Current technology allows for off-the-ear (OTE) processors, rechargeable batteries, accessory and hearing aid compatibility, and iPhone connectivity.[1] Additionally, the candidacy criteria has grown to include children, infants, moderate to profound hearing loss, and hybrid candidacy.



Med-El Corporation Candidacy for their EAS Cochlear Implant[2]

The significant changes still underway in the cochlear implant space can easily be seen with the 28 patents already granted to Cochlear Limited in 2018.[3] In fact, the IEEE Journal of Solid-State Circuits in January 2015 published an article about fully-implantable cochlear implants[4] indicating great possibilities for cochlear implants in the future.

IMPLEMENTING COCHLEAR IMPLANTS

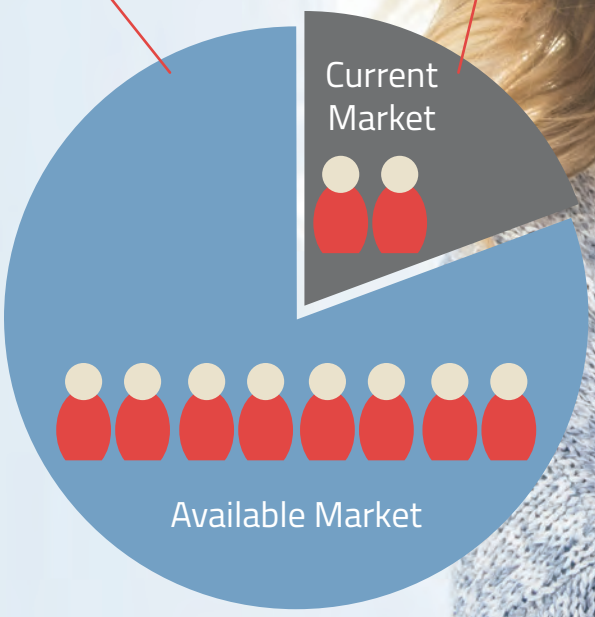
Towards the end of the meeting with my colleague, I was intrigued and ready to add cochlear implants to my private practice. The idea of offering a full spectrum of treatment options: assistive listening devices/personal sound amplification products to hearing aids, to cochlear implants appealed to me as a provider and the additional profitability was welcomed as a small business owner. Fortunately,

Continued on page 55

Lead the way in a changing market!

Approximately 20% of adults with hearing loss have hearing aids.*

Approximately 80% of adults who could benefit from hearing aids have not sought help; affordability being one factor.*



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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

Brian Taylor, Au.D.

Cochlear Implants Go Mainstream

As over-the-counter (OTC) hearing aids and their intended users—adults with mild-to-moderate hearing loss—continue to generate headlines, the underutilization of cochlear implants remains largely overlooked. Reports indicate that just under 8% of adults with severe-to-profound hearing loss have received a cochlear implant (CI), a technology with proven outcomes for those meeting candidacy requirements.

This issue of *Audiology Practices* takes a deep dive into cochlear implants. Historically confined to medical centers with otologists and audiologists that specialize in cochlear implants, modern advances in CI fitting software and hardware now enable audiologists, outside the confines of the multispecialty medical center, to get directly involved in the care of individuals with severe-to-profound hearing loss.

The timing could not be better. The rise of OTC devices, Medicare Advantage programs and big-box retail are beginning to force a growing number of audiologists to unbundle their fees for services from the provision of hearing aids. One strategy, for overcoming the effects of these changes in the marketplace, is diversification of clinical services. Providing services to cochlear implant recipients as part of a larger network of private practice audiologists, in areas of the country where cochlear implant recipients are under-served, is one way to diversify and provide a much-needed service.

This issue of *Audiology Practices* provides an overview of why and how audiologists, who do not specialize in CI, can still play a vital role in the care and management of CI recipients, and generate revenue by providing a valuable service.

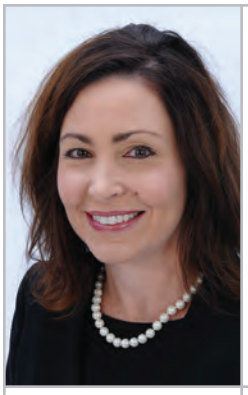
The first article examines several of the common myths associated with CI in the clinic and how rank and file audiologists can improve the uptake of CI in adults by getting directly involved in the provision of cochlear implants within their own clinic, even if there isn't a surgeon on site.

The second article, co-authored by a CI surgeon, delves deeper into the patient journey and current CI candidacy requirements. The third article, authored by an audiologist with more than 30 years of CI experience, provides readers with important insights on issues related to counseling patients interested in transitioning from hearing aids to cochlear implants.

Two audiologists, who specialize in CI research, contribute to the fourth article in this issue. Their focus is on the evolution of hybrid cochlear implants and their updated candidacy requirements. Finally, we round out this special issue of Audiology Practices by discussing rehabilitation considerations with Dr. Jane Madell , professor at New York Medical College and the Albert Einstein College of Medicine, and Drs. Brent Spehar and Nancy Tye-Murray of Washington University in St Louis.

It's also worth mentioning that even though some of the authors in this issue are employed by one CI manufacturer, Cochlear Americas, there are two other CI manufacturers, Advanced Bionics and Med-El, that are used extensively at CI centers around the globe. All three CI manufacturers are commonly recommended, implanted and mapped by our article contributors who work in the clinic. It is important to note that the Academy of Doctors of Audiology and *Audiology Practices* does not exclusively endorse one CI manufacturer over another. ■

Stephanie Czuhajewski, CAE, Executive Director



Physicians Support the Audiology Patient Choice Act

Ask Your Physician Colleagues to Advocate for Audiology

An article aptly titled, "Senate bill would give audiologists big advantage over ENT," published by the Association of Otolaryngology Administrators (AOA), effectively cites the real reason for opposition to the Audiology Patient Choice Act (H.R. 2276 and S. 2575) from the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS).[1]

The article states, "S.2575 is being driven in part by persistent lobbying efforts from audiology groups, says Kevin Watson, administrator at Colorado ENT & Allergy in Colorado Springs. The bill is being marketed as a way to help patients, but it also effectively multiplies the competitive advantage of audiologists, whose reimbursement is tied closely to services like the sale and fitting of hearing aids, Watson says. 'Right now 99% of ENT offices sell hearing aids. Chances are, right now if I'm an audiologist waiting for a Medicare patient to walk into my shop for a hearing aid, I'm not going to see that happen because they're going to see an ENT for a referral and in that visit the ENT will give them hearing aids.'"

With the influx of 10,000 baby boomers into the Medicare system each and every day, the universe is more than big enough for standalone and ENT-housed audiology practices in an APCA future! The focus should be on delivering the best, most efficient services for the patient, and in doing so, success of the practice is assured.

Mr. Watson fails to recognize the benefits of the Audiology Patient Choice Act for ENT practices that employ audiologists. If H.R. 2276 and S. 2575 are enacted, ENT practices can make better use of both ENT and audiology provider resources, reduce duplicative services, and enhance productivity. If audiologists are properly recognized and reimbursed by Medicare for all the Medicare-covered services that they are licensed to provide, their associated ENT practices can achieve desired patient outcomes in a more sustainable fashion.

On the opposite page is a letter, written by Dr. James Lin of Kansas, which perfectly illustrates this point. His strong support of the Audiology Patient Choice Act is grounded in evidence-based practice, which avoids waste, prioritizes quality and access, and seeks to eliminate unnecessary delays in patient care.

At the time of this writing, the Audiology Patient Choice Act enjoys the documented support of two physician legislators, including the lead Republican Senate co-sponsor, Dr. Rand Paul, an ophthalmologist.

As we all know, audiology professional organizations are oftentimes not adequately representing the views of members when it comes to the Audiology Patient Choice Act. The same holds true for medical societies as well!

Now is the time to ask your physician friends and colleagues to advocate for their patients by advocating for the Audiology Patient Choice Act! Ask them to write, call, and visit members of Congress so that their voices are heard on this issue! ■

May 3, 2018

To Whom It May Concern,

I am a physician specialized in Otolaryngology (Ears, Nose, and Throat) and subspecialized in Neurotology (medical and surgical treatment of ear disorders), and I support HR 2276/S.2575, the Audiology Patient Choice Act.

Title XVIII of the Social Security Act limits Medicare recipients' access to audiologists by effectively making physicians the gateway to audiology services. This is an outdated measure that is financially wasteful and may lead to delays in appropriate patient care. Audiologists today require 4 years of graduate school training leading to a doctoral degree (Au.D); the qualifications to practice audiology have become more stringent and regulated since Title XVIII's enactment. Audiologists receive more than adequate training to diagnose and treat the majority of hearing and balance problems faced by patients, and importantly, they understand when medical referral is necessary and appropriate. Most private insurers have abandoned the notion that physician input is necessary to access audiology services, and it is time Medicare follows suit.

Significant cost savings would occur with passage of the Audiology Patient Choice Act. In the past calendar year, I have seen at least 70 new Medicare patients who could have simply seen audiology alone; the visits with me cost Medicare $100 per patient. This means that at least $7000 Medicare dollars were spent on visits with me alone last year to simply "order" the audiology evaluation that is reimbursed for separately. Also consider a common balance disorder that occurs in up to 9% of the Medicare population, benign positional paroxysmal vertigo (BPPV). I have cared for several patients with BPPV who underwent thousands of dollars in CT and MRI scans in both emergent and outpatient settings who could have been diagnosed and treated with a simple bedside evaluation and maneuver that is within an audiologist's scope of practice. This relatively common scenario could be avoided by allowing direct access to audiology services.

Also consider this country's healthcare provider shortage. We have accepted the use of midlevel providers such as nurse practitioners (NPs) and physician's assistants (PAs) to ease the patient burden. For this strategy to be effective, these midlevel providers need to work autonomously to the full extent of their training. The population is aging; about 40% and 70% of patients 65 and 75 years old, respectively, have a measurable hearing loss. The current constraints on Medicare patients' access to audiologists in the face of this demographic shift was almost certainly not accounted for during the enactment of Title XVIII, and significant delays in diagnosis and rehabilitation of hearing loss may result because of it.

The Audiology Patient Choice Act will allow audiologists to evaluate and treat Medicare patients to the appropriate extent of their training as they are already allowed to do with most private healthcare insurance patients. From my perspective as a physician specialist in hearing and balance disorders, I believe the proposed Act is the right thing to do for physicians, audiologists, and, most importantly, the expanding Medicare population at this time.

Sincerely

James Lin, MD, FACS

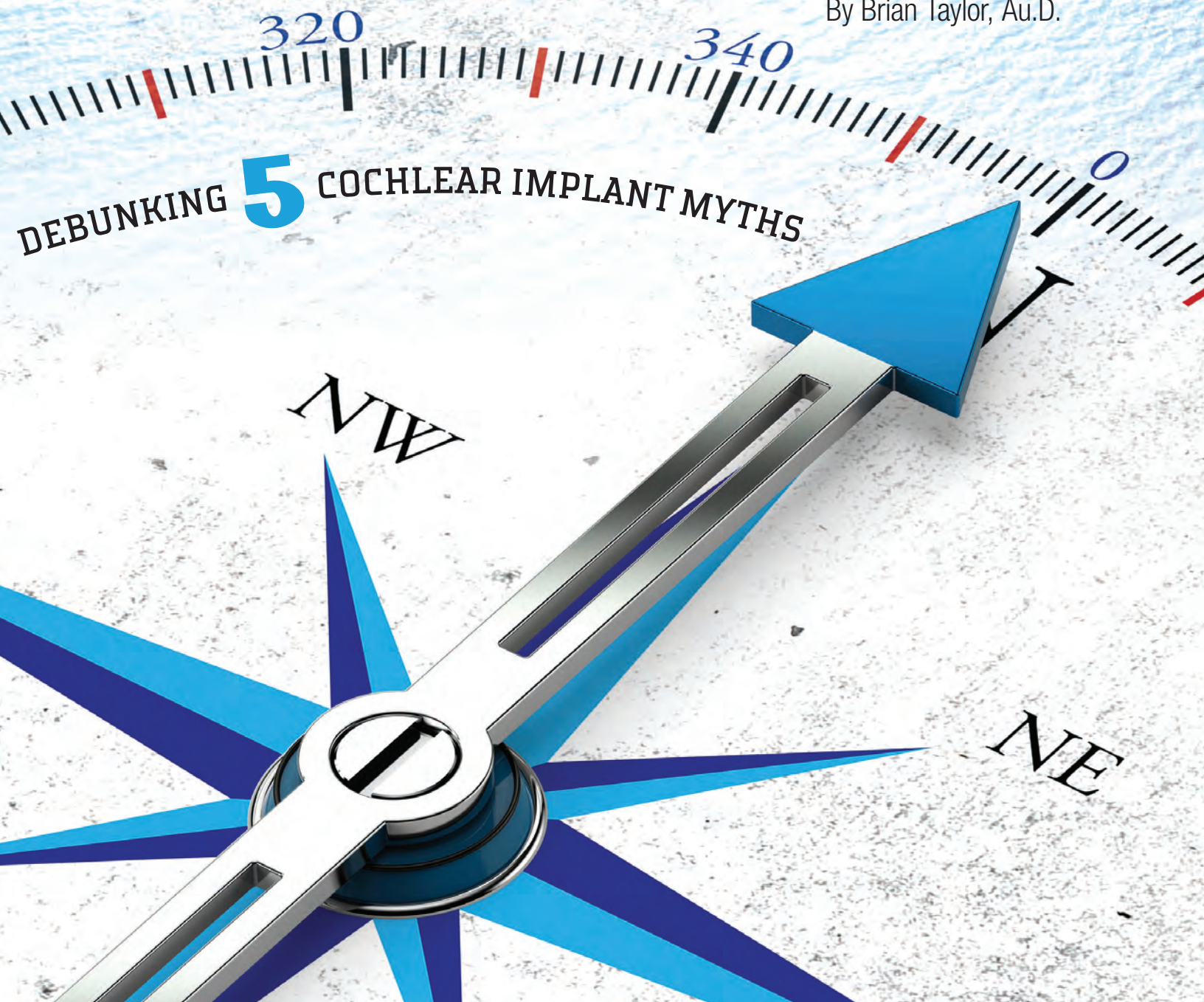
REFERENCE

[1]Association of Otolaryngology Administrators. Senate bill would give audiologists big advantage over ENT. The ENT Voice. Volume 3, Issue 4. April 2018. Accessed on May 27, 2018 at the following location: https://c.ymcdn.com/sites/www.aoanow.org/resource/resmgr/communications/0418-ENT-voice.pdf

Changing the Course of Care

at the Local Level in Adults with Severe Hearing Loss

By Brian Taylor, Au.D.



DEBUNKING 5 COCHLEAR IMPLANT MYTHS

Cochlear implants (CI) are the standard treatment for bilateral, severe to profound sensorineural hearing loss. It is estimated there are over 30,000 recipients implanted per year worldwide (Vaerenberg, et al 2014). Yet, cochlear implant audiologists remain a subspecialty within the audiology profession. In many medical centers in the United States, cochlear implant audiologists work primarily with children and adults with severe-to-profound hearing loss, participating in the identification, selection, and rehabilitation process of cochlear implantation. Survey data indicate that cochlear implants specialization is confined to a small number of audiologists, as only approximately 11% of audiologists self-identify as working with cochlear implants. This shortage of CI audiologists is likely to have an impact on access to care, but it provides an opportunity for audiologists to participate in the care of adults with severe-to-profound hearing loss, beyond fitting hearing aids.

This schism between cochlear implant audiology and other types of clinical audiology is not without merit. Historically, many of the skills required in the cochlear implant clinical realm, such as mapping of an implanted medical device, CI candidacy selection, counseling and surgical considerations are unique relative to other areas of clinical audiology. However, as cochlear implant candidacy requirements have become less restrictive, and as the programming and adjustment process (known as mapping) has become more automated, there are increasing opportunities for audiologists, who are not cochlear implant specialists, to more fully participate in the care of adults with severe hearing loss.

This article debunks five myths that, until now, have prevented more audiologists from getting involved in the care of CI users—and makes the case for why private practice audiologists should get involved in the process of providing care to these patients.

Myth 1

Cochlear implants are suitable for individuals with profound hearing impairments only.

The opinion generally held by CI experts is that, for the motivated candidate, cochlear implants can be a life-changing experience. Figure 1 shows the hypothetical performance over time for many adult patients with a moderate, progressing-to-severe hearing loss. The Figure can be used to demonstrate how various interventions are intended to improve auditory performance for a hearing-impaired individual over time. At some point, many of these patients become hearing aid users. The hypothetical amount of improvement from bilateral hearing aid use for individuals with severe hearing loss is shown in the center of Figure 1. (Labelled as "2 HA's"). Also depicted in Figure 1, is the presumed improvement from various interventions involving cochlear implantation and follow-up care. Notice the rather dramatic levels of improvement following intervention, compared to hearing aid use.

