www.safeinsound.us

Our New (Financial) Reality

The Academy is facing an unprecedented reality for the new fiscal year beginning July 1 (ending June 30, 2011). Like most not-for-profit organizations, the economic downturn continues to affect our financial landscape. The evolving ethics discussion in the health-care arena has necessitated additional budget adjustments for the Academy. Providing previously sponsored items at Academy expense, e.g., lanyards at AudiologyNOW!®, has decreased sponsorship revenue and increased expenses. The seven percent decrease in total revenue (since FY08) recently meant tough decisions for the Board of Directors recently in order to approve a balanced budget for FY11.

On a more positive note, projections indicate that FY10's financials (fiscal year ended June 30) could fall safely in the black. This is due in part to proactive measures spearheaded by Treasurer Gary Jacobson, PhD. Three months into FY10, Dr. Jacobson and the Finance Committee requested that I work with senior management to identify yet another round of expenses to cut from the already board-approved FY10 budget. Here are a couple of creative solutions from staff: instead of purchasing stock photography, the communications staff worked with NIDCD to develop a photo shoot of audiologists in action. Since NIDCD retained the credit for each photo, they provided the facilities and photography complimentary. The Academy came away from the partnership with a great assortment of photographs for use in our publications at no cost to the Academy. Additionally, several creative ideas were suggested by the meetings staff without compromising the AudiologyNOW! 2010 experience, e.g., bringing the production of *ProgramNOW!* in house.

To help navigate this new reality, the board is using a tool called the Academy Dashboard, which was just launched this year. A best practice from the association management profession, the dashboard is developed quarterly by our professional staff and provides relevant metrics on key Academy programs/initiatives. Each item is identified with a

- Green dot (on target),
- Yellow dot (lagging behind target), or
- Red dot (at risk).

This tool creates the opportunity for the board to make informed decisions, based on the succinct presentation of key indicators.

It is a board's fiduciary responsibility to keep the organization viable, and the Academy board is no exception. Remaining resilient through these tough times takes strong leadership committed to the mission and vision of the organization. Know that the Academy's board take their responsibility as financial stewards seriously, and are fully engaged to this end.

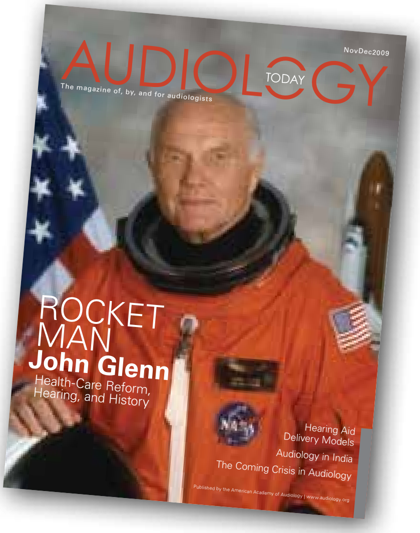
Cheryl Kreider Carey, CAE
Executive Director
American Academy of Audiology

Rising Above the Fray?

Editors are expected to provide editorial comments: Responses to issues or articles with clinical assessment or treatment methods appropriately provide adequate fodder for editorial pieces. The Letters to the Editor section in *Audiology Today* (*AT*) has historically been reserved for readers to submit their opinions about author's articles and for those authors to respond to readers interested in their work—positively or negatively. Referencing the letter to the editor by Fred Rahe, AuD, in the Nov/Dec 2009 issue of *AT*, perhaps the term "academic elite" touched a personal nerve such that Dr. Fabry was unable to appropriately remain above the fray in his role as content editor. I did not consider Dr. Rahe's use of the term "academic elite" to mean anything but a reference to a group rather than a specific individual. The content editor's need to defend Dr. Palmer's positions immediately brings an appropriate question—why is Dr. Palmer not writing her own response to Dr. Rahe's comments? As an avid reader of Letters to the Editor, I have enjoyed comments by readers and responses by authors since *AT* began the this section. I do not recall an issue wherein an editor responded in a manner similar to the recent response to Dr. Rahe by the content editor.

Although it might be considered gallant to spring to the defense of a friend and colleague, I am sure the readership-at-large of *AT* would much rather hear from the author of the article responding to reader's comments and concerns. Perhaps it is time for the content editor to rise above the fray and let the players play.

Robert G. Glaser, PhD



EDITOR'S RESPONSE

Thank you for your letter regarding this article, which provided very stimulating "water cooler" discussion for many audiologists. Consistent with her evidence-based perspective on the topic, Dr. Palmer felt that there was nothing to add beyond what she stated in the article and declined to respond. As content editor, I apologize if it appeared as though Dr. Palmer was not offered that opportunity, or that I was "putting words in her mouth."

David Fabry, PhD
Content Editor, Audiology Today
dfabry@audiology.org

Using Newsletters to Stay in Touch

A newsletter is a wonderful way to distribute information to your existing patient base and an excellent way to reach out and market to prospective patients and other professionals regarding the services and products that you provide. A newsletter can be a beneficial and cost-effective investment for your business or organization. Whether you're using a newsletter to boost sales and referrals or to educate readers, you should expect a payback that offsets the costs of publishing and distributing the newsletter.

The payback may be easy to quantify, such as an increase in sales or referrals, or the benefits may be more difficult to measure but equally important, such as increased patient confidence. In either case, a newsletter should generate a return on investment that is worth the cost and time to produce it.

A newsletter can focus the reader on useful or new information, but the goal is to generate results. Articles should be chosen for their ability to attract interest in new products or services or provide answers to frequently asked questions. A newsletter is also a way to advertise any specials, promotions, or seminars that you may be offering in the near future.

Bigger isn't necessarily better. A four-page, 8.5-by-11-inch newsletter is by far the most popular format. However, many companies, especially small practices with limited resources, may not need that much space for their newsletter. Newsletters that fill pages with generic "filler" items such as recipes and famous quotations may be bulky but not effective. Small newsletters, even as little as a page or two, can be just as effective in relaying important and interesting information to your readers. Topics can include information on the latest research, updates on new technology, attendance at conventions or educational programs, new hours, or personal information on staff members.