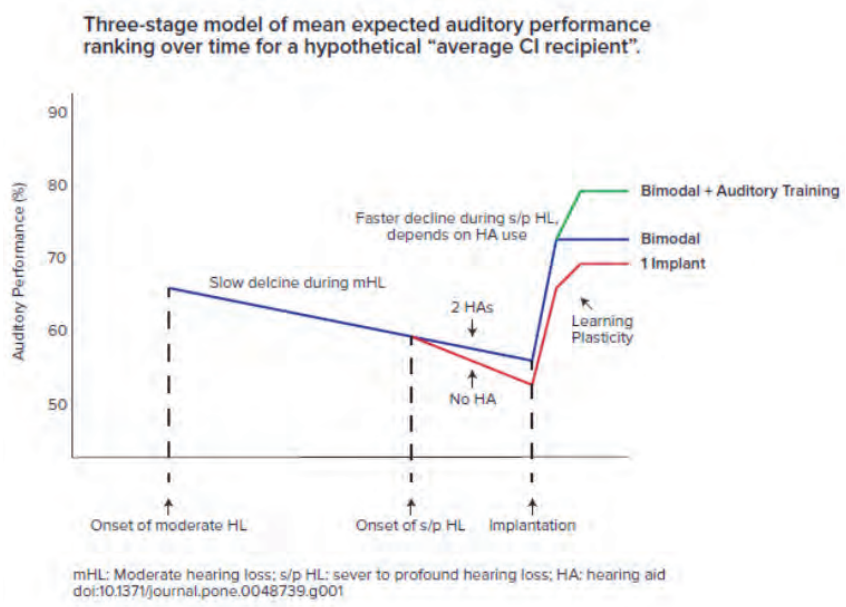


Figure 1. The hypothetical course of auditory performance over time for adults with gradual, adventitious severe hearing loss. Note: The average levels of improved performance that result from three different types of interventions (depicted by the red, blue, and green lines)

The three colored lines in Figure 1 illustrate three distinct types of interventions involving cochlear implants: 1.) one cochlear implant (unilateral arrangement), 2.) one cochlear implant + one hearing aid (bimodal arrangement), and 3.) either a unilateral or bimodal arrangement + auditory training. Even though each of these three lines in Figure 1 represents a hypothetical case, there is ample evidence the properly selected candidate will experience benefit in an equivalent manner (Blamey, et al 2013). In effect, Leigh et al (2013) indicated appropriate candidates can be advised that they have a greater than 75% chance of improving their speech perception with a cochlear implant over their best preoperative condition, and a 95% of chance of improvement in their implanted ear alone. Given the multiple intervention options that

can optimize CI outcomes, audiologists who do not specialize in CI have an opportunity to participate in the management of CI users by providing some combination of care with a bimodal arrangement, auditory training, and mapping a cochlear implant.

What once was an intervention for the most profoundly hearing impaired, has expanded to include individuals with moderate-to-severe hearing loss. Driven primarily by improvements in CI technology and surgical procedures, the pool of patients considered to be viable candidates for CI has expanded. Today, an adult with unaided hearing thresholds worse than 60 dB at 500 Hz, 70 dB at 1000 Hz and 90 dB at 2000 Hz, unaided single word recognition performance worse than 45% in the better ear and documentation that hearing aid benefit is suboptimal would be within the candidacy requirements for CI (Gubbels, et al, 2017). Because the audiological candidacy requirements have expanded, it is believed a larger pool of patients, many of which might be experiencing poor hearing aid benefit, are now CI eligible. Thus, a larger number of audiologists, not directly affiliated with a cochlear implant center are needed to identify and manage these potential CI recipients.

Given the paucity of audiologists who specialize in CI, combined with the relatively poor benefit many individuals with severe-to-profound hearing loss receive from their hearing aids, it is an excellent opportunity for audiologists, who do not specialize in CI, to become directly involved in providing a full range of reimbursable CI services to adult patients. Moreover, because third party insurance and Medicare reimburse for many of the services related to CI, and because non-audiologists who dispense hearing aids are not eligible to receive third party reimbursement, providing CI services can be a differentiator in a competitive marketplace that is about to see the rise of over-the-counter hearing aids and the continued success of big-box retail.

A recent prospective study sheds light on factors that contribute to low CI uptake rates among adults with severe profound hearing loss. Over a two-year period, Holder, et al (2018) collected data on 287 adults who presented at their clinic for a CI evaluation. The primary goal of the study was to better understand the adult population seeking a CI evaluation. A secondary goal of the study, according to the researchers, was to define the percentages of adults presenting for the CI evaluation who were bimodal (CI plus hearing aid in contralateral ear) or bilateral CI candidates.

Results of the prospective study reveal several remarkable findings: All the adults (mean age = 62.3 years) who presented to the clinic for a CI evaluation had hearing aid experience, but a whopping 62% of these individuals presented to the CI evaluation without their hearing aids. Additionally, only 32 of the 110 (29%) individuals who wore their hearing aids to the CI evaluation were successfully fitted to a standard audibility target for average level sound inputs.

Perhaps even more surprising, despite the expanded CI candidacy requirements that have occurred over the past decade-plus, nearly two-thirds of individuals who presented for the CI evaluation at Vanderbilt University Clinic had a severe-to-profound hearing loss with a mean pure tone average of 82.5 dB and very low unaided sentence recognition-in-noise scores on the AzBio of 23.3% across all 287 adults. Even though CI candidacy requirements have expanded, individuals with moderate-to-profound hearing loss, with aided speech understanding near the upper range of candidacy, are not finding their way into the CI center for an evaluation.

Myth 2

There are a small number of adults with severe-to-profound hearing loss who could benefit from a cochlear implant.

The exact number of individuals with severe-to-profound hearing loss varies. Blanchfield, et al (2001) estimated that approximately 738,000 Americans had severe-to-profound hearing loss, with seniors aged 65 and older representing 54% of this population. Alice et al (2013) reported between 0.6 to 1.1% of the general population has a severe-to-profound loss, which cannot benefit from a hearing aid. Additionally, it is expected that the prevalence of severe-to-profound hearing loss will more than double in the next 30 to 40 years, mainly due to an aging population.

Another recently published study examining the prevalence, characteristics, and treatment patterns of hearing loss in the U.S., sheds light on the current plight of individuals with severe-to-profound hearing loss. Mahboubi et al (2017) examined the functional capability of individuals with a range of self-perceived hearing difficulties. Of considerable interest, their analysis suggests 2.8 million adults in the U.S. (1.1% of the population) are unable to hear shouting in a quiet room, which likely equates to a severe-to-profound

Table 1. A summary of key demographics.

Numbers to Know

- 11% of audiologists in the US specialize in CI.
- About 1% of the entire American adult population has severe-profound hearing loss.
- 5.3% of individuals with severe-profound hearing loss report they received a recommendation for a CI evaluation.
- Just under 8% of adults with severe-to-profound hearing loss have received a cochlear implant.
- 6.7% to 13.5% of an audiology clinic's caseload is already comprised of patients with severe-profound hearing loss, with an indeterminant number of them receiving lower-than-expected benefit from hearing aids.

degree of hearing impairment. According to the researchers, moreover, a mere 5.3% of the adults in this category received a recommendation for a cochlear implant. Perhaps even more troubling, of this small percentage of individuals referred for a cochlear implant, just 1 in 5 people, within that small cohort of adults with self-perceived severe-to-profound hearing loss, actually received a CI. Despite solid clinical evidence supporting the effectiveness of CI and insurance reimbursement for the procedure, the low rate of referral for a CI evaluation in this study is consistent with previous estimates of a 5% utilization rate in the eligible adult population with severe profound hearing loss. This low CI uptake rate is an opportunity for otolaryngologists and audiologists to raise awareness among primary care physicians and the general population about the benefits of cochlear implants.

Another consideration are the long-term ill-effects of untreated (or inadequately treated) hearing loss in adults with severe-to-profound hearing loss. Data suggest that individuals with severe-to-profound hearing loss are vulnerable to several negative consequences resulting from their condition. Adults with severe-to-profound hearing loss have lower family incomes, are less educated, and are more likely to be unemployed than the general population (Blanchfield, et al, 2001). Thus, improved access to cochlear implantation and related interventions is warranted.

Perhaps more germane to clinical practice, there is ample evidence suggesting most hearing aid dispensing centers are already serving a substantial number of adults with severe-to-profound hearing loss. Numerous studies report a range between 6.7% and 13.5% of an audiologist's clinical caseload has a severe-profound hearing loss (see Turton & Smith, 2013 for a review of these studies). Based on the updated hearing threshold CI candidacy requirements, and lower-than-expected benefit from hearing aids, many of these individuals already seeking assistance from a non-CI audiologist would be considered candidates for cochlear implants. Unfortunately, many of these individuals, because they don't have access to a clinic specializing in CI, fail to get properly evaluated for implantation. Table 1 provides a summary of these important data points that underscore the need for mainstreaming cochlear implants into audiology practices.

Myth 3

Working with cochlear implant recipients requires specialization.

When cochlear implants became clinically available more than 30 years ago, a high degree of specialization was required to become proficient at all aspects of the selection, mapping, and long-term management process. Even today, several electrical parameters of the CI need to be programmed and adjusted. These parameters, as a whole, are commonly called the cochlear implant MAP. Finding and programming the optimal values for a recipient is referred to as "mapping". Cochlear implant mapping is achieved using proprietary software and a hardware interface connected to the processor, and depends on behavioral responses from the CI recipient. Since many patients with cochlear implants, especially in the early years, relied on sign or written language to communicate, combined with rather primitive computing capability, the mapping process was often time consuming, inefficient and also prone to specialization.

Table 2. A summary of the advantages of providing CI care in a local practice.

Reasons for Teaming with an Existing CI Surgery Center

- Offer a clinically proven alternative to hearing aids for adults with severe to profound hearing loss.
- Generate alternative sources of revenue.
- Differentiate your practice from hearing instrument specialists and retail audiologists who are not equipped to offer CI services or cannot get reimbursed from third party payers for them.
- Develop relationships with the medical community.
- Strengthen your brand as a multispecialty center of excellence.

Given the historically strict candidacy requirements for receiving a cochlear implant, the need to become specialized in CI is borne out of the distinct needs of profoundly impaired adults and children. It is common that many individuals with this magnitude of hearing loss rely primarily on sign language to communicate. Further, they often struggle with, or reject hearing aids, and have other unique needs. The characteristics of individuals with profound hearing loss, combined with their relatively sparse numbers relative to other patients with milder degrees of impairment, make it difficult for the non-CI audiologist to provide the effective care to this group. For all these reasons, cochlear implant audiology evolved into a sub-specialty with roughly 10% of clinical audiologists involved in it.

Over time, however, we have experienced a convergence in cochlear implant technology and hearing aid technology that make these interventions more alike than different. Today, unlike prior decades, cochlear implants are programmed and fine-tuned like hearing aids, often with automated computer-based algorithms designed to streamline the fitting process. For example, a software application using deterministic and probabilistic logic, called Fitting to Outcomes eXpert (FOX), has been developed to optimize and automate cochlear implant programming, and will soon become available commercially (Battner et al 2015). Additionally, because the candidacy requirements for cochlear implantation have broadened, a growing number of patients within a typical hearing aid dispensing practice would be considered CI eligible. For all these reasons, less specialization is needed to fit and fine-tune (map) cochlear implants in a local providers office. The rationale for providing CI services are listed in Table 2.

Myth 4

For older individuals with longstanding severe-to-profound hearing loss, there is no difference in benefit between hearing aids and cochlear implants.

Although younger adults tend to receive more favorable cochlear implant outcomes relative to older adults, a review of the literature provides convincing evidence that cochlear implants in older adults are safe, improve speech understanding, enhance participation in daily activities, and boost mental health (see Clark et al 2012 for a review). Older adults progress more slowly and experience smaller gains in speech perception and quality of life improvements (Friedlund, et al 2003). Additionally, other aspects of communication, such as psychological and physical status, cognitive ability and family and emotional support affect intervention status and need to be managed by the audiologist.

Another consideration is the expected benefit received from a CI relative to hearing aids. There is evidence suggesting that, on balance, cochlear implants outperform hearing aids for the appropriate CI candidate. Bittencourt et al (2012) demonstrated that a group of CI users had significantly higher word recognition ability, one year post implantation, when compared to a group of similarly matched hearing aid users. Studies that have compared hearing aid to CI

use, along other dimensions of benefit, are summarized in Figure 2. In addition, although still a challenge, most study participants reported improvements with telephone use and group conversations (Clark, et al 2012). Although older adults with longstanding hearing loss probably will not experience the same degree of improvement from a CI as younger adults with deafness of shorter duration, studies indicate these individuals can still derive substantial benefit from cochlear implants.

New Hearing Aid	Performance Dimension Relative to Existing Hearing Aid Use	Cochlear Implant
+19%	Word Recognition Scores (1-year post-intervention	+43%[a]
0%	Residual Improvement on Word Recognition Scores (2-years post-intervention)	+16%[a]
No change	Speech Understanding Ability in Noise (Subjective: 1-year post-intervention)	Improved [b,c]
No change	Anxiety and Depression	Improved [c]
No change	Confidence and Participation in Social Activities	Improved [b,c]
No change	Overall Quality of Life	Improved [b,c,d]

a. Bittencourt, A. et al (2012) Post-lingual deafness: benefits of cochlear implants vs. conventional hearing aids. Braz J Otorhinolarngol 78, 2, 124-127.
b. Lenarz, T. et al (2017) Patient-related benefits for adults with cochlear implantation: a multicultural longitudinal observational study. Audiology & Neurotology. 22, 61-73.
c. Clark, J. et al (2012). Cochlear implant rehabilitation in older adults: Literature review proposal of a conceptual framework. Journal of the American Geriatric Society 60, 10, 1936-1945.
d. Damen, G. (2007) Cochlear implantation and quality of life in postlingually deaf adult: long-term follow-up. Otolaryngology Head Neck 36, 597-604.

Figure 2. A summary of studies showing the difference in average outcomes for adults with severe-to-profound hearing loss for cochlear implant versus hearing aid use

Myth 5

Audiologists cannot generate revenue from cochlear implants.

One of the shortcomings of audiology, unlike similar allied professions such as dentistry and optometry, is an inability to generate consistent revenue pathways. Data from multiple industry surveys tend to indicate that the average practice generates 80% or more of its revenue from the sales of hearing aids. Although hearing aid revenue is likely to remain a staple source of revenue for many practices, the rise of over-the-counter, self-fitting hearing aids, as well as big-box retail and Medicare Advantage programs, are likely to create pressure on audiology practices to find consistent alternative revenue streams. The provision of cochlear implant services could be one of these reliable sources of revenue.

Viewed through the lens of the traditional hearing aid dispensing business model, in which services provided over several years are bundled with the price of hearing aids, it is not surprising that many audiologists view cochlear implants as a money-losing proposition. However, to see the revenue-generating potential of cochlear implants, it is helpful to evaluate the amount of service time spent with the typical cochlear implant user over a five-year period. Each of these scheduled appointments with the audiologist is, after all, a revenue-generating opportunity, if an unbundled service model is used. Beyond simply billing for your time, it is imperative that the correct CPT codes are used in the billing process (see The Source, page 46)

Based on observational data from several CI centers, the average adult patient requires approximately 5-to-6 hours of billable clinic time for the first year and about 2 hours of care per year over subsequent years. To gain a better understanding of the revenue-generating potential of CIs, audiologists must first calculate their revenue per hour (RPH) needed to cover all costs and provide a marginal profit. See Kim Cavitt's monthly column on page 46 of issue for details on CPT codes associated with the provision of cochlear implants.

In addition to billing for your clinical time for each appointment, there are other revenue-generating opportunities related to the provision of services for cochlear implant recipients. Many patients with bilateral severe-to-profound hearing loss choose to wear a hearing aid in the non-CI ear, and there is evidence to suggest a bimodal arrangement is beneficial to the patient (Blamey, et al, 2013).

One vestigial effect of CI remaining a subspecialty within audiology is the fact that hearing aids and cochlear implants are usually billed differently. Because hearing aids are less likely to receive reimbursement from third-party payers, patients have been conditioned over time by their audiologist to pay out-of-pocket for ancillary items and services, such as batteries, warranties and office visits for routine services. On the other hand, due perhaps to the medical nature of cochlear implants, ancillary CI products and services are

billed to third-party payers, and CI recipients have been conditioned not to pay out of pocket for any of them.

This landscape — hearing aid patients pay out-of-pocket and CI recipients do not — is an opportunity for audiology to unbundle some of the value-added extras that result from an outstanding level of care for CI recipients. In the future, both hearing aid and CI users could be offered service contracts that provide the patient with an outstanding level of service and another source of revenue for the practice. Finally, indirect sources of revenue could flow to a practice simply from involvement in cochlear implants. Cochlear implant services are often unique to a community and, as such, are a point of differentiation from competitors who do not offer CI as part of their clinical armamentarium.

Fact: Independent audiology and ENT-audiology practices can provide an elevated level of care and support to severely impaired adults in their community … and make money.

Although cochlear implants have made enormous technological progress over the past few decades, these successes have not translated into greater activity or awareness within hearing aid clinics. Holder et al (2018) offers both proof and guidance on how adults, who often struggle with conventional hearing aids, might obtain better day-to-day benefit from implantable technology. In the emerging era of direct-to-consumer healthcare and deregulated hearing aid distribution, non-CI audiologists would be wise to get more involved in CI selection, mapping and follow-up care.

Given the positive results that CI recipients experience, which are often substantially improved compared to their previous hearing aids, audiologists looking for a way to differentiate their practices from big-box retail and chain-retail audiology centers have an opportunity to provide care to a segment of the hearing-impaired market that has ordinarily consulted with an audiologist who specializes in CI.

Making CI services more accessible to hearing impaired adults in your local market is a win-win-win proposition. Surgical centers that provide CI procedures benefit from referrals from a wider pool of pre-qualified candidates. Your audiology practice wins by enhancing your reputation as a multispecialty audiology center with an alternative revenue-generating opportunity. And, most importantly, patients in your community benefit when a local audiologist can provide much of the care that CI users need. When the clinical evidence and demographic data is carefully weighed, now is the time to take cochlear implants mainstream. Not only can non-CI audiologists change the course of care for those who can benefit from cochlear implants, they can change the outcome of care by practicing to their full scope of practice. ■

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Cochlear Implants

What You Need to Know Today

By Brian Kaplan, M.D. and Mickey Brown

Overview

The very best Doctors of Audiology are well-versed in various types of hearing instruments, assistive technologies, cochlear implants, bone conduction devices, and hybrid implants. While it can be a challenge to stay up to date with rapid technological advancements in today's market, maintaining a facility with all the various hearing technologies, diagnostic platforms and a high level of personalized service can help you differentiate your practice.

From a strictly fiscal perspective, it is best practice to cast the widest net possible so that you serve a diverse set of patients who can then act as referral sources. On average, the typical adult cochlear implant candidate will have worn three-to-four pairs of hearing aids prior to consideration of a surgical alternative. Further, once implanted, many of these patients will continue to be users of hearing instruments in their non-implanted ear.

In this article, the authors will explore the business side of cochlear implantation, providing insight into what you may need to consider and what you will need to do when you bring cochlear implants into your practice. The implementation is more rewarding, and less complex, than you may think.

Cochlear Implants: What You Need to Know Today

Once considered a treatment of last resort for profoundly deaf adult patients, today's cochlear implants are indicated for adult patients with moderate-to-profound sensorineural hearing loss in both ears, and for children who fall into the severe-to-profound sensorineural hearing loss range*. Additionally, adults with bilateral moderately-severe-to-profound sensorineural hearing loss in the higher frequencies, who retain significant hearing in the lower frequencies, can now be considered for hybrid cochlear implants which offer electric-plus-acoustic stimulation for what are commonly referred to as "ski slope hearing losses."* Figure 1 outlines the candidacy guidelines for one line of CI devices on the market today.

In the early days of their existence, cochlear implants (CI) were envisioned as an aid to lip-reading and were reputed to provide environmental-sound awareness for the "deaf" patient. Contrasted against this stark beginning are today's cochlear implant sound processors which utilize Bluetooth® technology — with some even able to leverage "Made for iPhone" streaming of music, movies, telephone calls, and more. Where we once saw CI outcomes as aided soundfield testing only, a review of a modern cochlear implant recipient's electronic medical record (EMR) is likely to show speech perception testing conducted in noise, using recorded sentence test measures such as the AzBio (Spahr AJ et al, 2012).

With the rise of wearables and fitness trackers, our industry and perhaps, most importantly, our patients, are enjoying the erosion of stigma, related to hearing loss and its treatment. Baby Boomers are aging into hearing loss in large numbers and, as a tech-savvy demographic, they require excellence in design, performance, and strong lifestyle compatibility, matched to their chosen technologies. Given the length of time many patients wait before seeking treatment, there is a near universal response following implantation. These individuals consistently comment on the improvement in their quality of life (and hearing), wishing they had made the decision sooner.

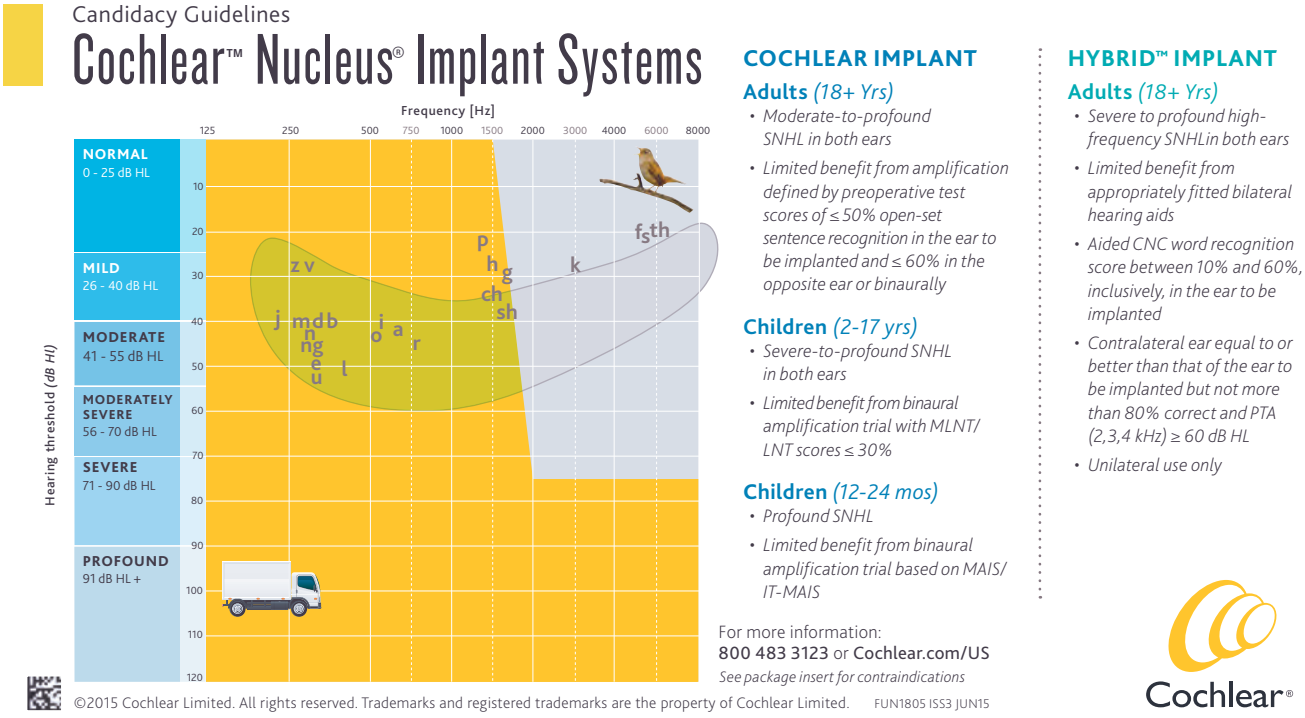

Figure 1: Candidacy Guidelines Cochlear Nucleus Implant Systems FDA Indication for the Cochlear™ Nucleus® portfolio of cochlear implants.**

*The Cochlear™ Nucleus® Hybrid™ Implant System is approved in the US for adults 18 and older. The acoustic component should only be used when behavioral audiometric thresholds can be obtained and the recipient can provide feedback regarding sound quality. The Cochlear™ Nucleus® Hybrid acoustic component is not compatible with the Cochlear™ Kanso® Sound Processor. The Kanso Sound Processor is not intended to be used by Hybrid L24 Cochlear Implant recipients who receive benefit from the acoustic component.

In contrast to hearing instruments, cochlear implants are typically a covered benefit for those with private health insurance,* as well as those patients covered under Medicare and Medicaid.**

The Patient's CI Journey

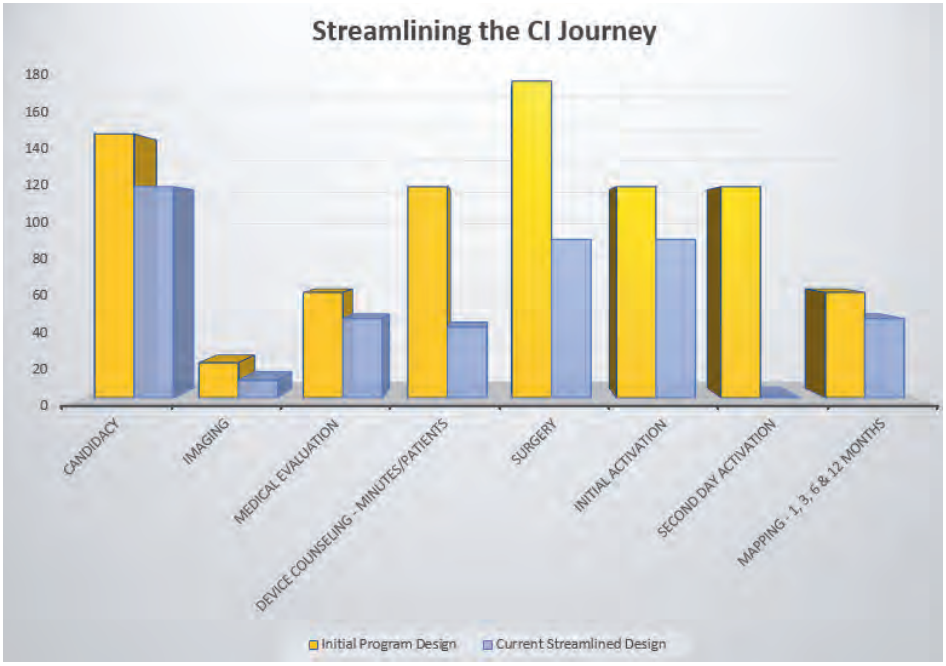

Figure 2. Clinical time estimates, Kaplan 2017 (unpublished)

With improvements in the patient-worn technology continuing at a rapid pace, software and CI clinical care have also seen a rise in efficiency. Objective measures such as Cochlear's Neural Response Telemetry (NRT ™) and interpolation of threshold (T) and comfort (C) level measures can help to make programming efficient for patient and clinician alike. While many of us may remember the early days of cochlear implant patient care, where initial device activation appointments lasted several days, today, cochlear implant activation can be accomplished in as little as an hour. Routine follow-up visits can be conducted as needed and some of the implant manufacturers offer a level of self-service to the patient for ordering of parts, how-to videos, and replacement processor programming. This corporate partnership can remove the previous workload burden from the programming audiologist.

Figure 2 shows how the CI patient journey has become more streamlined, as a result of improvements in CIs and their programming software.

Because less than 10% of patients, who currently meet audiometric criteria, have a cochlear implant, there remains an enormous unmet clinical need. If you use NOAH or an Electronic Medical Records system (EMR), it may be as simple as a quick data pull to find patients who may fit Food and Drug Administration (FDA) indications. Adults with bilateral moderately-severe-to-profound sensorineural hearing loss, who meet the indication for cochlear implantation, are often struggling to understand speech in both quiet and noise – yet may still be able to use a telephone with assistive technologies like a telephone coil (T-coil). They may have worn several sets and types of hearing instruments, and may be in your office for frequent updates, asking what else can be done to improve their hearing. As noted in Zwolan's article in this issue of Audiology Practices, performance in the booth should be compared to the individual's own report of how their hearing aids are performing in their daily life.

The FDA recently approved telehealth for remote programming of cochlear implants which can further improve access to care for patients who live in remote areas and/or experience challenges with their mobility (or ability to drive a car). Learn more at the following link: https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm585767.htm.

Hosting professional and candidate events in your area can help to increase referrals to your practice for CI and bone-conduction candidacy evaluation and connect you directly with new patients who are seeking an alternative to hearing aids. Social media posts and updates to your website are also great ways to generate interest across your community. Since only 5-10% of these patients will be candidates for implantable technology, these events are likely to significantly increase traditional hearing aid sales as well.

**Each cochlear implant manufacturer will have slightly different FDA indications and the reader is referred to each manufacturer's website for clarity. www.cochlear.com/us is the address for Cochlear Americas

A candidacy evaluation can be completed in about an hour and incorporates both aided and unaided testing, including speech reception measures. The Minimum Speech Test Battery (MSTB) is available at no charge when you visit the following link: http://www.auditorypotential.com/MSTBfiles/MSTBManual2011-06-20%20.pdf.

This site can also serve as a good reference for test materials and recommended test batteries. If your assessment indicates that the patient may benefit from cochlear implantation, your next step is referral to an implanting surgeon for a medical evaluation. Figure 3 provides some general guidance on the estimated amount of time spent for various appointments related to CI.

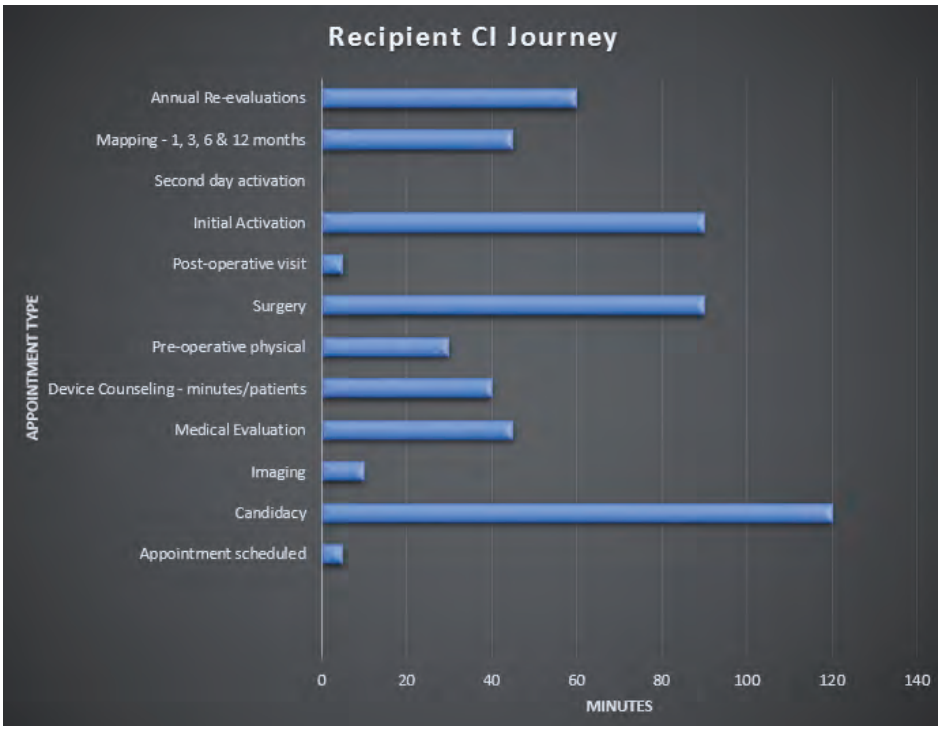

Figure 3. Time Estimates for the Patient's Journey, Kaplan, 2017 (unpublished)

Surgical Considerations

Today, cochlear implantation is most often an outpatient procedure that takes about 90 minutes to complete. Patients typically experience very little post-operative pain and the actual surgical procedure is considered both safe and effective. As with all surgeries, the typical risks of bleeding and infection apply.

Counseling on the surgical risks/benefits will be managed by the implanting surgeon. Cochlear implantation is performed on children as young as 12 months of age, all the way through the age spectrum to patients who may be in their 90's. The surgeon will address the patient's medical candidacy and answer your patient's questions during the pre-op candidacy evaluation at the implanting center.

Once you are connected with an implant surgeon, she can advise you on how she prefers that you counsel around the medical aspects of cochlear implantation. Additionally, post-operative care will be determined by you and the implanting surgeon. You may wish to provide both initial activation programming as well as routine follow-up, or you may elect to see the patients only on an as-needed basis for CI adjustments and/or maintenance of the contralateral hearing aid after initial activation.

Reimbursement

We know that many recipients report that receipt of a CI improved their quality of life. Of note, Crowson, Semenov, Tucci et al (2017) concluded, "... Considerable work has been done on the quality of life (QoL) attainment and health economic implications of CI. Unilateral CI across all age groups leads to reported sustained benefits in the recipients' overall and disease-specific QoL…".

As a whole, the industry agrees that cochlear implants can provide real value to the lives of patients; however, billing for cochlear implants does differ slightly from billing for hearing aids. Cochlear implants are a Class III medical device and, as such, are subject to a higher degree of federal regulation and can be reimbursed by both public and private insurance.

It is most likely that the implanting surgeon will assume responsibility for ordering and billing for the cochlear implant system and that evaluation, programming, and follow-up care will be provided by your team. Billing for these important services can be supported in a variety of ways by CI manufacturers:

- Reimbursement resources to hearing healthcare providers and to the patients themselves. Experts are available to assist with various provider-needs such as coding, payment, payer coverage, contracting, and other related issues.

- On-demand online education related to cochlear implant billing through Audiology Online (e.g., www. Audiology-online.com/Cochlear Americas). The professional blog, pronews.cochlearamericas.com also features periodic articles on how to bill, code and ensure reimbursement. Access to the professional portal, myCochlearClinic.com, saves time and helps clinics deliver optimal care. A myCochlearClinic.com account gives providers exclusive, secure access to tools and resources that support patient care.
- Otologic Management Services (OMS) is a no-charge service offered by Cochlear Americas that is available to help patients and providers obtain the necessary insurance coverage and assistance in appealing denied coverage for both the Cochlear™ Nucleus® portfolio of cochlear implants and the Cochlear™ Baha® bone anchored system as well.
- Clinics can also offer sale of assistive technologies and upgrades to their patients as well as fee-for-service care.

The relationship forged between the implanting surgeon and the referring audiologist is incredibly rewarding for all involved. Providing the best level of care for our patients, while creating new professional networks and friendships, is often a foundation of the practice.

Conclusion

To recap: A high level of personalized service that includes cochlear implants, bone anchored solutions, assistive technologies, and a variety of hearing instruments can help you differentiate your practice in today's marketplace. Information on candidacy, evaluation, and patient outcomes is widely available to you across a variety of channels. Developing a strong and active referral partnership with an implanting surgeon in your local community can be a win-win for your practice, your patients, and for your implanting surgical partner's practice as well. Support in developing this type of partnership is made easily accessible through Cochlear's Provider Network (CPN) program and development of strong billing practices and support is delivered through the Otologic Management Services (OMS) group as well as through the Coding Support Program. On-demand 24-hour access to both the professional and recipient portal helps to improve clinical efficiencies within your practice.

Hosting events in your area can help to increase referrals to your practice and can connect you directly with new patients who are seeking an alternative to hearing aids. Social media and updates to your website are also great ways to generate interest across your community. Since only 5-10% of these patients may be candidates for implantable technology, these events are likely to significantly increase traditional hearing aid sales for your practice. ■

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*Contact your insurance company or local Hearing Implant Specialist to determine your eligibility for coverage.