Newsletters can be created monthly, quarterly, or annually. A quarterly newsletter can provide patients with updated information and yet not require a daunting time commitment. However, some audiologists find it helpful to send shorter, monthly newsletters to keep in touch with their patients. The newsletter can be created using simple software such as Microsoft Publisher, or in some cases, it may be more cost-effective to enlist the services of an outsider to create and publish the newsletter.

In addition to creating the newsletter, accessing your patient database is essential. You may want to send different newsletters to different segments of your patient base. For instance, you may not want to send a newsletter that contains information on a new technology to patients who purchased new aids within the past few months. Or you may want to produce a newsletter for your pediatric patients. The purpose is to keep your patients connected to you and your organization and to let them know that you are keeping abreast of the latest technological and clinical developments.

Ideas for Newsletter Topics

- Hunters and Hearing Loss
- Are Two Hearing Aids Better Than One?
- Nine Out of Ten Consumers Say Hearing Aids Improve Quality of Life
- Open-Ear Hearing Aids: Discreet and Comfortable to Wear
- Bluetooth? What Is It?
- Patient's Perspective
- My Ringing Ears
- Keeping Your Hearing Aids Dry
- Using Good Communication Strategies
- Custom Ear Molds Are Available for a Wide Range of Applications

Starting a Web Site for Your Practice

With increasing numbers of consumers engaged in online commerce, audiology practices need to have an Internet presence and a Web site that will captivate and cultivate business. Not all audiologists or patients are computer savvy, but as the Internet grows in popularity as an avenue for business, having a Web site related to audiology practice has increasingly become a measure of credibility and information for the consuming public, not to mention a powerful marketing tool and source of referrals to expand your patient base.

When you have your own Web site, you have control over the content. This means you can do everything possible to maximize your site for organic search engine optimization. Creativity is helpful in designing a Web site that will hold visitors' attention and cause them to return for future visits. You may decide to share some personal details of your life, such as your background and how your unique qualities contribute to the business. Including photos or interesting facets of the business may also be of interest to current and prospective patients. What you chose to include in your Web site will, in part, depend on the message you are trying to convey. Most important, you will want the Web site to be creative and original enough to set you apart from your competition.

The first step to building a Web site is to do some basic research on Web site creation by professionals specializing in this marketing arena. Doing it yourself may be possible for some—there are plenty of articles and Web sites available for the daring and creative. However, for those who need additional expertise in design and implementation, Web site development services can prove invaluable in creating a Web site that will captivate visitors. When consulting with these companies about creating your unique site, keep the following in mind:

- Be sure you have a clear understanding about initial design costs and monthly fees to maintain the Web site. Software is available that can make it easy to perform your own monthly maintenance and updates to the Web site.
- Get references of other Web sites the company has created and take time to look them up to get an idea of its previous work.
- Determine how many pages are included in the original package and what's involved in terms of cost and man-hours for updating your site.
- Have photographs of your office and staff ready to provide to the designer. Limit the number of photographs as they will increase the time to load the site.
- Include information that highlights the personal nature, not the size, of your audiology practice. Show how the products or services that you provide have benefited your patients. You may even want to include a page for patient testimonials.
- Remember the basics—your company's name, logo, address, and telephone number should be easy to find, and they should appear on each page of the Web site.
- Check to be certain that preferred keywords such as audiology and hearing aids appear on your home page. This will help ensure that your site is easy for patients to find.
- Make sure the Web site will be identified by all of the major search engines.
- Be sure the text offers concise, easy-to-understand information about what your practice offers. Use visuals to draw visitors in, but don't confuse them with too many words or flashy pictures.
- Personalize your site with links to local and state programs of interest to your patients and links to organizations that may provide more information on hearing loss.
- Ask for a mechanism to track hits on your site. Like all marketing efforts, tracking your Web site's activity will help you determine its usefulness and help justify the cost.

Once the creative portion of the Web site has been completed, you will want to make certain that the finished product is attractive, offers information that is appealing to visitors, and is easy to navigate. However, the job isn't finished because a good Web site requires continual maintenance.

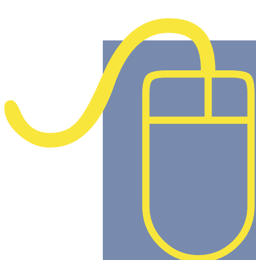
Businesses and organizations, whether large or small, need to regularly monitor Web site performance to ensure that opportunities that become available are utilized. Improvements in technology occur constantly. Although Web site development has certainly been simplified, the marketing challenge has become greater as more organizations have recognized the importance of Web marketing and competition has exploded.

Having an effective Web site can be a cost-effective and easy way to advertise an audiology practice. It is not a coincidence that more and more patients are doing business on the Web. Maybe now is the time to reach out to a Web site developer and get more information on how the Web can work for you and your audiology practice.

These two short articles are reprinted from the Academy's book, The BEST Guide to Marketing for Audiologists, *edited by Gyl A. Kasewurm, AuD, and the BEST Committee. The book is available through the Academy Store: www.audiology.org/Pages/store.aspx.*

If you have a practice management success story, experience, or idea that you would like to share in an article, send your idea to David Fabry, PhD, content editor for AT, at dfabry@audiology.org.

Illustrations by Johanna van der Sterre.



Also of Interest

A variety of practice management resources, including articles, photos, and sample forms, are available on the Academy's Web site.

Log in to www.audiology.org and search key words "resources & tools."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AMERICAN ACADEMY OF AUDIOLOGY

JULY

15

Have an *AT* article idea?

Send a summary of your idea to David Fabry, PhD, at dfabry@audiology.org.