**Covered for Medicare beneficiaries who meet CMS criteria for coverage. Coverage for adult Medicaid recipients varies according to state specific guidelines.

Views expressed by Cochlear recipients and hearing health providers are those of the individual. Consult your hearing health provider to determine if you are a candidate for Cochlear technology. Outcomes and results may vary.

Cochlear Provider Network

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How to **Counsel** Hearing Aid Users About Their Prospective Candidacy for a **Cochlear Implant**

By Terry Zwolan, Ph.D.

Multichannel cochlear implants (CIs) have progressed significantly since they first received FDA approval for adults in 1984 and for children in 1990. This includes enhancements in design of the surgically implanted electrode arrays, improvements in surgical tools and techniques used to implant the electrode array, advances in sound processing strategies used to convey important speech information, and improvements in the function, usability, and cosmetic appeal of the externally worn sound processor. These enhancements have led to improved outcomes: Cochlear implants provide most adult recipients with significantly improved speech recognition skills when compared to preoperative scores obtained with hearing aids (e.g. Sladen et al., 2017; Runge et al., 2016). Additional benefits of CIs include improvements in self-reported quality of life (Crowson et al., 2017; Cohen et al., 2004) and improvements in socialization, self-esteem, communication, and relations to friends and family (Orabi et al., 2005).

Despite these demonstrated benefits, CI utilization remains low for both adults and children in the United States. Sorkin and Buchman (2016) recently reported that pediatric utilization ranged from a low of 50% in the United States, compared to a high of 97% in Australia, and blamed the low incidence rate in the US on lack of an appropriate referral system. The utilization rate reported for adults is low everywhere – it is estimated that only 10% of adults who qualify for a CI receive one. Sorkin and Buchman feel the lack of adult utilization is due to the absence of routine hearing screenings for adults. They additionally

cite that many primary care physicians and audiologists are unfamiliar with current CI candidacy criteria and outcomes and, therefore, fail to make appropriate referrals.

Some patients are hesitant to proceed with a CI evaluation, even when they experience grave difficulty with their hearing. There are many reasons for such hesitancy, including a fear of surgery, lack of understanding of what the evaluation process will entail, lack of understanding of insurance coverage of CIs, and inappropriate understanding of how the device works and the expected outcomes. In this article, we provide suggestions of when patients should be referred for a CI evaluation, and we also provide recommendations regarding how to present such a recommendation to patients, in order to facilitate their attendance at a CI evaluation.

Referring **Patients** for a **CI Evaluation**

When they were first introduced, CIs were only considered for patients with bilateral profound sensorineural hearing loss who scored 0% on open-set tests of sentence recognition, making it easy for clinicians to identify and refer potential candidates for a CI. These patients were often highly motivated to consider a CI as it was the only option available for them to obtain access to hearing.

Over the years, FDA-approved indications for CIs have expanded as the benefits of this technology have become proven across the age range. Such indications typically include statements regarding speech recognition with appropriate hearing aids as well as statements regarding the audiometric configurations that typical candidates should demonstrate. FDA-approved indications can be confusing, however, as they vary depending on the device manufacturer and the make and model of the electrode array. For example, the most lenient FDA-approved criteria are for hybrid/EAS arrays as they are more likely to preserve hearing than more traditional electrode arrays. Audiometric indications for the Nucleus® Hybrid L24 device state that the typical preoperative hearing of candidates for this device range from normal-to-moderate hearing loss in the low frequencies (thresholds no poorer than 60 dB HL up to and including 500 Hz), with severe-to-profound mid- to high-frequency hearing loss (threshold average of 2000, 3000, and 4000 Hz greater than or equal to 60 dB HL) in the contralateral ear (Nucleus® Hybrid L24 cochlear implant professional package insert, 2014). Conversely, subjects who qualify for more traditional cochlear implant systems, such as the Nucleus® CI512 and the Nucleus® CI532, typically demonstrate a bilateral moderate to profound sensorineural hearing loss. Audiometric configurations of CI candidates for the devices mentioned above are provided in Figure 1 on page 20.

Food and Drug Administration (FDA) indications for currently available devices also vary in regard to speech recognition requirements. Again, the most lenient indications are for the Nucleus Hybrid, which state that candidates' preoperative CNC word recognition score should fall between 10% and 60% in the ear to be implanted and be less than or equal to 80% correct in the preoperative contralateral aided condition (Package insert, Nucleus Hybrid L24, 2014). This was one of the first FDA-approved indications to base candidacy on a word recognition score; previously approved indications for CIs have always utilized a sentence recognition score. This expanded candidacy can be contrasted with more traditional speech recognition requirements, such as those published for the Nucleus CI512 (Nucleus® CI512 cochlear implant professional package insert, 2016) which state that candidates should demonstrate scores less than or equal to 50% correct on recorded sentences in the ear to be implanted and less than or equal to 60% correct on sentences in the best aided condition. The change to utilization of word scores for Nucleus Hybrid indications should be applauded as non-CI audiologists are more likely to administer word recognition tests than sentence recognition tests, making it easier for professionals to recognize patients that should be referred for a CI evaluation.

Theoretically, anyone whose audiogram falls within the indications listed listed in Figure 1 on page 19 could be considered for a CI evaluation. However, not all patients whose hearing falls in this range will meet either the FDA indications or their insurer's candidacy requirements regarding speech recognition. Some patients whose audiograms fall within the shaded audiometric indication area are best suited to receive a hyrbrid/EAS device while others are best suited to receive a traditional CI. Additionally, some who meet these audiometric criteria may not meet speech recognition indications, or they may meet indications but choose to continue using hearing aids.

It should also be noted that many clinics across the country are actively participating in clinical trials that enable patients to receive a CI even if they do not meet FDA indications. Additionally, many clinics are receiving approval from insurers to provide CIs to patients who do not meet FDA or insurer indications. Such "off label" devices are often provided to patients with asymmetric hearing losses where the

better-hearing ear would preclude a patient from meeting indications while the poorer-hearing ear is suitable for a CI. Such decisions are based on data showing improved speech recognition when use of an implant is combined with use of a hearing aid in the contralateral ear (Ching et al., 2004; Dunn DD, Tyler RS, Witt SA, 2005; Devocht et al., 2017).

At the University of Michigan clinic, we have noted that many professionals will only refer a patient for a CI evaluation if they are highly confident that the patient will qualify for a CI. Unfortunately, this means that some professionals refrain from making a referral if they think there is a chance the patient will not qualify. Below we provide suggestions regarding when a patient should be considered for a CI evaluation. It is our hope that, after reading this article, professionals will recognize that there are very few inappropriate referrals and that most patients, even if they do not qualify for a CI, will feel that their participation in such an appointment was valuable and worthwhile. This article will focus on referral of patients who may qualify for a more traditional, non-hybrid device. Information regarding referral of patients who may qualify for a hybrid/EAS device are outlined in a separate article in this edition.

...most patients, even if they do not qualify for a CI, will feel that their participation in such an appointment was valuable and worthwhile.

Referring **Patients** for a Cochlear Implant **Candidacy** Evaluation

As stated previously, FDA-approved indications for traditional CIs typically base candidacy on both audiometric and open-set sentence recognition criteria, and one problem with such indications is that many referral sources, such as audiologists who dispense hearing aids, do not regularly administer sentence tests to their patients, making it difficult for them to know if a patient will qualify for a CI. Many professionals do, however, administer word recognition tests as part of routine unaided audiometric testing or as part of the hearing aid fitting/verification process. Thus, we propose that scores obtained on such word recognition tests, along with the results of audiometric testing, be used as a guide for determining if a patient should be referred for a CI evaluation.

Gubbels et al. (2017) examined the medical records of patients who were seen at their clinic over a five-year period, in order to determine if findings from routine unaided audiometric tests could be used to predict the results of a more formal CI candidacy evaluation. They found that 86% of patients with monosyllabic word recognition scores at or below 44% met CI candidacy requirements for private insurance. In their study, candidacy decisions were based on the use of AzBio Sentences (Spahr et al., 2012) or older test materials that included HINT Sentences (Nillson et al., 1994). If predictability had been based solely upon subjects' AzBio Sentence scores, it is likely their data would have revealed a slightly higher monosyllabic word score. Additionally, many clinics today determine candidacy based on AzBio sentences administered in the presence of background noise, which would have yielded an even higher monosyllabic word score to predict candidacy.

We recently performed a similar review of data obtained on all adults who received a CI at our facility over the past two years. Monosyllabic word scores used in our analyses to predict CI candidacy were obtained from a careful chart review and included unaided word scores obtained at the referral site or at our site during preoperative testing. For this analysis, we based candidacy on the FDA-approved indications used most often in our clinic, which included a score of less than 60% correct on open-set sentence recognition in the patient's best aided condition when recorded AzBio sentences were presented to a soundfield at a level of 60 dB SPL using a signal to noise ratio of +10 dB. Because CI candidacy is most often based on the patient's best-aided performance, we elected to use subjects' "best" unaided monosyllabic word score when scores for the left and right ears were compared. To reflect scores being obtained in various clinics, we included all available unaided scores obtained for the right and left ears, and included scores obtained on the NU-6 monosyllabic words test (Tillman & Carhart, 1966), the CID W-22 test, and the CNC Monosyllabic words test (Peterson & Lehiste, 1962). Additionally, we included scores obtained using either recorded materials or presented live voice.

Of 249 adults referred for a CI evaluation, 157 (63%) qualified for a CI, while 90 (36%) did not qualify for a CI based

on the criteria cited above. Unfortunately, because Medicare has different criteria than the FDA (i.e. beneficiaries must obtain a score less than 40% correct on open set sentences in the best aided condition), some of the patients who met these candidacy requirements were unable to receive a CI.

Unaided monosyllabic word scores were available for 84 subjects who met candidacy requirements for a CI. We analyzed our dataset similar to the procedure used by Gubbels et al (2017) and found that CI candidates obtained a best unaided monosyllabic word score that ranged from 0 to 82% correct. The 86% threshold for our patients was much higher than the 44% monosyllabic word threshold reported by Gubbels et al (2017). We found that 86% of the patients who qualified for a cochlear implant at our facility obtained a best unaided monosyllabic word score of 60% or less.

Based on these scores, we recommend professionals consider referring a patient for a CI evaluation if he/she obtains a score of approximately 60% correct or less on an unaided monosyllabic word test for their better hearing ear, especially if the patient also demonstrates a bilateral moderate to profound sensorineural hearing loss. It should be noted that 12 of our patients scored above this threshold score of 60% yet still qualified for a CI. Thus, some patients who are candidates for a CI may have preoperative unaided word recognition scores higher than this recommended score of 60%.

Other **Factors** to **Consider**

For both hybrid and traditional candidates, there are other factors that are often taken into consideration when deciding if a patient is a suitable candidate for a CI. These factors include motivation, dissatisfaction with current amplification, recent experience (or lack of) with appropriate amplification, ability to function/hear at work, and ability to function/hear in social situations, to name a few. We feel that asking patients about these factors can provide insight that can be used to help determine if a patient should be referred for a CI evaluation.

What if They're **Not** a **Candidate**?

It's important for professionals to recognize that most patients feel the CI candidacy evaluation is worthwhile, even when the results indicate they are not a candidate. This is because the evaluation typically includes verification of their hearing aid settings (a necessary step prior to speech recognition testing), discussion of their difficult listening conditions, counseling regarding their candidacy/non-candidacy, and recommendations for future follow-up. In our experience, most patients who are not candidates leave the appointment grateful that their referring audiologist considered them for this evaluation.

Discussing the Referral for a CI Evaluation with the **Patient**

Receiving a recommendation from a professional, to consider a CI evaluation, may be difficult for some patients. Therefore, such recommendations should be handled with care to ensure the patient understands the reason for the recommendation. We find the following steps helpful when communicating with patients about a referral.

Description of their audiogram

It is important for patients to understand their audiogram as this will facilitate understanding of what their current hearing technology can or cannot do for them (as described below in regards to functional gain). For all potential CI recipients, it is helpful for them to know if their hearing loss meets the audiometric requirements for a cochlear implant as stated in the FDA indications. For this purpose, we provide an audiogram that includes the traditional CI indications. We recommend professionals consider overlaying the patient's thresholds on this audiogram, as doing so can help support a recommendation for a CI evaluation and help explain the audiometric indications for a CI.

Functional Gain

Although the standard of care for determining the optimal fit of amplification is real ear verification (AAA 2013, AAA 2006), it may be helpful to perform functional gain testing with patients you are considering referring for a CI evaluation. When displayed graphically, aided thresholds can serve as a useful counseling tool to help illustrate the sounds of speech that the patient does or does not have access to when using optimally-fit amplification. Overlaying this information on an audiogram that shows both speech and environmental sounds (such as the audiogram in Figure 1 on page 19 of the previous article) helps patients understand what their current technology is, or is not, providing them in regard to sound detection. Additionally, including a visual representation of the detection skills that CIs typically provide (20-25 dB HL 250-4000 Hz) can have a positive effect on how they will view the CI. It is important to keep in mind that that the most thorough objective verification and booth testing only provides you with a glimpse of how your patient performs in idealized settings. It is important to listen to your patient

when he describes difficulties and challenges. It may be that a CI could potentially help him to overcome some of these perceived difficulties.

Speech Recognition

It will also be helpful to provide the patients with information regarding their speech recognition test results, and to inform patients of recent outcomes with typical CI users. For example, one could cite recent publications on adults, such as the study of Runge et al. (2017), where adults demonstrated significant improvements in word scores in quiet, sentence scores in quiet, and sentence scores in noise when compared to preoperative scores obtained with hearing aids. Adults in this study obtained mean improvements in speech recognition (12-month post-operative score minus pre-operative score) of 51.2% for words and 58.1% for sentences in quiet. We additionally counsel patients about the range of scores obtained by patients as this helps clarify that CI patients demonstrate a variety of outcomes and that patients may score well above or below these typical scores. We then discuss factors that may impact performance with a CI, including their length of deafness, age at implant, history of hearing aid use in the ear to be implanted, cognitive factors, and any medical conditions that may hinder performance, such as abnormal cochlea(e) and/or cochlear ossification.

Quality of Life

It is important to inform patients that several studies indicate that CI use frequently results in improvements in self-reported quality of life (Hinderink et al., 2000; Mo, Lindbaek, & Harris, 2005; Orabi et al.,2005). Such studies cite improvements in socialization, self-esteem, communication, and relations to friends and family, following intervention with a CI.

Providing Information

Patients who are considering a cochlear implant frequently conduct a great deal of investigative work on the topic of CIs prior to participating in an evaluation. It is important for them to access accurate and reliable information. Unfortunately, there is a great deal of misinformation on the internet regarding CIs, their outcomes, and the risks associated with surgery. We recommend audiologists provide prospective patients with web addresses for the three CI manufacturers who provide devices in the United States: www.advancedbionics.com, www.cochlear.com, www.medel.com. These websites provide important information regarding candidacy, electrode arrays, device reliability, and patient experiences. They additionally provide prospective patients with the ability to connect with CI users to learn first-hand about their experiences with their CIs.

What Not to Do

In our experience, referral sources have a large impact on a patient's willingness to participate in a CI evaluation. In addition to encouraging patients to seek a CI evaluation, some audiologists unknowingly discourage patients from considering this important next step. Below we provide examples of some of the things our patients have shared with us regarding the discussions they have had with well-meaning audiologists.

If a child is born with a bilateral profound sensorineural hearing loss, we do not recommend the family be counseled to "try hearing aids first to see if they work". When parents hear these words, they frequently hold out hope that the hearing aids will "work" and that their child will not need surgery. It is well known that children with profound losses who receive CIs obtain better spoken language skills than children with profound losses who continue to use hearing aids (Bittencourt et al., 2012). Thus, it may be more appropriate to ask the parent if they have the goal of spoken language for their child. If they respond that they do, they should be informed that the best chance for successful development of spoken language skills is with early implantation with a CI. They should be encouraged to establish consistent hearing aid use, but for reasons other than to "see if they will work". Benefits of early hearing aid use include access to sound, establishment of a device-wearing routine, and that, in some cases, insurers may require a hearing aid trial before they will provide preauthorization for a CI.

We recommend that professionals refrain from referring to the CI as a "last resort". Such a reference often increases the grief and dread that some patients or parents may feel about a CI for themselves or their child. Referring to the CI as a last resort causes potential patients and parents to worry about hypothetical situations, such as what will happen if the CI is not successful.

Do not wait until you feel a patient IS a candidate to refer them for a CI evaluation. Frequently, patients who are seen in our clinic likely qualified for a CI much sooner. If you have questions regarding the appropriateness of a referral, we recommend you contact the CI center directly and ask them to review your test results. The additional benefit of such contact is that the CI Center can alert you of any studies they are participating in that may have more lenient criteria than those of the FDA-approved devices. When such

communication occurs, the patient seems to find comfort knowing that the referring audiologist took an extra step to ensure the evaluation would be worthwhile and that the CI center is familiar with their case.

Do not assume the patient has too many "other issues" that would make him/her a poor candidate for a CI. Cochlear implant centers frequently provide implants to patients with additional disabilities. This includes adults with cognitive or physical disabilities and/or children with cognitive and/or developmental delays. Frequently, providing the patient with improved communication can have a large, positive impact on the ability to diagnose and treat other health issues.

Summary

Dispensing audiologists play a key role in referring patients for CI evaluations. However, determination of when to refer someone is not always a straightforward decision. Based on data obtained at our clinic we recommend dispensing audiologists consider referring patients when they demonstrate an unaided monosyllabic word score that is less than or equal to 60% correct. In this paper, we have provided suggestions that you may find helpful when communicating with your patients regarding your recommendation for a CI evaluation. Without referrals from their dispensing audiologist, many of the patients who currently use CIs would still be receiving inappropriate benefit from hearing aids. Instead, many of these patients are receiving great benefit from a CI and are grateful their dispensing audiologist had the knowledge and foresight to recommend such an evaluation. ■

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Nucleus® Hybrid L24 cochlear implant professional package insert, 2014

Nucleus® CI512 cochlear implant professional package insert, 2016

Continued on page 56

Candidate Selection for Electric-Acoustic Stimulation

Hybrid and Bimodal Cochlear Implantation

By Aaron J Parkinson, Ph.D. and Megan Mears, Au.D., MS

Introduction

In the early days, 20-plus years ago, cochlear implants (CIs) were considered by many to be supplemental aids to lip-reading. This was reinforced by the relatively modest open-set speech perception recipients presented with post-implantation. Despite the time that has passed since implants first became available, it may be a surprise to more than a few that the performance of postlingually deafened CI recipients today goes well beyond that to be expected of a lip-reading aid. In this issue, Dr. Zwolan points to a number of studies that have demonstrated the significant gains in speech perception and quality of life (QoL) to be expected from cochlear implantation over hearing aids (HA) alone, which have only increased as indications have broadened. This should be taken as good news for anyone hesitant to explore cochlear implants, or unfamiliar with the potential implantation delivers. The lives of patients and their friends and families are positively impacted by the intervention. In addition, a more positive patient-clinician experience is made possible for those patients for whom hearing aids are not enough. The potential for patients to benefit from both CI and HA technology opens up opportunities for both hearing aid and cochlear implant professionals to develop rich and rewarding partnerships in delivering effective, meaningful auditory (re)habilitation. No better example of this is the development of electric-acoustic implant systems, which will be discussed below.

In the treatment of significant (severe or poorer) high-frequency hearing loss, electrical access to lost sounds through cochlear implantation is the accepted standard-of-care, which precipitates the question, What about any residual hearing? While many CI recipients are already profoundly deafened at the time of implantation, the evolving landscape of candidacy has shown that people with lesser degrees of hearing loss can also benefit from a CI and particularly from a CI (electric) plus acoustic amplification. Typically, residual hearing refers to low-frequency hearing that can remain intact in the implanted ear after surgery and/or stable in the contralateral ear. Even after speech clarity is regained with a CI, when it is present, the residual low-frequency hearing should not be overlooked, but instead maximized to preserve the completeness of sound in summation of all its discrete and complex details.

As Teresa Ching (Ching, van Wanrooy, & Dillon, 2007) highlights, referring to patients who use a CI in concert with contralateral amplification, low-frequency acoustic information provides cues that point to voice pitch and suprasegmental aspects of the speech signal, and can be useful when listening to speech in background noise. In this way, the addition of low-frequency amplification is complementary to mid- to high-frequency spectral information more readily available via the CI. Encompassing the broad spectrum of speech sounds results in a more accurately reconstructed signal reaching the hearing nerve in such a cohesive fashion

that the brain can take advantage of its natural ability to glean cues from each minute feature. These cues can relay the richness and intention of the original sound, resulting in a more normalized listening experience.

The harmonization of electric stimulation and acoustic amplification is germane in two specific patient profiles: the Hybrid Hearing patient,* and the CI patient with aidable acoustic hearing in the contralateral ear (bimodal hearing).

Hybrid Cochlear Implantation

With the evolution of technology and the benefits to be derived becoming clear, indications for implantation have broadened, which in turn has contributed to the superior performance observed in more recent recipients. This pattern is most evident in the development of electric-acoustic implant devices such as the Cochlear™ Nucleus® Hybrid™ Implant System.

Hybrid cochlear implantation addresses the needs of a population with severe high-frequency sensorineural hearing loss (often referred to as "ski-slope" hearing loss) underserved by hearing aids. Such individuals typically benefit by the presence of functional low-frequency acoustic hearing but continue to struggle understanding speech due to the extent of their high-frequency hearing loss. This is likely the result of a significantly diminished or absent cochlear reserve (i.e., loss of sensory hair cells) in the basal region of the cochlea. Frequencies corresponding to this region of the cochlea are important for effective speech understanding in quiet and in noisy and/or more complex listening situations (e.g., (Amos & Humes, 2007; Hornsby & Ricketts, 2003).

Electrical stimulation provides a means to bypass the (absent) sensory component of the cochlea and directly activate residual neural elements that would normally depend on functional hair cells for innervation. However, prior to March of 2014, cochlear implant technology was not indicated for patients in the United States (U.S.) with severe high-frequency hearing loss and better than a moderate degree of low-frequency hearing loss. This left individuals "stuck in the middle," frustrated with hearing aid technology not meeting their needs, yet not able to access implantable technology that might better address their severe high-frequency loss.

Advances in cochlear implant electrode array design and surgical technique allowed for the development of the Cochlear™ Nucleus® Hybrid™ L24 Implant. The goal of this design was to provide for electrical stimulation of the diminished high-frequency region of the cochlea while maintaining functional acoustic hearing in the lower frequencies.

Surgery for the Hybrid L24 implant is similar to that for standard CIs, except that a 16 mm electrode array is slowly advanced into the scala tympani rather than a 19 to 24 mm array as would be the case for standard CIs (Roland, Gantz, Waltzman, & Parkinson, 2016). The Hybrid L24 cochlear implant and sound processor are shown in Figure 1. The 16 mm straight array is very thin with 22 half-band modiolar-facing electrode contacts. The intent of this design is to provide stimulation of the basal (high-frequencies) region of the cochlea while maintaining apical cochlear structures responsible for low-frequency hearing. The system includes an external processor that integrates electric and acoustic sound processing when using the either the Cochlear™ Nucleus® 6 or 7 sound processor with the acoustic component attached

The Hybrid system was approved by the U.S. Food and Drug Administration (FDA) as a first-of-its-kind electric-acoustic device in March 2014. Clinical trial outcomes are provided in a series of publications (Kelsall, Arnold, & Lionnet, 2017; Roland et al., 2016; Roland, Gantz, Waltzman, & Parkinson, 2018). Briefly, these studies show that Hybrid recipients demonstrate:

1. Restoration of high-frequency hearing sensitivity, so important for good speech understanding, as evidenced by significant improvement on objective measures of speech perception in both quiet and in noise,
2. Significant improvement on self-reported measures related to hearing speech and sounds in quiet and in complex listening environments encountered in everyday life,
3. Improved levels of satisfaction with Hybrid technology, relative to hearing aids alone, and
4. Maintain superior levels of music perception relative to most traditional CI recipients.

Prospective candidates must be counselled regarding the risk of the procedure to residual acoustic hearing in the implanted ear. However, it is equally important that this be considered in balance with the fact that their high-frequency hearing is significantly compromised. While there are benefits to maintaining acoustic low-frequency hearing in the implanted, and all efforts are made to achieve this, improved communication ability is only possible if high-frequency speech perception is regained. The level of improvement and

the overall capabilities observed in Hybrid recipients is only possible via electrical stimulation to address severe high-frequency sensorineural hearing loss.

Candidacy Criteria

The Nucleus Hybrid L24 cochlear implant system is indicated for unilateral use in patients 18 years and older (see Figure 1 on page 19) with:

- thresholds ≤ 60 dB HL up to and including 500 Hz, and a threshold average of 2000, 3000, and 4000 Hz ≤ 75 dB HL in the ear to be implanted,
- a threshold average of 2000, 3000, and 4000 Hz ≤ 60 dB HL in the contralateral ear,
- an aided CNC word recognition score between 10% and 60%, inclusively, in the ear to be implanted, and
- an aided CNC word recognition score equal to or better than that of the ear to be implanted but not more than 80% correct.

Prospective candidates should go through a suitable HA trial, unless already appropriately fit with hearing aids. One should also carefully consider ruling out the Hybrid L24 implant for those presenting with evidence of rapidly progressive and/or fluctuating hearing loss and they can, be considered for a traditional CI instead. Figure 2 shows an example of a hybrid cochlear implant

Approval of the Hybrid L24 implant and the above indications represent the most significant broadening of indications for cochlear implantation in more than 15 years. While speech perception requirements for traditional cochlear implantation are predicated on sentence recognition scores, rather than word recognition scores, the preoperative speech perception abilities of Hybrid L24 candidates are considerably higher than typical cochlear implant candidates. The mean preoperative aided CNC score for Hybrid L24 clinical trial participants was 28% for the ear to be implanted, with scores typically in the range of 10% to 60%. Across a number of clinical trials with traditional CIs, mean preoperative aided word scores were under 10% for the implanted ear. For example, in a recent trial of the Nucleus 5 cochlear implant system (Runge, Henion, Tarima, Beiter, & Zwolan, 2016) the mean score preoperatively was 5.6% in the implanted ear, with scores ranging from 0% to 31% (the majority, 30/38 subjects, scored < 10%). Clearly, Hybrid implantation opened up electrical stimulation technology to a much broader range of hearing impairment than previous to 2014.

Figure 2. The Nucleus 7 with ACO Hybrid Hearing. Reprinted with Permission

Referring for Hybrid L24 cochlear implantation

The first step, audiometrically, is confirming that a patient presents with the audiometric profile described, above, under Candidacy Criteria. Cochlear implantation should always be in mind when discussing treatment options for those with severe high-frequency sensorineural hearing loss, regardless of low-frequency hearing status. In the case of Hybrid L24 cochlear implantation, the level of residual hearing for low frequencies (up to and including 500 Hz) also needs to be considered, as delineated above. That is, patients with better levels of low-frequency hearing are more suited to Hybrid L24 implantation, should electrical stimulation be appropriate, whereas those with poorer low-frequency hearing thresholds are possible traditional cochlear implant candidates. Individuals with thresholds poorer than 60 dB HL up to 500 Hz, should be referred for traditional cochlear implantation evaluation.

Assuming audiometric requirements are met, the next step is to assess aided speech perception performance. For Hybrid L24 implantation, this assessment is based on aided monosyllabic word recognition, typically using CNC word materials (Peterson & Lehiste, 1962). Should a patient demonstrate aided word scores in the ranges referred to above, in addition to the audiometric requirements being met, referral for Hybrid L24 implantation would be appropriate.

If a patient presents with very poor word recognition (e.g., < ~30%) the patient may be a traditional cochlear implant

candidate instead of, or in addition to, a Hybrid L24 candidate, particularly if low-frequency thresholds are poorer than ~40 dB HL. In this case, since selection criteria include sentence recognition scores, further testing should be completed to assess aided performance using sentence materials. If additional testing and/or sentence materials are not readily available the recommendation is to refer on to a cochlear implant facility. This topic is discussed more fully by Dr. Zwolan in this issue of *Audiology Practices*.

If in doubt about a patient's eligibility for either traditional or Hybrid L24 cochlear implantation, and the patient presents with severe high-frequency hearing loss, referral is recommended for further evaluation. Fostering a positive and collaborative relationship with a local CI clinic is highly encouraged. Together, hearing aid and cochlear implant professionals can develop effective treatment plans for patients with significant high-frequency sensorineural hearing loss.

> Cochlear implantation should always be in mind when discussing treatment options for those with severe high-frequency sensorineural hearing loss...

Whether one is considering traditional CI or Hybrid L24 implantation, the goal should be to maximize hearing outcomes for both ears. It is noteworthy, that all patients who participated in the Hybrid L24 clinical trial continued to make use of a hearing aid in the contralateral ear and optimal outcomes were observed in this listening mode (Roland et al., 2016). Whether patients were able to make use of acoustic amplification on the implanted ear or not, the best speech perception scores were observed in quiet and in noise when patients used a contralateral hearing aid and this was their preferred listening configuration. The importance of contralateral amplification for traditional CI similarly applies and will be discussed more below.

Hybrid and Bimodal Hearing

Another way that patients can benefit from the combination of electric and acoustic hearing is through Nucleus ® Hybrid™ Hearing, which refers to use of any Nucleus cochlear implant model coupled to either a Nucleus® 6 or a Nucleus® 7 sound processor and an acoustic component – both on the implanted ear.

And, finally, one more way in which recipients can benefit from the combination of electric and acoustic hearing is through a bimodal configuration. It is this bimodal wearing paradigm that we will focus on now. Most CI users (both traditional and Hybrid L24) are unilaterally implanted and likely will benefit by continued use of amplification in conjunction with their CI. With broadening indications for implantation, the potential for patients to benefit by continued use or addition of a hearing aid contralaterally is not to be underestimated, simply because more patients present with aidable hearing in the non-implanted ear.

As described earlier, a CI will allow the damaged portions of the cochlea to be bypassed and provide electrical representation of sound directly to the hearing nerve for interpretation by the brain. While the cues that are most necessary for speech understanding are extracted and preserved, full representation of the signal can be limited. Namely, mid- and high-frequency cues of consonant articulation manner and place are well conveyed by the CI, while low-frequency cues of voicing and fundamental frequency (less crucial for perception in stress-timed languages) are less-well conveyed. *So what can be done to improve the quality of this signal?*

Patients who have a CI on one ear and a hearing aid on the other (bimodal hearing) demonstrate improved hearing in background noise, improved sound quality, and improved satisfaction (Fitzpatrick, Seguin, Schramm, Chenier, & Armstrong, 2009; Illg, Bojanowicz, Lesinski-Schiedat, Lenarz, & Buchner, 2014; Morera et al., 2012). Clearly, patients can benefit by the best of both worlds – acoustic and electric hearing.

As a general rule, hearing aid patients scoring 70% word recognition or better in both ears are probably appropriately amplified with hearing aids and may not qualify for a CI though only a complete CI referral can determine candidacy. Continued monitoring of these patients is recommended, with referral for a CI if a decrease in hearing thresholds or speech perception is reported by the patient. CI patients who have been appropriately fit with hearing aids prior to implantation tend to do better than those who spent extended periods of time being deprived of auditory stimulation (Blamey et al., 2013; Lazard et al., 2012).

Patients with speech perception scores of 50-60% or worse: This is the perfect time to begin the cochlear implant discussion with these patients. Ask them how well they are managing in their classroom/job settings, find out if hearing

in background noise is burdensome, or if they struggle to use the telephone. Other valuable details to find out are the importance of music in these patients' lives, how often they find themselves in challenging listening environments, and what their expectations are for their hearing technology. These patients may benefit from a formal CI evaluation and it is best to take a whole-picture approach and figure out how the hearing loss affects their lifestyle. If the patients report significant difficulty hearing in their daily lives, a CI evaluation may begin to prepare them for future options whether or not they qualify for implantation at this time. If they do not qualify, continue to monitor their hearing performance, and refer them again if they experience increasing challenges in their daily lives. Many people who choose to get a CI in one ear to improve their speech understanding, but still have an average low frequency PTA of 70 dB HL or better in the non-implanted ear, do well wearing a hearing aid in that non-implanted ear (Choi et al., 2016). These patients will continue to need hearing aid services and may be able to take advantage of bimodal features offered by CI/hearing aid joint partners. Because of the known benefits of listening with two ears, patients with useful residual hearing in the non-implanted ear should continue to take advantage of that bimodal benefit with a hearing aid (Dunn, Tyler, & Witt, 2005; Firszt et al., 2018; Tyler et al., 2002).

When patients are missing over half of the spoken message while using their hearing aids, they should be evaluated for a CI to improve their speech perception.

Patients with asymmetric speech perception scores: What if one ear is just below the qualifying speech recognition score and the other ear scores less than 20%? You already know that the poorer ear can have a high probability of showing improvement with a CI, so a referral is absolutely warranted for this patient. However, for the other ear, the decision may not be as clear. These patients likely still have aidable thresholds and could benefit from an acoustic balance on the better ear. There are a host of bimodal benefits that a CI user can reap from continuing to wear a hearing aid in the contralateral ear such as better hearing in background noise and music appreciation.

Patients with poor speech perception scores in both ears: These patients will likely have a severe-profound audiogram. When patients are missing over half of the spoken message while using their hearing aids, they should be evaluated for a CI to improve their speech perception. In this situation, even if a patient qualifies for two cochlear implants, and even if they might benefit from two cochlear implants, they do not always choose that option. Most choose to proceed with one CI initially, while maintaining hearing aid use in the non-implanted ear. There are certain populations of patients who, based on a long history of hearing aid use, prefer the 'boomy' sensation of a super-power hearing aid in the non-implanted ear to round out speech cues from the CI. Some patients find the contribution of the hearing aid to be comforting, even if the hearing aid is not providing them clarity and would never be sufficient on its own.

Summary

It would be a mistake to assume that the line dividing patients who benefit from a hearing aid and those who benefit from a CI is hard and fast. In reality, there are many patients whose outcomes are maximized by the combined use of both technologies. Cochlear implant candidacy is no longer restricted to only the profoundly deaf, but encompasses those with residual hearing who can wear an acoustic component in their implanted ear (Hybrid™ Hearing), and/or a hearing aid on the opposite side (bimodal hearing). Recognizing these potential Hybrid hearing and Bimodal patients is a skill that can be mastered by audiologists in both hearing aid and hearing implant specialties. Tips for providing comprehensive patient care:

1. Establish a professional network with one or two CI surgeons or clinics in your area that you feel confident referring your patients to for evaluation. A good working relationship will ensure that patients you refer who do not qualify for a CI will be referred to you for continued service. See the article by Kaplan and Brown in this issue of Audiology Practices (AP) for additional details on how to bring CI into your practice as a differentiator in your market.
2. In addition to the FDA approved indications for cochlear implants, all patients require a whole-person approach. Please consider:
    a. The needs and priorities of the patient: job requirements, lifestyle preferences, social interactions, impact of hearing loss on activities of daily living, goals for intervention

b. Hearing performance in a variety of situations: an audiogram cannot tell the whole story. How does the patient hear in a crowded room? Or on the phone? Or using both ears together?