21

eAudiology Web Seminar—Hearing Aid Reality Check (.2 CEUs)

1:00–3:00 pm ET

www.eaudiology.org

26

Call for Submissions Deadline—Society for Ear, Nose, and Throat Advances in Children (SENTAC) Meeting

www.sentac.org

AUGUST

4

***Audiology Today Enews*, don't miss it in your e-mail every first Wednesday of the month.**

18

eAudiology Web Seminar—Aging and Speech Understanding in Complex Environments (Tier 1) (.3 CEUs)

1:00–4:00 pm ET

www.eaudiology.org

25

Prepare to Celebrate…October Is National Audiology Awareness Month. Visit the Academy's Web site and download resources, tools, and marketing materials.

www.audiology.org/resources/consumer/audiologyawareness

Career and Externship Opportunities Await

Post your rèsumè and search job postings on HEARCareers, the Academy's year-round resource for jobs in audiology. The Academy also offers the Externship Registry, the Academy's site for clinical audiology externships, providing a broad range of clinical experiences with a variety of patient populations.

For more information, visit www.audiology.org and search key words "employment" and "externship."

HIV/AIDS-Related Communication, Hearing, and Swallowing Disorders: Interview with De Wet Swanepoel, PhD

Dr. Swanepoel discusses co-editing his book, *HIV/AIDS-Related Communication, Hearing and Swallowing Disorders*.

Programming Cochlear Implants: Interview with Jace Wolfe, PhD

Dr. Wolfe discusses co-authoring his book, *Programming Cochlear Implants*, FM and Bluetooth, binaural hearing, bilateral cochlear implants, adult and pediatric criteria, and more.

Strategic Practice Management: Interview with Robert G. Glaser, PhD

Dr. Glaser discusses his book, *Strategic Practice Management*, as well as bank loans, business plans, pricing, and more.

Visit www.audiology.org/news and review the latest interviews.

Wind-Turbine NOISE

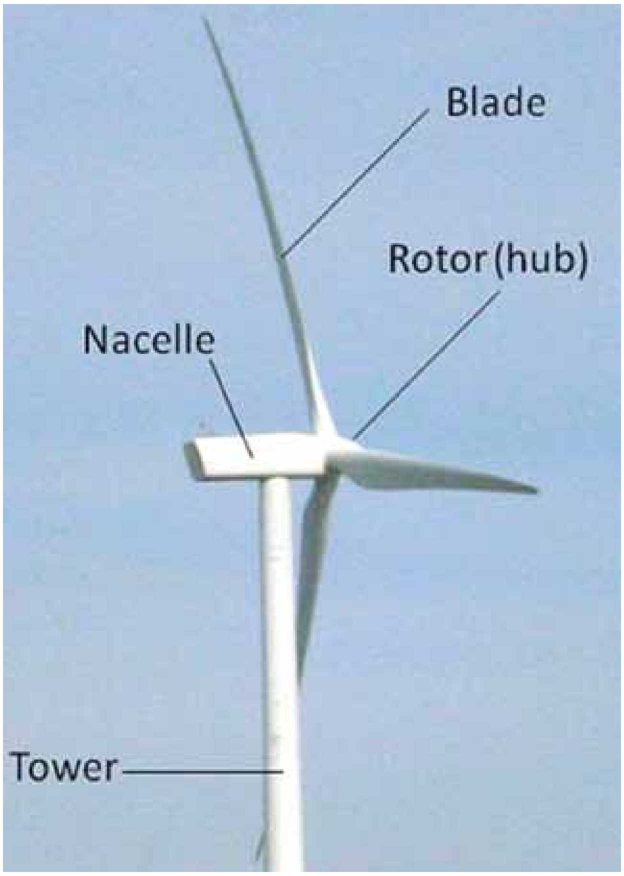
What Audiologists Should Know

BY JERRY PUNCH, RICHARD JAMES, AND DAN PABST

Noise from modern wind turbines is not known to cause hearing loss, but the low-frequency noise and vibration emitted by wind turbines may have adverse health effects on humans and may become an important community noise concern.

Most of us would agree that the modern wind turbine is a desirable alternative for producing electrical energy. One of the most highly touted ways to meet a federal mandate that 20 percent of all energy must come from renewable sources by 2020 is to install large numbers of utility-scale wind turbines. Evidence has been mounting over the past decade, however, that these utility-scale wind turbines produce significant levels of low-frequency noise and vibration that can be highly disturbing to nearby residents.

None of these unwanted emissions, whether audible or inaudible, are believed to cause hearing loss, but they are widely known to cause sleep disturbances. Inaudible components can induce resonant vibration in solids, liquids, and gases—including the ground, houses, and other building structures, spaces within those structures, and bodily tissues and cavities—that is potentially harmful to humans. The most extreme of these low-frequency (infrasonic) emissions, at frequencies under about 16 Hz, can easily penetrate homes. Some residents perceive the energy as sound, others experience it as vibration, and others are not aware of it at all. Research is beginning to show that, in addition to sleep disturbances, these emissions may have other deleterious consequences on health. It is for these reasons that wind turbines are becoming an important community health issue, especially when hosted in quiet rural communities that have no prior experience with industrial noise or urban hum.



Major components of a modern wind turbine.

The people most susceptible to disturbances caused by wind turbines may be a small percentage of the total exposed population, but for them the introduction of wind turbines in their communities is not something to which they can easily become acclimated. Instead, they become annoyed, uncomfortable, distressed, or ill. This problem is increasing as newer utility-scale wind turbines capable of generating 1.5-5 MWatts of electricity or more replace the older turbines used over the past 30 years, which produced less than 1 MWatt of power. These large wind turbines can have hub heights that span the length of a football field and blade lengths that span half that distance. The increased size of these multi-MWatt turbines, especially the blades, has been associated with complaints of adverse health effects (AHEs) that cannot be explained by auditory responses alone.

For this article, we reviewed the English-language, peer-reviewed literature from around the world on the topic of wind-turbine noise and vibration and their effects on humans. In addition, we used popular search engines to locate relevant online trade journals, books, reference sources, government regulations, and acoustic and vibration standards. We also consulted professional engineers and psychoacousticians regarding their unpublished ideas and research.

Sources of Wind-Turbine Noise and Vibration

Physically, a modern wind turbine consists of a tower; a rotor (or hub); a set of rotating blades—usually three, located upwind to the tower; and a nacelle, which is an enclosure containing a gearbox, a generator, and computerized controls that monitor and regulate operations (FIGURE 1). Wind speed can be much greater at hub level than at ground level, so taller wind towers are used to take advantage of these higher wind speeds. Calculators are available for predicting wind speed at hub height, based on wind speeds at 10 meter weather towers, which can easily be measured directly.