3. When in doubt, refer for a CI evaluation. An evaluation is not a commitment, and it can set the stage for future expectations for the patient. As Dr. Zwolan points out in this issue of AP, patients often report that they appreciate the referral and the opportunity to learn more about their treatment options. It would be far worse for a patient to continue to struggle with their hearing performance because their hearing healthcare provider did not know when it was time to refer or assess them for the next option. ■

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*The Acoustic Component should only be used when behavioral audiometric thresholds can be obtained and the recipient can provide feedback regarding sound quality. The Hybrid L24 Implant is approved in the US for adults ages 18 and older.

Auditory Brain Training & Adults who Use Cochlear Implants

A Little Philosophizing & Some Interesting Data

By Nancy Tye-Murray, Ph.D. and Brent Spehar, Ph.D.

The term *auditory training* is often used to describe a broad array of training programs, many of which differ from one another in philosophical approach and training activities. For example, some programs emphasize recognition of nonsense syllables while others emphasize words or sentences. Some gamify training while others present rote drill. Not surprisingly, recent mega-analyses that have been performed about auditory training have yielded nebulous conclusions about its benefits because, in essence, apples are being lumped together with oranges. In this report, we make the case that cochlear implant centers often do not provide auditory training to their adult cochlear implant recipients because of ambiguity about its effectiveness. A new approach, *auditory brain training,* which is meaning-based and gamified, is described and results are presented for 15 experienced cochlear implant users. The participants showed improved speech discrimination and sentence recognition after receiving 12 hours of training.

When hearing healthcare professionals say "auditory training" or when they see the term in a research article, they often believe that the term always refers to a similar training experience. "They're teaching people how to maximize their residual hearing, right?" they might muse, or, "Listening therapy for the ears, like physical therapy for a bum knee."

The problem with this kind of assumption is that there is no universal agreement on what constitutes auditory training and different training curricula can lead to different results. For instance, Sweetow and Palmer (2005) surveyed the literature to answer the following question: "Is there evidence of improvement in communication skills through individual auditory training in an adult hearing –impaired population?" (p. 494). Not surprisingly, the answer was equivocal. For the six research studies that met the authors' criteria of methodological rigor, four reported that auditory training enhanced listening performance, one did not, and one reported mixed results. All six studies had a different instantiation of auditory training. Similarly, Henshaw and Ferguson (2013) performed a meta-analysis of the benefits of computerized auditory training. Based on the authors' examination of

thirteen research studies that met their inclusion criteria of good experimental design, they concluded that overall, results were not always consistent or robust but it appeared that training results in modest gains in speech recognition.

Because there are many different philosophies about how to structure auditory training, its effectiveness should be considered within the context of what comprises the training experience. For example, some curricula focus on phoneme-based, nonsense syllable training (e.g., *aba* and *ata*, Moore, Rosenberg, & Coleman, 2005), with the assumption that once a patient acquires the "building blocks" of language, this learning will lead to better recognition of words and sentences. Other curricula emphasize meaningful speech units such as words and sentences. For example, Humes et al. (2009) advocate teaching patients to recognize the most frequently used words of the English language, as they comprise the bulk of everyday conversation. Boothroyd's approach (2008) entails presenting sentences that are topically related, such as sentences pertaining to the topics of *food* or *work*.

The inconsistent findings about the effectiveness of auditory training, and the ambiguity about what auditory training means, probably account in part for why formal auditory training is often not offered on a routine basis to adults who have just received a cochlear implant. It is seemingly impossible to make a blanket statement about whether or not patients will receive benefit, and because evidence-based practice is the gold standard for many cochlear implant centers, auditory training is not offered in a formal or systematic way.

clEAR (customized learning: Exercises for Aural Rehabilitation) provides auditory brain training to people who have hearing loss via computer games that are accessed through the web (www.clearworks4ears.com). The word *brain* is inserted between the words *auditory* and *training* because clEAR not only provides training on word discrimination, the most frequent words of the language, and sentence and discourse comprehension, but also provides training for those cognitive skills that are needed to recognize any connected speech. These cognitive skills are auditory processing speed, auditory working memory, and auditory

attention. The clEAR games rest on two fundamental principles: 1) training must engage patients' attention in order for learning to occur and 2) training must be meaningful.

The rationale for gamified training is presented in Table 1. In a nutshell, in order for the adult brain to learn new perceptual skills, it must be aroused by and engaged in the learning process. Rote discrimination tasks, such as indicating trial after trial whether two nonsense syllables are the "same" or "different", as often happens in traditional auditory training, likely does not engage the brain in a way that will promote perceptual learning and indeed, might lead to a brain state that is soporific.

The rationale for meaningful training is founded on principles of learning and memory and includes exclusive use of meaning-based training. Meaning-based training is critical because to communicate successfully in the real world, adults with cochlear implants, like learners of any novel language, must not only attend to the formal properties of sounds but must do so while attending to the meaning or communicative content that the sounds convey. Moreover, there is evidence that phoneme perception and word perception are uncorrelated (Sommers et al., 2005), making it unlikely that even successful form-only training on nonsense syllables will lead to generalizable gains in word perception. Evidence for the superiority of meaning-based training has a long history within the field of second language acquisition (e.g., Savignon, 1972).

To assess the effectiveness of gamified, meaning-based auditory brain training for experienced adult cochlear implant (CI) users, we provided 12 one-hour training sessions to 15 CI users (see Table 2). We stipulated that they be experienced because we did not want to confound the effects of auditory brain training with the natural adjustment period with a new listening device.

On a four-choice word discrimination test, 10 of the 15 participants showed improvement in their ability to discriminate the speech of a talker with whom they did not train (Figure 1). On a "Build-a-Sentence" test, which assessed closed-set sentence recognition using words displayed in a matrix, eight of 15 participants showed improvement in their ability to recognize sentences (Figure 2). Finally, on a test of perceptual effort, which measures perceptual effort with a memory task, results were variable and inconclusive (Figure 3).

Participants also completed questionnaires at the end of training and 6-months post-training. Results are presented in Table 3. Overall, the subjective impression of auditory brain training was very favorable.

Table 1.

Why auditory brain training that is "gamified" is more likely to be effective than ordinary auditory training for people who have hearing loss.

- Playing video games is pleasurable.
- Pleasant activities cause the brain to increase production of dopamine, which is a neurotransmitter that acts as a "messenger" between brain cells.
- Research has shown that playing video games increases production of dopamine.
- Increased dopamine levels enhance neural plasticity.
- Enhanced neural plasticity allows for greater perceptual learning.
- Hence, adults with hearing loss have better potential for learning to use their residual hearing when playing auditory brain training games than when engaging in rote auditory training tasks.

Table 2. Information about the participants.

Participants	15 CI users, 7 female, average age = 59 years (SD=17.6)
Average duration of CI use	5.5 years (SD=5.2)
Device type	10=Cochlear Corp.; 5=Advanced Bionics; 9 use HA in non-implanted ear
Training procedures	Twelve 1 hour training sessions, twice per week using beta versions of the clEAR computer auditory brain training games, occurring at the Tye-Murray lab

These findings are remarkable because, with the exception of perceptual effort, auditory brain training improved objective and subjective measures of performance for the majority of the participants. In our next round of research, we will providing clEAR to new CI recipients (i.e., less than 6 months of experience). It is quite possible that gamified, meaning-based auditory brain training that utilizes the kinds of training activities described here will accelerate the natural learning curve that occurs with receipt of a new cochlear implant and leads to a higher level of speech recognition performance than would have occurred otherwise. ■

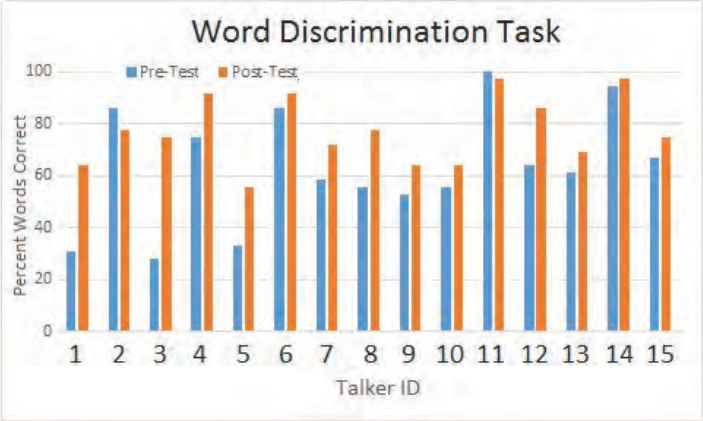

Figure 1. Results from a 4-choice word discrimination test. The participant hears two words (e.g., cup-pup and then has to pick the correct illustration from four pictures, one of which shows two cups, one which shows two pups, one which shows a cup by a pup, and one which shows a pup by a cup..

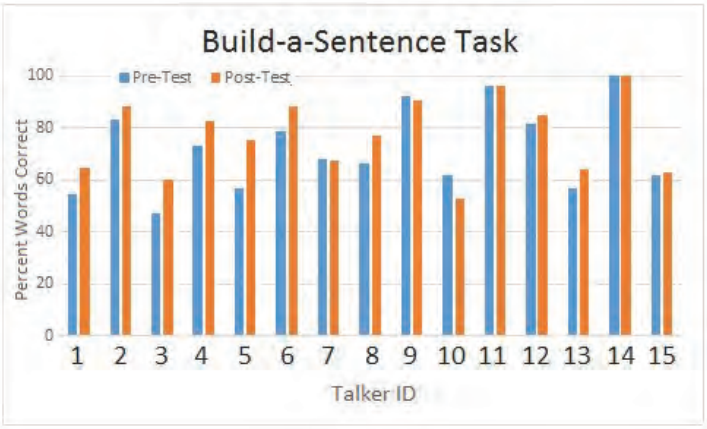

Figure 2. Results from the Build-a-Sentence test. The participant hears a sentence that is a a carrier phrase, The ____ and the ____ see the ____ and the _____, and then must fill in the target words from a matrix of 36 candidates.

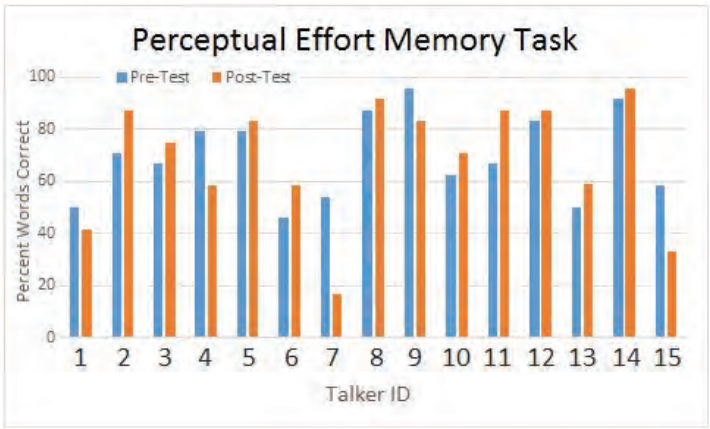

Figure 3. Results from the test of perceptual effort. A variant of an N-back memory task, participants hearing a running list of words and are asked to update continually the three most recently presented words.

Table 3. Responses to questionnaires administered immediately after auditory brain training and then 6 months later.

1	**Please indicate how much you believe that you improved in your ability to understand spoken language as a result of having participated in training on a scale from 1 through 7, where 1 = "very little" and 7 = "very much".**
	Average = 4 (SD = 1.2)
2	**To what extent has participating in this program improved your self-confidence in engaging in conversation with casual acquaintances or strangers on a scale from 1 through 7, where 1 = "very little" and 7 = "very much"?**
	Average = 4 (SD = 1.6)
3	**To what extent has participating in this program improved your self-confidence in engaging in conversation with family members or close friends on a scale from 1 through 7?**
	Average = 4 (SD = 1.8)
4	**Please indicate how much you enjoyed participating in this program on a scale from 1 through 7?**
	Average = 6 (SD = 1.1)
5	**Was the program worth your time? (asked at 6 months post training)**
	100% said yes
6	**Would you do the program again? (asked at 6 months post training)**
	100% said yes
7	**Would you recommend the program to a friend? (asked at 6 months post training)**
	100% said yes

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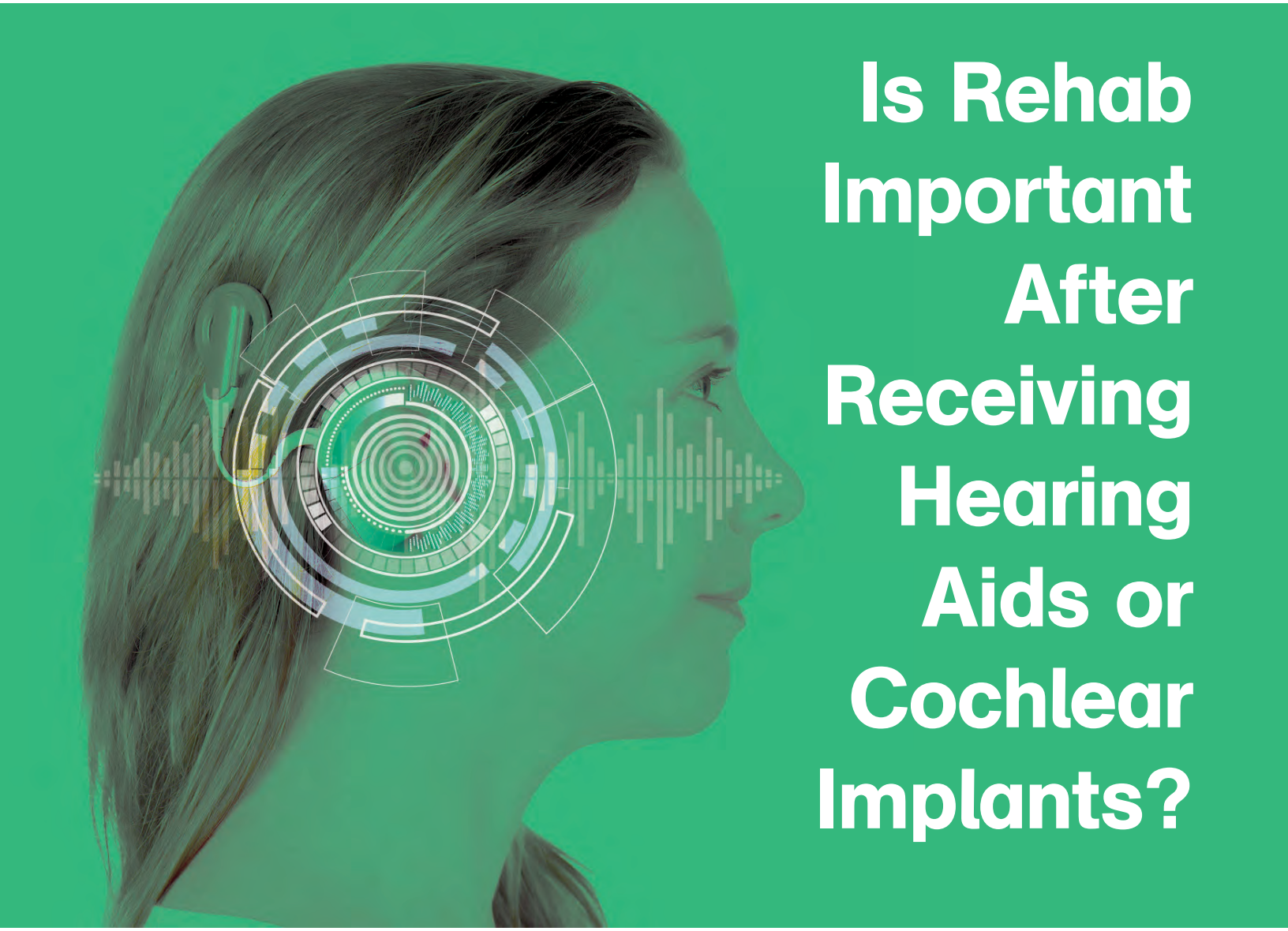

Is Rehab Important After Receiving Hearing Aids or Cochlear Implants?

By Jane R. Madell, Ph.D.

We all know that hearing aids and cochlear implants are not like eye glasses. For most people, eyeglasses cure vision problems. Not so with hearing loss. No matter how good the technology, we are listening through a damaged auditory system. So why would we expect that just fitting technology will be all that a person needs?

What is included in a comprehensive hearing health care program?

Boothroyd (2017) describes comprehensive hearing health care as having four parts. Part 1 is sensory management: what we do when we fit technology (hearing aids, cochlear implants, bone-anchored hearing aids, and remote microphone systems). Part 2 is instruction: instructional counseling about maintenance and function of technology. It may include how to control the environment including both visual and acoustic controls. Part 3 is perceptual training. This is usually described as auditory training, lip-reading and communication strategies. Part 4 is counseling. This may include communication counseling, helping people cope with the imperfect assisted technology and psychosocial counseling designed to help the person deal with the impact of imperfect aided technology and improving emotional state and quality of life.

Audiologists are usually very good at the first and second part. A very few may offer some of the counseling Boothroyd discusses in Part 4, but almost no audiologists offer or participate in Boothroyd's 3rd criteria although I think that everyone would agree that it would be beneficial.

Let's review all the parts of a comprehensive hearing health care program. The primary goals of technology are to provide auditory access to the listener's brain that is audible, comfortable, and provides access to intelligible speech. How do we know this is happening?

How do we know how well a person is doing with technology?

Hearing aids are fit using real ear and we "assume" that the person will do well with those settings. Cochlear implants are fit using programming devised by implant manufacturers. Great start! We can verify that the technology is doing what the manufacturer intended will work for the person sitting in front of us. But how do we know? Validation is good, but until we verify what a person is hearing, we really don't know. When a person with hearing loss complains that they are not hearing well we need to listen to them.

First step – Verification

We cannot know how well a person is doing with technology without testing them. *Can you hear me? How does this sound?* Good basic questions, but without testing we really do not know. I cannot count the number of people with hearing loss who have said to me, "*I don't know what I am missing because I didn't hear it.*"

I am a really big fan of aided thresholds. They provide a lot of information about what to expect from speech perception. The goal is aided thresholds at 20-25 dB across the frequency range. If a person is not hearing high frequencies with technology, we can expect that she will have trouble hearing /s/, /sh/, /f/, /ch/, and voiced and voiceless /th/. This effects understanding of grammatical markers like possession, pluralization etc. So just seeing aided thresholds with poor high frequencies will tell the audiologist that technology settings should be adjusted to provide more high frequencies.

Testing speech perception with technology is critical if we really want to know how a person is hearing. We need to know how a person is hearing normal conversation, soft conversation, and how he or she is hearing in the presence of competing noise. In an ideal world, when there are no time limits to how long we can spend in testing, it would be great to fill in all the boxes in Table 1.

Table 1.

	Right Technology	Left Technology	Binaural Technology
50 dBHL			
35 dBHL			
50 dBHL +5 SNR			

It is essential that testing be performed right, left, and binaurally for normal conversation. If time is a problem, testing for soft speech and speech in noise can be performed in the binaural condition only. The reason it is critical to test each ear separately is to determine if the person hears equally well in both ears. If a person hears worse in one ear than the other, it gives us information about what we might change

in technology settings, as well as information about how to proceed with rehabilitation. It is the first clue that we need to provide assistance. For example, if a person has a speech perception score of 46% in one ear and 76% in the other ear, and if the aided thresholds tell us that he is hearing equally well in both ears, we know that we need rehabilitation to build skills in the poorer hearing ear and to improve overall performance. Without testing, we don't know.

When I do speech perception testing, in addition to recording whether the response was correct or incorrect, I record the errors. A total score is useful, but does not help you determine what needs to be fixed. I record perception errors and then look at a frequency allocation table to determine what frequency bands the person seems to be missing. That tells me how to adjust the technology settings. For example, if a person is misperceiving /s/, /f/, and /ch/, knowing that /s/ has energy 5000-6000 Hz, and that /f/ and /ch/ have energy at 4000-5000 Hz, helps me determine what to change in hearing aid or cochlear implant settings.

Learning to use technology – Step 2

A critical component of dispensing hearing technology is teaching our patients to use it. Teaching has to be two way – not just lecturing, but having a dialogue. Patients need to really understand how their technology works and know what they can do to improve listening. They need to be able to learn to recognize what situations are difficult and understand what actions they must take to improve outcomes.

Rehabilitation – Step 3

Who needs rehabilitation?

Rehabilitation cannot be successful if the child or adult is not hearing well. First, the audiologist needs to be sure that technology is performing as well as possible. The goal of aided thresholds is 20-25 dB. If a person is not hearing one or more of the frequency bands, no amount of rehabilitation will make him hear it. If you can't hear /s/, therapy will not make you hear it. It may teach you how to compensate, but it will not help you hear sounds you cannot hear. So, audiology first.

Children

Children with hearing loss need auditory-based therapy. They need it to help them develop language and to help them build their auditory skills. A listening and spoken language therapist can help a child build an auditory base, which can be used to learn spoken language and can build literacy skills. Children who develop good listening skills will be able to self-monitor their speech and correct it as they hear the speech of those around them. Even children with mild hearing losses are hearing things in a different way and will benefit from listening and spoken language therapy. They may not have as much difficulty as those with more severe hearing loss, but they are still missing things and need assistance. This is supported by looking at speech perception scores for soft speech and in competing noise.

We know that literacy is phonologically based. Children read by sounding out words. They need to know what a /b/ or /t/ sound like so they can pick it out when reading. If they cannot use phonics to learn to read they will have to learn words by sight, which will limit the number of words they know, and make it difficult to learn new words.

Every child, with any degree of hearing loss, should be referred to a listening and spoken language clinician or a speech-language pathologist who is skilled in an auditory-based approach to developing skills in children with hearing loss. Not only will he/she be able to develop skills in the child, but he/she will be able to help the audiologist know what the child is and is not hearing. Language skills should be monitored yearly to assure that the child is developing appropriately and to know if additional assistance is needed, and if so, when and how much.

Adults

Adults with acquired hearing loss may be able to "fill in the blanks" when they are not hearing high frequencies or other sounds because of their knowledge of language. However, it is a lot of work and is exhausting. Whatever we can do to improve a person's auditory skills will permit her to function more easily.

What is rehabilitation?

Who needs rehab? People who are getting excellent results with their technology may not need any additional rehabilitation. The technology may be enough. But what is "excellent"? By excellent, we mean speech perception in multiple conditions in each ear at 90% or better. For anyone, whose speech perception is not excellent, additional assistance should be considered.

All children need therapy. There are no children for whom therapy should not be considered. Every child with hearing

loss should be referred to a listening and spoken language therapist to evaluate language, speech, and auditory skills. Therapy is usually individual because training includes both improving language and developing language skills. Group therapy may be added to individual therapy to assist in teaching language skills, communication in small groups, turn taking, and other communication skills. For young children, therapy is primarily directed at teaching parents to be the primary providers of language and listening skills.

Therapy for adults is different. Hearing aid users report that hearing aids make things louder, but they don't always make things clear, especially in competing noise. Those who are not happy with hearing aids need additional rehabilitation. The goals of perceptual training include reducing listening difficulty, listening effort, and listening fatigue. Building auditory skills is primary, but some therapy includes building lip-reading skills and other communication strategies. Therapy can be individual, in small groups, or via telemedicine. In the past, some clinics offered small groups for new hearing aid users. The groups were designed to teach attendees various ways to improve listening in difficult listening situations, to allow them to practice in difficult listening situations, and to discuss ways to discuss their hearing needs with communication partners. Preminger and Lind (2012) have demonstrated that including communication partners in therapy groups improved performance.

What if we cannot adjust technology to provide good hearing?

Most audiologists, who are not involved in cochlear implant programs, do not know who should be referred for cochlear implant evaluation. When I was director of a cochlear implant center, most of the adults who came for cochlear implant evaluation reported that their hearing aid audiologists told them they were not candidates for cochlear implants. However, almost all of them were. Why? I think it is because the audiologists didn't know the current criteria. For adults with severe and profound hearing loss, using hearing aids is not easy. These patients are usually not satisfied with the performance of their hearing aids, so they are not the patients we all look forward to seeing. It stands to reason that if audiologists knew these patients would be better off with implants they would have referred them.

Criteria for cochlear implants can change quickly. Years ago, only patients who received no benefit from hearing aids were considered candidates. Implant criteria then included patients with profound hearing losses who received minimal gain from hearing aids, and then moved to include patients with severe hearing losses. As cochlear implants have improved, criteria have changed. Current research indicates that people who have severe or profound hearing loss will perform better with cochlear implants than they will with hearing aids. In fact, they will perform like patients with moderate hearing losses. (Leigh et al, 2011). Hybrid implants have been used for patients with good low frequency hearing for several years. Some clinics are now providing implants for patients with unilateral hearing loss.

So, what can we do to encourage more audiologists to refer more patients for cochlear implant evaluations?

Patients who are not doing well with hearing aids need additional help. Patients who do not have aided thresholds at 20-25 dB HL, and are not receiving speech perception scores of 70% or better, are not hearing well enough. They will not hear soft speech and they will have trouble hearing in noise. These patients need technology that will provide them with greater access. If we can adjust the hearing aids, or if we can provide them with different hearing aids that provide sufficient benefit, then they can proceed with hearing aids. But if not, cochlear implants should be considered. For patients who are receiving sufficient gain from hearing aids, but who have speech perception scores worse than 60%, referral for rehabilitation and for cochlear implant evaluation should be considered.

The changing role of audiology

Unfortunately, rehabilitation is no longer universally included in audiology training. Those of us educated in the 1960's and 1970's did have rehabilitation included in our

training. Many of us ran rehabilitation groups teaching lip-reading skills, auditory training, and counseling for individuals to better communicate with their families. Thankfully, a few programs continue to teach these important skills, such as the program at the University of Louisville, organized by Dr. Jill Preminger. When I was learning to run aural rehabilitation groups, hearing aids were not great. They were analog and had limited frequency range. As hearing aids improved, the need for therapy may have appeared to be less necessary.

Cost is certainly another consideration. It can be difficult to charge for rehabilitation. It may, or may not, be reimbursable by insurance, but even if it is covered, reimbursement may be limited for a variety of reasons, including the patient's age or coverage plan. Diagnostic audiology and hearing aid dispensing pay more. But, if we look at the number of people who do not consider getting hearing aids, even though they know they are not hearing well, and those who reject hearing aids after trying them, we know we are not doing a good job. Maybe we need to consider rethinking our role. ■

Jane R. Madell, Ph.D., *is an audiologist, speech-language pathologist, and listening and spoken language specialist Certified Auditory-Verbal Therapist. She has worked as a pediatric audiologist directing Speech and Hearing Programs and Cochlear Implant programs for 50 years. She can be reached at www.janemadell.com. and Jane@JaneMadell.com.*

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Leigh, J, Dettman, S, Dowell, R,k and Sarant, J (2011) Evidence-Based Approach for Making Cochlear Implant Recommendations for Infants and Residual Hearing; *Ear and Hearing, Vol 32, No. 1.*

Preminger and Lind, (2012) Assisting Communication Partners in the Setting of Treatment Goals: The Development of the Goal Sharing for Partners Strategy. Seminars in Hearing. 33, 1, 53-64.

HEAR AND NOW

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!

ADA
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The Original Unbundled Delivery: Auditory Prosthetic Devices

BY KIM CAVITT, Au.D.

Cochlear implants, auditory osseointegrated devices, and auditory brainstem devices have, technically, always been unbundled as the devices are purchased by the operating facility or, with an upgraded processor, directly through the manufacturer. Unlike a bundled hearing aid delivery, we, the audiologists, provide the care and service around the device but not the device itself.

So, how do audiologists provide the care and service needed to determine candidacy and provide programming, fitting and orientation, and long-term service, re-programming, troubleshooting, and service AND not lose money doing it? There is a path to fairly monetizing an auditory prosthetic device program, while providing the expertise and care these patients want and need by more accessible means. It just requires some groundwork.

Like all good unbundling projects, it starts with data and knowledge. What is your breakeven plus profit per hour? What is your clinic protocol for candidacy, initial activation, and follow-up? How much time do you spend in these appointments? What codes do you use to represent these visits? You need this data and information to create your pricing structure. Patients, both implanted and prospective, need be informed of this structure and their financial responsibilities within it at scheduling and as part of the candidacy process.

See, much of the auditory prosthetic device activation, delivery, fitting, and management is private pay. CPT codes and coverage exist to cover most, but not all, of the candidacy determination process for auditory prosthetic devices. The CPT codes such as 92538, 92557, 92550, 92584, 92585, 92587/8 are medically necessary and covered services for most payers, including Medicare, for auditory prosthetic device candidacy assessments. The only legitimate use of 92626/7 for third-party coverage is to represent the candidacy assessments (or post-implantation testing such as AZ Bio, MAC, HINT, speech in noise, WIN, etc.) for auditory prosthetic devices performed in the best aided condition. Other services though, such as evaluation and management procedures (99201-99203 and 99211-99213; as allowed by state scope of practice and appropriate use and documentation) and team meetings (99366 and 99368) would typically be the financial responsibility of the patient or their guardian.

Cochlear implants have coverage (via 92601 and 92603) for the costs of initial activation (the programming of the device) but this code does not encompass the time and skill required for orientation (use and care of the coils, cables, processors or batteries) or the often necessary aural rehabilitation or auditory training (92630 or 92633). As there is no code to represent cochlear implant fitting and orientation,

92700 is the most appropriate option. Third-party coverage for 92700 and 92630 or 92633 are extremely limited. As a result, the patient or their guardian is typically responsible for these costs. This holds true as well for the long-term management (follow-up, troubleshooting and service) of a cochlear implant. While third-party payers allow for coverage of re-programming (92602 and 92604), follow-up soundfield testing of 31 minutes or more (92626), neurotelemetry (92584) and eSRT (92568), they do not have a code to represent follow-up care or service. Again, this makes 92700 the most appropriate choice.

Unlike cochlear implants, auditory osseointegrated devices do not have codes to represent the programming, fitting or orientation to the device. Again, as a result, 92700 is the most appropriate code and, as often noted, third-party coverage is rare. In most cases, all of the costs associated with the initial and long-term management (follow-up, initial and re-programming, fitting, orientation, troubleshooting and service) of an osseointegrated device is the financial responsibility of the patient or their guardian.

Patients should be notified of these out of pocket costs at scheduling and, for new potential implantees, during the candidacy process. Patients should complete, prior to services being rendered, all appropriate notices of non-coverage (advanced beneficiary notice for traditional Medicare, organization pre-determination for Medicare Part C/Advantage and notices of non-coverage for Medicaid and private third-party payers). They should also pay the costs of all non-covered services (such as any service that is represented by 92700, aural rehabilitation, evaluation and management codes, team meetings, etc.) at the time of visit.

Some bi-modal patients may have coverage for the hearing aid that aids their non-implanted ear. The costs of the procurement, fitting and care of these devices should follow your typical hearing aid delivery model, insurance process and pricing structure.

All of the device manufacturers offer wonderful provider training and resources and customer support related to insurance as well as the order, repair and shipment of replacement batteries, coils or processors. They also can assist the patient in obtaining desired or needed processor upgrades.

Cochlear: https://www.cochlear.com/us/recipients

Advanced Bionics: https://advancedbionics.com/content/advancedbionics/us/en/home/support.html

Med-El: http://www.medel.com/us/user-support-us/

Oticon Medical: https://www.oticonmedical.com/us/bone-conduction/new-to-bone-conduction/getting-a-ponto/insurance-support

Offering auditory prosthetic device services can be a real differentiator for your practice. It can lead to increased physician and hearing health provider referrals, increased exposure, and increased options and satisfaction for the patients you serve. There is still a significant need for these services in many communities, especially those in more suburban and rural locations that are farther away from many current implant centers. The keys to success are creating a standard pricing and delivery structure, standard appointment types, appropriate notification forms, and materials that allow you and your staff to explain your program to patients and families. Price transparency, setting realistic expectations and the delivery of evidence-based care will help your program grow and thrive.

ADA members may contact me free of charge at Kim.Cavitt@audiologyresources.com with specific reimbursement questions. ■

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.*

HAVE YOU HEARD?

ADA Seeks Volunteers to Establish and Facilitate Mastermind Groups

If two heads are better than one, then 8-10 can move mountains! With that in mind, ADA is pleased to announce the formation of Mastermind peer mentoring and problem-solving groups. The Mastermind Group concept was originally introduced by author Napoleon Hill in the early 20th Century.

ADA Mastermind groups will be comprised of 8-10 non-competing audiologists who share similar goals and interests. Groups will meet bi-monthly. ADA members only.

While it is ADA's pleasure to host the Mastermind groups through its GotoMeeting platform, the groups will have complete autonomy in terms of discussion topics. Meeting discussions will be private and confidential to each group.

Please contact Stephanie Czuhajewski at sczuhajewski@audiologist.org for more information and to volunteer as an ADA Mastermind committee member and/or group facilitator. Information about participating in an ADA Mastermind group will be released in the coming weeks. Special thanks to Dr. Liz Rogers and Dr. Chrissy Lemley for bringing this idea forward!

Register for the Audiology Project Webinar: Diabetes and Audiological Monitoring of Ototoxic/ Vestibulotoxic Medications, to be Held on Tuesday, June 26th, at Noon Eastern

There are at least 59 prescription medications (including oral and injectables) for patients with diabetes that have auditory, vestibular, and/or cognitive side effects. Not knowing which medications have these side effects could lead to inappropriate recommendations thus leading to management errors.

This webinar will review the signs and symptoms of hearing loss in adults and discuss who is considered "at risk." There will also be a review of the diabetes medications that could cause any one, or all, of these side effects. The program continues with a discussion about the importance of audiometric testing for Type II diabetes patients as well as for patients who might be "at risk" for diabetes.

We will discuss preferred websites for obtaining reliable, up-to-date drug information (including side effects). Suggestions for improved communication strategies between the referring physician, the patient, and their pharmacist will be given.

Presenters: Robert M. DiSogra, AuD, FAAA and Michelle B McElhannon, PharmD, CDE

Date: Tuesday, June 26, 2018

Time: 12:30-1:30 p.m. Eastern Time

Visit **www.audiologist.org** for more information.

This webinar is presented by The Audiology Project and proudly sponsored by the Academy of Doctors of Audiology.

ADA is approved by the American Academy of Audiology to offer Academy CEUs for this activity. The program is worth a maximum of 0.1 CEUs. Academy approval of this continuing education activity is based on course content only and does not imply endorsement of course content, specific products, or clinical procedure, or adherence of the event to the Academy's Code of Ethics. Any views that are presented are those of the presenter/CE Provider and not necessarily of the American Academy of Audiology.