Mechanical equipment inside the nacelle generates some noise, but at quieter levels than older turbines. This mechanical sound is usually considered of secondary importance in discussions of annoyance from today's turbines. The main cause of annoyance is an aerodynamic source created by interaction of the turning blades with the wind. With optimal wind conditions, this aerodynamic noise is steady and commonly described as an airplane overhead that never leaves.

When wind conditions are not optimal, such as during turbulence caused by a storm, the steady sounds are augmented by fluctuating aerodynamic sounds. Under steady wind conditions, this interaction generates a broadband whooshing sound that repeats itself about once a second and is clearly audible. Many people who live near the wind turbine find this condition to be very disturbing.

The whooshing sound comes from variations of air turbulence from hub to blade tip and the inability of the turbine to keep the blades adjusted at an optimal angle as wind direction varies. The audible portion of the whoosh is around 300 Hz, which can easily penetrate walls of homes and other buildings. In addition, the rotating blades create energy at frequencies as low as 1–2 Hz (the blade-passage frequency), with overtones of up to about 20 Hz. Although some of this low-frequency energy is audible to some people with sensitive hearing, the energy is mostly vibratory to people who react negatively to it.

Adverse Health Effects of Wind-Turbine Noise

Hubbard and Shepherd (1990), in a technical paper written for the National Aeronautics and Space Administration (NASA), were the first to report in depth on the noise and vibration from wind turbines. Most of the relevant research since that time has been conducted by European investigators, as commercial-grade (utility-scale) wind turbines have existed in Europe for many decades. Unfortunately, the research and development done by wind-turbine manufacturers is proprietary and typically has not been shared with the public, but reports of the distressing effects on people living near utility-scale wind turbines in various parts of the world are becoming more common.

Studies carried out in Denmark, The Netherlands, and Germany (Wolsink and Sprengers, 1993; Wolsink et al, 1993), a Danish study (Pedersen and Nielsen, 1994), and two Swedish studies (Pedersen and Persson Waye, 2004, 2007) collectively indicate that wind turbines differ from other sources of community noise in several respects. These investigators confirm the findings of earlier research that amplitude-modulated sound is more easily perceived and more annoying than constant-level sounds (Bradley, 1994; Bengtsson et al, 2004) and that sounds that are unpredictable and uncontrollable are more annoying than other sounds (Geen and McCown, 1984; Hatfield et al, 2002).

Annoyance from wind-turbine noise has been difficult to characterize by the use of such psychoacoustic parameters as sharpness, loudness, roughness, or modulation (Persson Waye and Öhrström, 2002). The extremely low-frequency nature of wind-turbine noise, in combination with the fluctuating blade sounds, also means that the noise is not easily masked by other environmental sounds.

Pedersen et al (2009), in a survey conducted in The Netherlands on 725 respondents, found that noise from wind turbines is more annoying than transportation or industrial noises at comparable levels, measured in dBA. They noted that annoyance from turbine sounds at 35 dBA corresponds to the annoyance reported for other common community-noise sources at 45 dBA. Higher visibility of the turbines was associated with higher levels of annoyance, and annoyance was greater when attitudes toward the visual impact of the turbines on the landscape were negative. However, the height of wind turbines means that they are also most clearly visible to the people closest to them and those who also receive the highest sound levels. Thus, proximity of the receiver to wind turbines makes it difficult to determine whether annoyance to the noise is independent of annoyance to the visual impact. Pedersen et al (2009) also found that annoyance was substantially lower in people who benefitted economically from having wind turbines located on their property.

Among audiologists and acousticians, it has been understood for many decades that sufficiently intense and prolonged exposure to environmental noise can cause hearing impairment, annoyance, or both. In essence, the view has been *what* you can hear can hurt you. In the case of wind turbines, it seems that *what* you can't hear can also hurt you. Again, there is no evidence that noise generated by wind turbines, even the largest utility-scale turbines, causes hearing loss. But there is increasingly clear evidence that audible and low-frequency acoustic energy from these turbines is sufficiently intense to cause extreme annoyance and inability to sleep, or disturbed sleep, in individuals living near them.

Jung and colleagues (2008), in a Korean study, concluded that low-frequency noise in the frequency range above 30 Hz can lead to psychological complaints and that infrasound in the frequency range of 5–8 Hz can cause complaints due to rattling doors and windows in homes.

The energy generated by large wind turbines can be especially disturbing to the vestibular systems of some people, as well as cause other troubling sensations of the head, chest, or other parts of the body. Dr. Nina Pierpont (2009), in her definitive natural experiment on the subject, refers to these effects as Wind-Turbine Syndrome (WTS). TABLE 1 lists the symptoms that, in various combinations, characterize WTS. Although hearing impairment is not one of the symptoms of WTS, audiologists whose patients report these symptoms should ask them if they live near a wind turbine.

It is well known that sleep deprivation has serious consequences, and we know that noncontinuous sounds and nighttime sounds are less tolerable than continuous and daytime sounds. Somewhat related effects, such as cardiac arrhythmias, stress, hypertension, and headaches have also been attributed to noise or vibration from wind turbines, and some researchers are referring to these effects as Vibroacoustic Disease, or VAD (Castelo Branco, 1999; Castelo Branco and Alves-Pereira, 2004). VAD is described as occurring in persons who are exposed to high-level (>90 dB SPL) infra- and low-frequency noise (ILFN), under 500 Hz, for periods of 10 years or more. It is believed to be a systemic pathology characterized by direct tissue damage to a variety of bodily organs and may involve abnormal proliferation of extracellular matrices.

Alves-Pereira and Castelo Branco (2007) reported on a family who lived near wind turbines and showed signs of VAD. The sound levels in the home were less than 60 dB SPL in each 1/3–octave band below 100 Hz. We have measured unweighted sound levels ranging from 60 to 70 dB Leq (averaged over 1 minute) in these low-frequency bands in Ontario homes of people reporting AHEs from wind turbines. A spectral analysis of sounds emitted at a Michigan site revealed that unweighted peak levels at frequencies under 5 Hz exceeded 90 dB SPL (Wade Bray, pers. comm., 2009).

Table 1. Core Symptoms of Wind-Turbine Syndrome

1	Sleep disturbance
2	Headache
3	Visceral Vibratory Vestibular Disturbance (VVVD)
4	Dizziness, vertigo, unsteadiness
5	Tinnitus
6	Ear pressure or pain
7	External auditory canal sensation
8	Memory and concentration deficits
9	Irritability, anger
10	Fatigue, loss of motivation

Source: Pierpont, 2009

Similar observations have been made in studies of people who live near busy highways and airports, which also expose people to low-frequency sounds, both outdoors and in their homes. Evidence is insufficient to substantiate that typical exposures to wind-turbine noise, even in residents who live nearby, can lead to VAD, but early indications are that there are some more-vulnerable people who may be susceptible. Because ILFN is not yet recognized as a disease agent, it is not covered by legislation, permissible exposure levels have not yet been established, and dose-response relationships are unknown (Alves-Pereira, 2007).

As distinguished from VAD, Pierpont's (2009) use of the term Wind-Turbine Syndrome appears to emphasize a constellation of symptoms due to stimulation, or overstimulation, of the vestibular organs of balance due to ILFN from wind turbines (see TABLE 1). One of the most distinctive symptoms she lists in the constellation of symptoms comprising WTS is Visceral Vibratory Vestibular Disturbance (VVVD), which she defines as "a sensation of internal quivering, vibration, or pulsation accompanied by agitation, anxiety, alarm, irritability, rapid heartbeat, nausea, and sleep disturbance" (p. 270).

Drawing on the recent work of Balaban and colleagues (i.e., Balaban and Yates, 2004), Pierpont describes the close association between the vestibular system and its neural connections to brain nuclei involved with balance processing, autonomic and somatic sensory inflow and outflow, the fear and anxiety associated with vertigo or a sudden feeling of postural instability, and aversive learning. These neurological relationships give credence to Pierpont's linkage of the symptoms of VVVD to the vestibular system.

Todd et al (2008) demonstrated that the resonant frequency of the human vestibular system is 100 Hz, concluding that the mechano-receptive hair cells of the vestibular structures of the inner ear are remarkably sensitive to low-frequency vibration and that this sensitivity to vibration exceeds that of the cochlea. Not only is 100 Hz the frequency of the peak response of the vestibular system to vibration, but it is also a frequency at which a substantial amount of acoustic energy is produced by wind turbines. Symptoms of both VAD and VVVD can presumably occur in the presence of ILFN as a result of disruptions of normal paths or structures that mediate the fine coordination between living tissue deformation and activation of signal transducers; these disruptions can lead to aberrant mechano-electrical coupling that can, in turn, lead to conditions such as heart arrhythmias (Ingber, 2008). Ultimately, further research will be needed to sort out the commonalities and differences among the symptoms variously described in the literature as VAD, VVVD, and WTS.

Dr. Geoff Leventhall, a British scientist, and his colleagues (Waye et al, 1997; Leventhall, 2003, 2004) have documented the detrimental effects of low-frequency noise exposure. They consider it to be a special environmental noise, particularly to sensitive people in their homes. Waye et al (1997) found that exposure to dynamically modulated low-frequency ventilation noise (20–200 Hz)—as opposed to midfrequency noise exposure—was more bothersome, less pleasant, impacted work performance more negatively, and led to lower social orientation.

Leventhall (2003), in reviewing the literature on the effects of exposure to low-frequency noise, found no evidence of hearing loss but substantial evidence of vibration of bodily structures (chest vibration), annoyance (especially in homes), perceptions of unpleasantness (pressure on the eardrum, unpleasant perception within the chest area, and a general feeling of vibration), sleep disturbance (reduced wakefulness), stress, reduced performance on demanding verbal tasks, and negative biological effects that included quantitative measurements of EEG activity, blood pressure, respiration, hormone production, and heart rate.

Regarding work performance, reviewed studies indicated that dynamically modulated low-frequency noise, even when inaudible to most individuals, is more difficult to ignore than mid- or high-frequency noise and that its imperviousness to habituation leads to reduced available information-processing resources. Leventhall hypothesized that low-frequency noise, therefore, may impair work performance. More recently, as a consultant on behalf of the British Wind Energy Association (BWEA), the American Wind Energy Association (AWEA), and the Canadian Wind Energy Association (CANWEA), Leventhall (2006) changed his position, stating that although wind turbines do produce significant levels of low-frequency sound, they do not pose a threat to humans—in effect reverting to the notion that *what* you can't hear can't hurt you.

According to the World Health Organization guidelines (WHO, 2007), observable effects of nighttime, outdoor wind-turbine noise do not occur at levels of 30 dBA or lower. Many rural communities have ambient, nighttime sound levels that do not exceed 25 dBA. As outdoor sound levels increase, the risk of AHEs also increases, with the most vulnerable being the first to show its effects. Vulnerable populations include elderly persons; children, especially those younger than age six; and people with pre-existing medical conditions, especially if sleep is affected. For outdoor sound levels of 40 dBA or higher, the WHO states that there is sufficient evidence to link prolonged exposure to AHEs. While the WHO identifies long-term, nighttime audible sounds over 40 dBA outside one's home as a cause of AHEs, the wind industry commonly promotes 50 dBA as a safe limit for nearby homes and properties. Recently, a limit of 45 dBA has been proposed for new wind projects in Canada (Keith et al, 2008).

Utility-scale wind turbines located in Huron County, Michigan.

Much of the answer as to why the wind industry denies that noise is a serious problem with its wind turbines is because holding the noise to 30 dBA at night has serious economic consequences. The following quotation by Upton Sinclair seems relevant here: "It is difficult to get a man to understand something when his salary depends upon his not understanding it" (Sinclair, 1935, reprinted 1994, p. 109).