AMERICAN ACADEMY OF AUDIOLOGY Continuing Education in Audiology ™

Miss one of the previous Audiology Project webinar sessions? View them anytime for CE credit:

1. PPOD and Audiology, a National Diabetes Program
2. Diabetes Educators and Audiology: Improving Patient Outcomes
3. Dizziness Vertigo and Falls in Persons with Diabetes

▶ 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.

AuDacity 2018 is Bolder than Ever!

Audiologists are choosing bold new directions, paving the way to the future of the profession.

Join us October 22-24, 2018 at the Gaylord Palms Resort in Orlando, Florida to chart your course to success.

AuDacity 2018 begins on Monday, October 22nd with a Symposium on Managing Co-Morbidities, led by Dr. Victor Bray. This important symposium will feature 6 hours of programming on topics including a review of systems, documentation, and several interdisciplinary case studies.

On Tuesday, branding expert Lia James will guide attendees through a special interactive general session course on Building the Audiology Brand! Use her techniques to ensure that your practice stands out from the rest! Informative concurrent session options abound—explore didactic and experiential sessions on relevant professional and clinical topics including reimbursement, marketing, tinnitus, hearables, and much more!

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Bold Keynote Presentations Scheduled for AuDacity 2018

General Mark P. Hertling (ret.)

Lt. General Mark P. Hertling, U.S. Army (Retired) and Senior Vice President, Florida Hospital

Prior to joining Florida Hospital, Mark served for almost four decades in the U.S. Army; at the time of his retirement, he was Commanding General of U.S. Army Europe, where he led over 60,000 soldiers, cared for over 100,000 family members, and partnered with the armies of 50 countries. Mark was appointed by President Obama to be one of 25 members of the President's Council on Fitness, Sport and Nutrition. He also serves as a military analyst for CNN. Mark speaks and acts passionately on the subjects of leadership, national security, and health trends.

Dan Price

Dan Price, Founder and CEO, Gravity Payments

Dan is widely known for setting a $70k minimum wage at Gravity Payments, a small step in his goal to be a speck in a revolution where business is about purpose, not profit. Dan's mission is to create a world where values-based companies reshape the economy, so business stops being about making the most money possible. Instead, he wants leaders to recognize that business should be about purpose, service, and making a difference. Dan believes it's not about doing business as usual anymore, and instead, doing business better.

REGISTER NOW! **Visit audiologist.org/2018 to register. Early rate ends September 22.**

Contact info@audiologist.org with questions.

AuDacity 2018 Schedule

MONDAY, OCTOBER 22, 2018				
CO-MORBIDITIES SYMPOSIUM: Co-Morbidities Overview - 8:00 AM - 9:30 AM - Victor Bray, Ph.D.				
CO-MORBIDITIES SYMPOSIUM: Documenting Co-Morbidities - 10:00 AM - 11:30 AM				
CO-MORBIDITIES SYMPOSIUM: Healthcare Provider Collaboration on Co-Morbidities - 1:00 PM - 2:30 PM				
CO-MORBIDITIES SYMPOSIUM: Co-Morbidities Case Studies - 3:00 PM - 4:30 PM				
The Ins and Outs of Practice Accreditation - 4:30 PM - 5:30 PM - Angela Morris, Au.D.				
OPENING EVENT IN EXHIBIT HALL - 5:30 PM - 8:00 PM				
TUESDAY, OCTOBER 23, 2018				
BREAKFAST IN THE EXHIBIT HALL - 7:00 AM - 8:00 AM				
Welcome & President's Address - 8:00 AM - 8:30 AM - Alicia Spoor, Au.D.				
KEYNOTE PRESENTATION: Growing Healthcare Leaders – Empowerment to Improve Healthcare - 8:30 AM - 9:30 AM - Lt. General Mark P. Hertling, U.S. Army (Retired)				
GENERAL SESSION - 10:00 AM - 11:30 AM - Presented by CareCredit				
LUNCH in the EXHIBIT HALL - 11:30 AM - 1:00 PM				
INTERACTIVE SESSION: Building the Audiology Brand - 1:00 PM - 2:30 PM - Lia James				
KEYNOTE PRESENTATION: What I Learned From Setting a $70,000 Minimum Wage - 3:00 PM - 4:30 PM - Dan Price, CEO Gravity Payments				
FINAL RECEPTION IN EXHIBIT HALL - 5:00 PM - 6:30 PM				
WEDNESDAY, OCTOBER 24, 2018				
MEMBER BREAKFAST - 7:00 AM - 8:00 AM				
8:00 AM - 9:30 AM	**Physician Marketing** Thomas Tedeschi, Au.D.	**The End of Business as Usual: Three Tangible Skills for Long-term Success in Audiology** Brian Taylor, Au.D.	**Marketing Tinnitus Specialty Care to Grow Your Practice** LaGuinn Sherlock, Au.D. Torryn Brazell, MS, CAE	**EARLY CAREER PROFESSIONALS TRACK: Rapid Fire Sessions**
9:45 AM - 11:15 AM	**The Good, the Bad and the Ugly: Externs and Private Practice** Patricia Gaffney, Au.D. Alyssa Needleman, Au.D.	**Positioning Professional Care Value Through Innovative Practice Strategies** David Smriga, M.A. Gregory Frazer, Au.D. Dale Thorstad	**Streamline Tinnitus Treatment in Your Busy Practice** Natan Bauman, Ed.D.	**EARLY CAREER PROFESSIONALS TRACK: Hiring and Managing a Team**
LUNCH AND BUSINESS PLAN COMPETITION - 11:15 AM - 1:00 PM				
1:00 PM - 2:00 PM	**Expanding the Patient Journey (and the Practice) with Hearables** H. Christopher Schweitzer, Ph.D. Mark Kaal	**Threat Hunting OTCs (Part 1)** Jacqueline Scholl, Au.D.	**Optimizing Third-Party Reimbursements** Deb Abel, Au.D.	**EARLY CAREER PROFESSIONALS TRACK: Negotiating Skills** Lia James
2:15 PM - 3:15 PM	**Telehealth: Shifting the Paradigm to Improve Access to Care** Dan Quall, Au.D.	**Threat Hunting OTCs (Part 2)** Jacqueline Scholl, Au.D.	**What the Future Holds for Practice Ownership** Craig Castelli and Panel	**EARLY CAREER PROFESSIONALS TRACK: Buying a Practice** Craig Castelli
3:30 PM - 4:30 PM	**Practice Trends: Hearing Health Care or Consumer Electronics?** Amyn Amlani, Ph.D.	**Threat Hunting OTCs (Part 3)** Jacqueline Scholl, Au.D.	**The Future of Digital Marketing & Local Search to Generate Quality Leads** Gaetano Pizzi	**EARLY CAREER PROFESSIONALS TRACK: Billing and Coding** Deb Abel, Au.D.

Establish a Good Foundation with Early Career Professional Programming

ADA's Early Career Professionals (ECP) Committee members have been hard at work developing programming for peers and colleagues. The ECP Committee invites early career professionals to attend a special 6-hour ECP Track to be held on Wednesday, October 24, 2018 during the AuDacity Conference. The track will feature a rapid-fire, multi-faceted clinical session, as well as presentations on negotiation, hiring and managing a team, billing and coding, and steps to buying and/or partnering in a private practice.

ADA is pleased to extend a $100 discount of the registration rate for early career professionals (graduating 2009 or later). Please select the ECP rate at registration. Please visit http://www.audiologist.org/conference/audacity-2018-event-schedule for more information.

INSIGHTS FROM THE OUTSIDE

Use Your Practice Environment to Engage, Educate, Empower and Enable Patients/Clients

Insights from the Outside is a diverse group of practicing clinicians and practice owners from many medical specialties including dentistry, veterinary medicine, cosmetic surgery, ophthalmology, audiology and optometry. This group was uniquely created by CareCredit for the purpose of capturing and sharing "best practices" to some of the common challenges all healthcare business owners face such as attracting new patients, the patient experience, patient retention, social media, team training and empowerment.

In this article, Dr. Kathy Wentworth, owner of PetPoint Medical Center and Resort, Nola Aronson, M.A., CCCC-A, owner of Advanced Audiology and Dr. Howard Ong, owner of Seal Beach Dentistry, discuss best practices when it comes to creating an environment that engages, educates, empowers and enables patients to get the care they need and want.

DR. WENTWORTH The practice environment is a big part of people's perception of who you are, what you do, how well you do it and what they can expect while in your office. It's a reflection of your personality and brand, but it is created from the perspective of clients – what they want and need to trust you to take care of their family, which in our case is their pet. In veterinary medicine, illness and injuries to pets are often unexpected and can be extremely emotional and stressful for the owners. So, we know we will be able to accomplish better examinations, diagnostics and treatment if the client and patient (pet) are at ease. We practice the Fear-Free philosophy - which encourages a more calming atmosphere, even if there is a stressful medical concern. If clients are more relaxed, they can better understand what our goals are for treatment of their pets, and they will be more inclined to trust our recommendations. First impressions count because a good experience with the first visit will make clients more likely to follow through with recommendations, come back for another reason, and tell their friends about your practice.

MS. ARONSON I agree. If you don't make a good first impression, the person is less likely to be open and communicative with you and your team. If communication is not free-flowing, then chances are, you're not going to be able to help that patient because they won't share their goals, wants, needs and desires. Our philosophy is give more than expected. Exchange in abundance. We pride ourselves in treating our patients as family. From the moment they walk in our door, we have designed an environment that is so warm and welcoming, patients feel like they are walking into a friend's living room. As our guests, we offer coffee and treats and make them feel at home. Our goal is to give patients a sense of relaxation and trust. Often, the person with the hearing loss is not as excited to own their problem – or find a solution – as their significant other or spouse is. So, creating a warm, welcoming, relaxing first impression is important.

DR. ONG First impressions definitely matter in healthcare because it allows patients to give practitioners permission to explore their concerns, needs, treatment, etc. Permission is vital as we are exploring treatment with patients instead of telling patients what they should do. In our practice, the environment is defined by our culture and it is the most important part of our business. It is the starting point of patient experience, treatment acceptance, trust, etc. In fact, our culture is our brand. Our practice environment is our brand.

So we created the environment in our practice to focus on establishing and sustaining relationships by welcoming patients as if they were guests in our home. As guests, we are fortunate they have accepted our invitation, and while they are in our office its not about us - it's about them. Our practice environment promotes a stewardship mentality. This service mindset lowers the wall of trust and opens the door to high case acceptance. It takes collaboration of all team members.

MS. ARONSON It's definitely a team effort. My brand is represented by a heart - because it's all about caring. Through every facet of our environment and patient experience, we want patients to know we love to help them hear. We know it's a quality of life issue and if we can help patients hear, they will live more connected, vibrant lives. So my team is trained to listen, not just hear. We want the patient to share with us not just that they want to hear better, but the "why" they want to hear better. This is the real reason they are at our practice. Then it's our job to give solutions based on our understandings. So, when we designed our practice and our patient's experience, we started from the heart – to meet our patient's physical, emotional and hearing health needs.

DR. WENTWORTH We also purposefully designed the interior to meet the needs of clients and their pets. We started out in the parking lot and worked our way in. Every aspect was designed to communicate to clients that we care and want to make their experience fear free. As you drive into the parking lot, we have a sign that immediately lets clients know they are entering a place of care.

As we deal with many different sizes and species of animals, we have implemented different examination rooms to accommodate them. For example, we have cat-only examination room with feline pheromones, a cat tree and a cubby to hide in. We have a large dog room (big enough for three Great Danes and a family!) and a solar-lighted resort center for pocket pets (like bunnies and guinea pigs). We have a nutrition center and a resort and salon for wellness needs. We purposefully appeal to all senses to help create an overall impression of peace and calm. We have calming Zen colors, fresh flowers, large windows and no clutter present. We play light music and have a soothing waterwall. We keep our hospital clean (huge effort in an animal practice) so it smells nice and all of our furniture is comfortable and inviting, with plenty of space to avoid feeling crowded. We have an espresso bar, and a refrigerator full of juices and flavored water. People feel special and can relax while we take care of their pets.

DR. ONG For us, our brand is about human connections and relationships. In our practice, we display pictures of our events, from attendance at continuing education courses, community and family events or celebrations, to our famous Christmas parties. It shows we are just as authentic as our patients. We are a healthcare family treating your family. We, too, believe a big part of our "practice environment" is our team. And so we work hard and train hard to be advocates of their care. We encourage our team to ask questions to engage patients and explore their treatment options. Over a well-appointed office decor or soothing music or sounds, just visiting and being human with our patients fulfills their essential needs and, believe it or not, exceeds most patients' expectations.

Education is also one of the core values of our brand. Our practice learns together, meaning if we want to better educate patients or implement services in our practice, most if not all principals attend education courses. The practice educates by making the whole team accountable about treatment we offer. Our reception area is peaceful, with subtle messaging of services offered and literature of partners like CareCredit. It is a quiet time before treatment so we offer fresh water and coffee and WiFi.

MS. ARONSON We also strongly believe an educated patient can make the best decisions. So, we have educational videos in the reception area instead of using it as a television. Our job is not to entertain patients, but to educate and empower them. We also have CareCredit materials in our reception area, because after patients are educated and empowered, we want to enable them to get the hearing care they want..

DR. WENTWORTH This is definitely a best practice for most healthcare offices. In our reception area we have specifically implemented digital media to educate our clients about services and our practice. In our examination rooms we have a large digital whiteboard with interactive games, informative pictures and brochures, and medical illustrations. And, we also want to enable patients. So like the others, we educate clients on the availability of CareCredit as a financing option. As a Fear-Free practice, we don't want the cost of our services to be another cause for concern or worry for our clients. The bottom line is to create a place that makes people want to come back, and tell all of their friends about their positive experience.

MS. ARONSON I couldn't agree more. Every detail counts because what one patient finds exceptional may not be what matters to the next. So take time to objectively look at your practice and make sure it's the place you'd want your family to go for care, a team you'd want to help you and an environment that looks, smells, sounds, feels and even tastes welcoming and warm.

DR. ONG And honestly, when it comes to the environment, it's nice to have all the little extras that we've talked about, but the lasting impression is often made by the team. So make sure your team has embraced your practice culture, are empowered to be a physical representation of your brand and are advocates for your patients' health. ■

Continued from page 5

my colleague had strong connections to one of the (three) cochlear manufacturers and the neuro-otologists in Maryland. The initial connection was made from the manufacturer and often took two or more weeks before any additional information was relayed back to me. All three surgical sites eventually agreed to a business meeting dinner, in-person, and/or phone interview to further discuss the relationship with my private practice. After these meetings, everyone was comfortable, and the relationship moved forward. Protocols were discussed, communication was cemented, and preferences were all determined. Once the relationship with the surgeon was established by one cochlear implant manufacturer, another manufacturer came to me to ask if I would be willing to join their provider network. This was an easy addition, as the protocols are the same; learning another software system and obtaining the equipment was as easy as adding another hearing aid company. With two cochlear implant manufacturers offered at the office, I then lobbied the third cochlear implant manufacturer to obtain their equipment and software. The last company was difficult to obtain, as I had to convince the local representative that private practices could complete the candidacy criteria, active, and follow-up care for years to come. Reluctantly, the company agreed (perhaps from concern that they would not have any new users) and all three relationships were cemented.

A PERSONAL STORY

As a fourth-year extern, I was introduced to all three cochlear implant manufacturers and the complete process at the Mayo Clinic Arizona. My education did not adequately prepare me for cochlear implants, but the hands-on training prepared me to integrate them in a private practice.

My first cochlear implant patient found me through my practice website. She had been evaluated at another private practice office and was not happy with the (lack of) options presented to her. With a progressive, bilateral hearing loss and limited hearing aid benefit, she had been through all of the candidacy testing and knew she was a candidate. However, the initial practice only offered her one cochlear implant surgeon and one manufacturer. Being younger than 40 years, she knew there were more options in the Washington, DC/Baltimore area and three cochlear implant manufacturers. Presenting to my office, the initial appointment mainly consisted of counseling, presenting device options, and explaining surgical sites. After making her decision to move forward with implantation and staying with the practice, she was scheduled for a head scan and required information was sent to the surgeon's office. Another appointment was completed to finalize the manufacturer and pick sound processors (the surgeons and clinics in the area are a two-processor clinic), colors, cable lengths, and accessories. Additionally, the patient upgraded her opposite ear's hearing aid and obtained new earmolds. Two weeks after surgery, with the medical follow-up appointment completed, the patient was seen for activation. She presented with her family member and the session was videotaped, at her request. Activation of an adult is just as fun, emotional, and rewarding as a child/infant. At one month, testing was completed to start measuring the pre- and post-candidacy improvement. Testing and mapping appointments are completed using the evidenced-based protocols by Renee Gifford, Ph.D.[5] and continue to be an improvement from the hearing aid benefit. The patient is so happy with her outcome to date, that she scheduled her opposite ear for implantation later this year.

CONCLUSION

While no cochlear implant patient (or their support system) is "typical," the above story shows how cochlear implants can help private practices and patients. Payment is received, either through reimbursement from insurance or via private pay (depending on the procedure and coverage) making it a profitable service. Additionally, the relationship with area surgeons has helped provide more than cochlear implant referrals to the office and afforded all patients another option for medical management, when needed, without any threat that the patient will not return. After implementing cochlear implants, auditory osseointegrated devices (e.g. BAHA) is next! ■

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COCHLEAR IMPLANTS: WHAT YOU NEED TO KNOW TODAY

Continued from page 29

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AUDITORY BRAIN TRAINING & ADULTS WHO USE COCHLEAR IMPLANTS

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