In recent years, the wind industry has denied the validity of any noise complaints by people who live near its utility-scale wind turbines. Residents who are leasing their properties for the siting of turbines are generally so pleased to receive the lease payments that they seldom complain. In fact, they normally are required to sign a leasing agreement, or gag clause, stating they will not speak or write anything unfavorable about the turbines. Consequently, complaints, and sometimes lawsuits, tend to be initiated by individuals who live near property on which wind turbines are sited, and not by those who are leasing their own property. This situation pits neighbor against neighbor, which leads to antagonistic divisions within communities.

Measurement of Wind-Turbine Noise

It is important to point out that the continued use of the A-weighting scale in sound-level meters is the basis for misunderstandings that have led to acrimony between advocates and opponents of locating wind turbines in residential areas. The dBA scale grew out of the desire to incorporate a function into the measurement of sound pressure levels of environmental and industrial noise that is the inverse of the minimum audibility curve (Fletcher and Munson, 1933) at the 40-phon level. It is typically used, though, to specify the levels of noises that are more intense, where the audibility curve becomes considerably flattened, obviating the need for A-weighting. It is mandated in various national and international standards for measurements that are compared to damage-risk criteria for hearing loss and other health effects. The A-weighted scale in sound-level meters drastically reduces sound-level readings in the lower frequencies, beginning at 1000 Hz, and reduces sounds at 20 Hz by 50 dB.

For wind-turbine noise, the A-weighting scale is especially ill-suited because of its devaluation of the effects of low-frequency noise. This is why it is important to make C-weighted measurements, as well as A-weighted measurements, when considering the impact of sound from wind turbines. Theoretically, linear-scale measurements would seem superior to C-scale measurements in wind-turbine applications, but linear-scale measurements lack standardization due to failure on the part of manufacturers of sound-level meters to agree on such factors as low-frequency cutoff and response tolerance limits. The Z-scale, or zero-frequency weighting, was introduced in 2003 by the International Electro-technical Commission (IEC) in its Standard 61672 to replace the flat, or linear, weighting used by manufacturers in the past.

State of Michigan Siting Guidelines

Michigan's siting guidelines (State of Michigan, 2008) will be used as an example of guidelines that deal only in a limited way with sound. These guidelines refer to earlier, now outdated, WHO and Environmental Protection Agency (EPA) guidelines to support a noise criterion that SPLs cannot exceed 55 dBA at the adjacent property line. This level is allowed to be exceeded during severe weather or power outages, and when the ambient sound level is greater than 55 dBA, the turbine noise can exceed that higher background sound level by 5 dB. These levels are about 30 dB above the nighttime levels of most rural communities. When utility-scale turbines were installed in Huron County, Michigan, in May 2008, the WHO's 2007 guidelines that call for nighttime, outside levels not to exceed 30 dBA were already in place. Based on measurements made by the authors, these turbines produce 40–45 dBA sound levels at the perimeter of a 1,000 ft radius under typical weather conditions, and the additive effects of multiple turbines produce higher levels. Many of the turbines have been located close enough to homes to produce very noticeable noise and vibration.

Kamperman and James (2009) have offered recommendations for change in the State of Michigan guidelines (2008) for wind turbines. Some of the more pertinent details of the Michigan siting guidelines are shown in the left-hand column of TABLE 2. The state of Michigan permits sound levels that do not exceed 55 dBA or L90 + 5 dBA, whichever is greater, measured at the property line closest to the wind-energy system. These guidelines make no provisions to limit low-frequency sounds from wind-turbine operations.

In consideration of the current WHO guidelines (2007), measurements made by the authors in Huron County, Michigan, indicate that the current Michigan guidelines do not appear adequate to protect the public from the nuisances and known health risks of wind-turbine noise. In fact, these guidelines appear to be especially lenient

Table 2. Current and Proposed Wind-Turbine Siting Guidelines

Current Michigan Guidelines*	Alternative Proposed Guidelines**
Sound level cannot exceed 55 dBA or L90 + 5 dBA, whichever is greater.	Operating LAeq is not to exceed the background LA90 +5 dBA, where LA90 is measured during a preconstruction noise study at the quietest time of night. Similar dBC limits should also be applied.
Limits apply to sound levels measured at homes (as stated in Huron County Ordinance).	Limits apply to sound levels measured at property lines, except that turbine sounds cannot exceed 35 dBA at any home.
No provisions are made for limiting low-frequency sounds from wind-turbine operations.	LCeq-LA90 cannot exceed 20 dB at receiving property, e.g., LCeq (from turbines) minus (LA90 [background] + 5) < 20 dB, and is not to exceed 55 LCeq from wind turbines (60 LCeq for properties within one mile of major heavily trafficked roads).

*Source: State of Michigan, 2008

**Source: Kamperman and James, 2009

in terms of tolerable sound levels. Sound levels that approach 20 dBA higher than natural ambient levels are considered unacceptable in most countries; Michigan permits 30 dBA increases.

In considering the health and well-being of people living near wind-turbine projects, the changes recommended by Kamperman and James (2009) would abandon the 55 dBA limit in favor of the commonly accepted criteria of L90 + 5 dBA, for both A- and C-scale readings, where L90 is the preconstruction ambient level. These recommendations also include a prohibition against any wind-turbine-related sound levels exceeding 35 dBA on receiving properties that include homes or other structures in which people sleep. Additional protections against low-frequency sound are given in the right-hand column of TABLE 2. These recommended provisions would protect residents by limiting the difference between C-weighted Leq during turbine operation and the quietest A-weighted pre-operation background sound levels, plus 5 dB, to no more than 20 dB at the property line. This level should not exceed 55 dB Leq on the C scale, or 60 dB Leq for properties within one mile of major heavily trafficked roads, which sets a higher tolerance for communities that tend to experience slightly noisier conditions.

People living near wind turbines may experience sleep disturbance.

Implementation of the recommendations of Kamperman and James would result in siting wind turbines differently than what is currently planned for future wind-turbine projects in Michigan. This change would result in sound levels at nearby properties that are much less noticeable, and much less likely to cause sleep deprivation, annoyance, and related health risks. These sound-level measurements should be made by independent acoustical engineers or knowledgeable audiologists who follow ANSI guidelines (1993, 1994) to ensure fair and accurate readings, and not by representatives of the wind industry.

People living within a mile of one or more wind turbines, and especially those living within a half mile, have frequent sleep disturbance leading to sleep deprivation, and sleep disturbances are common in people who live up to about 1.25 miles away. This is the setback distance at which a group of turbines would need to be in order not to be a nighttime noise disturbance (Kamperman and James, 2009). It is also the setback distance used in several other countries that have substantial experience with wind turbines, and is the distance at which Pierpont (2009) found very few people reporting AHEs.

A study conducted by van den Berg (2003) in The Netherlands demonstrated that daytime levels cannot be used to predict nighttime levels and that residents within 1900 mile (1.18 mile) of a wind-turbine project expressed annoyance from the noise. Pierpont (2009) recommends baseline minimum setbacks of 2 kilometers (1.24 mile) from residences and other buildings such as hospitals, schools, and nursing homes, and longer setbacks in mountainous terrain and when necessary to meet the noise criteria developed by Kamperman and James (2009).

In a panel review report, the American Wind Energy Association (AWEA) and Canadian Wind Energy Association (CANWEA) have objected to setbacks that exceed 1 mile (Colby et al, 2009). A coalition of independent medical and acoustical experts, the Society for Wind Vigilance (2010), has provided a recent rebuttal to that report. The society has described the panel review as a typical product of industry-funded white papers, being neither authoritative nor convincing. The society accepts as a medical fact that sleep disturbance, physiological stress, and psychological distress can result from exposure to wind-turbine noise.

Wind turbines have different effects on different people. Some of these effects are somewhat predictable based on financial compensation, legal restrictions on free speech included in the lease contracts with hosting landowners, and distance of the residence from wind projects, but they are sometimes totally unpredictable. Planning for wind projects needs to be directed not only toward benefitting society at large but also toward protecting the individuals living near them. We believe that the state of Michigan, and other states that have adopted similar siting guidelines for wind turbines, are not acting in the best interest of all their citizens and need to revise their siting guidelines to protect the public from possible health risks and loss of property values, as well as reduce complaints about noise annoyance.

Wind-utility developers proposing new projects to a potential host community are often asked if their projects will cause the same negative community responses that are heard from people living in the footprint of operating projects. They often respond that they will use a different type of wind turbine or that reports of complaints refer to older-style turbines that they do not use. In our opinion, these statements should usually be viewed as diversionary.

Finally, it is important to note that there is little difference in noise generated across makes and models of modern utility-scale, upwind wind turbines once their power outputs are normalized. Kamperman (pers. comm., 2009), after analyzing data from a project funded by the Danish Energy Authority (Søndergaard and Madsen, 2008), has indicated that when the A-weighted sound levels are converted to unweighted levels, the low-frequency energy from industrial wind turbines increases inversely with frequency at a rate of approximately 3 dB per octave to below 10 Hz (the lowest reported frequency). Kamperman has concluded that the amount of noise generated at low frequencies increases by 3–5 dB for every MW of electrical power generated. Because turbines are getting larger, this means that future noise problems are likely to get worse if siting guidelines are not changed.

Conclusion

Our purpose in this article has been to provide audiologists with a better understanding of the types of noise generated by wind turbines, some basic considerations underlying sound-level measurements of wind-turbine noise, and the adverse health effects on people who live near these turbines. In future years, we expect that audiologists will be called upon to make noise measurements in communities that have acquired wind turbines, or are considering them. Some of us, along with members of the medical profession, will be asked to provide legal testimony regarding our opinions on the effects of such noise on people. Many of us will likely see clinical patients who are experiencing some of the adverse health effects described in this article.

As a professional community, audiologists should become involved not only in making these measurements to corroborate the complaints of residents living near wind-turbine projects but also in developing and shaping siting guidelines that minimize the potentially adverse health effects of the noise and vibration they generate. In these ways, we can promote public health interests without opposing the use of wind turbines as a desirable and viable alternative energy source.

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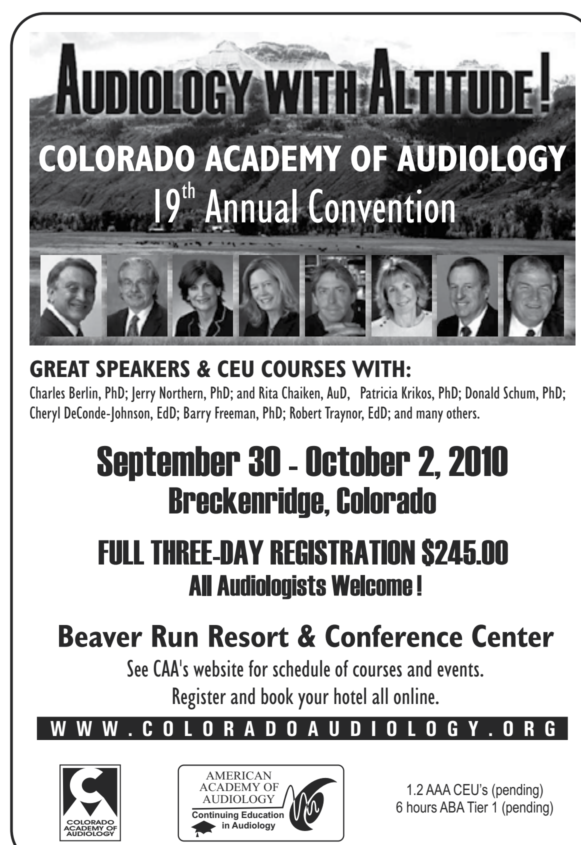

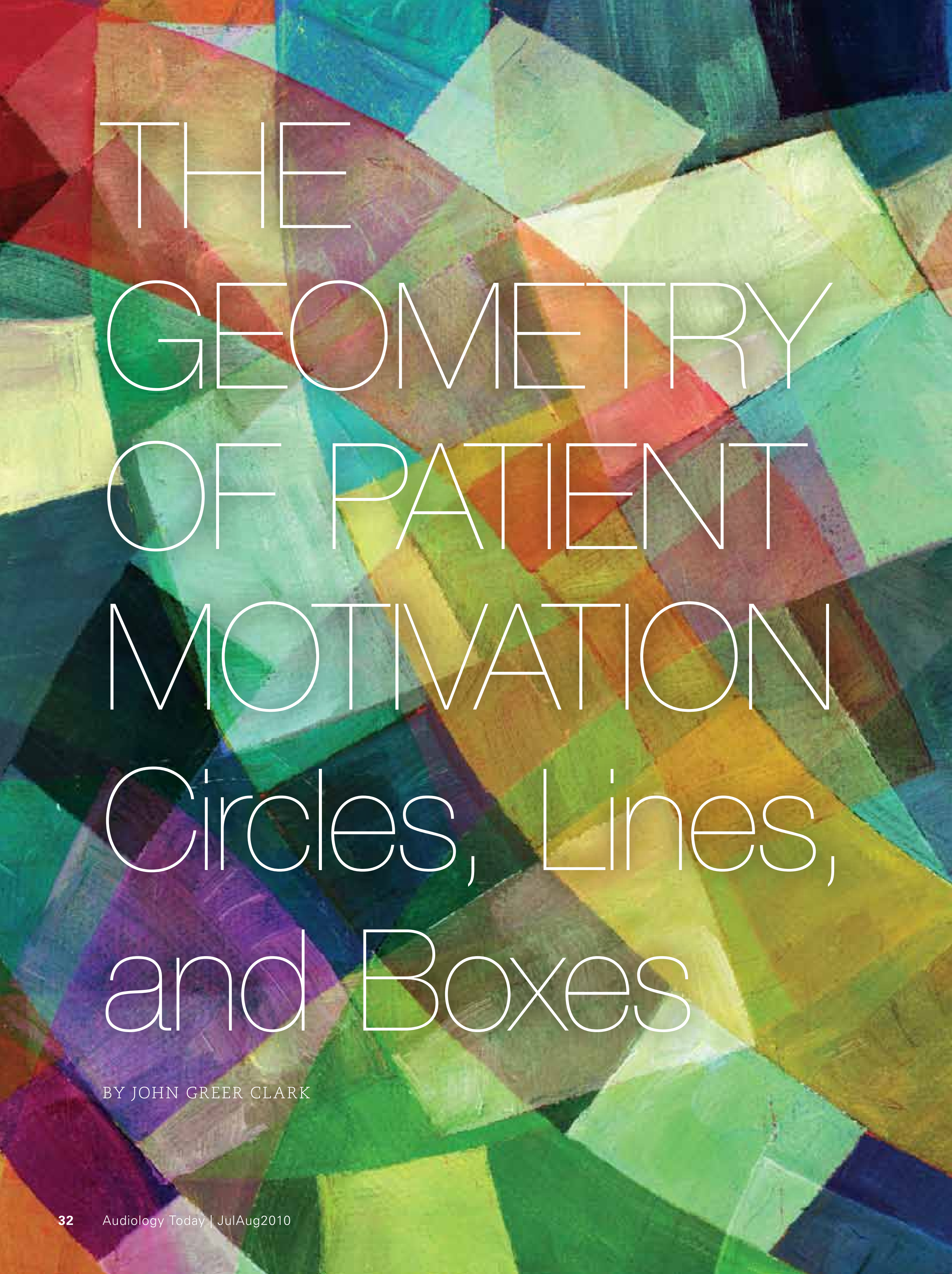

THE GEOMETRY OF PATIENT MOTIVATION

Circles, Lines, and Boxes

BY JOHN GREER CLARK

This article relays a set of simple tools represented by three geometric symbols that, with a little practice, audiologists can use effectively to help patients build their own internal motivation for hearing help.

It has long been recognized in health-care arenas that change does not occur without motivation for that change. This holds true when dealing with substance abuse issues, medication compliance, eating disorders, change in diet, smoking cessation, exercise regimens, or any host of health-related issues. Audiologists have also long recognized that patient motivation is a key to one's acceptance of hearing care recommendations.

Frequently, audiologists find themselves going to great lengths to develop ways of motivating their patients toward action. We often counter patient resistance to our recommendations with discussions of the patient's audiogram and the implications of measured hearing deficits on speech reception. Often, we will provide third-party stories of successful patients who had once questioned if they needed amplification, yet who are now quite successful hearing aid users. We may use hearing manufacturer marketing slicks that employ celebrity endorsements to support a product. We may even embrace the age-old sales tactics of financial inducements, offering limited time discounts or savings with binaural fittings. In spite of our efforts, we often find that reluctant patients operate on their own internal timetable and are only ready to proceed when they feel the necessity. Like our patients' family members, we are at times baffled that these patients do not seem to acknowledge the same communication frustrations and urgency for action that seem so apparent to others.

In actuality, clinicians can only set the stage for patients to find their own internal motivation to tackle the tasks required to achieve desired goals. It becomes the audiologist's role to help patients recognize the negative impact of untreated hearing loss and to articulate their own reasons for change. As we might recognize from our personal life experiences, motivation that arises from within oneself is far more sustainable and leads to far greater successes than motivation that another person attempts to instill within us.

The need for audiologists to successfully kindle patients' internal motivation has been a recent topic in audiologic literature (Harvey, 2003; Beck et al 2007; Beck and Harvey, 2009) and in a series of interactive workshops for hearing health professionals (idainstitute.com). The purpose of this article is to relay a set of simple tools represented by three geometric symbols that, with a little practice, audiologists can use effectively to help patients build their own internal motivation for hearing help.

Setting the Stage

Theodore Roosevelt said, "People don't care what you know until they know that you care." Toward this end, the manner in which we attend to our patients' needs, draw out their stories, and provide a true listening rooted in understanding is critical to setting the stage for successful engagement and the attainment of clinical goals (Clark, 2008). Patients present various levels of readiness to engage within the clinical process. It is our challenge and goal to help them to find, when lacking, the internal motivation to accept our recommendations and move forward.

More than a quarter of a century ago, Goldstein and Stevens (1981) presented four postures of readiness toward hearing loss management that patients may bring to the clinic. Those in the first posture, representing the vast majority of the patients coming for audiological services, are generally positive toward rehabilitation and ready to work with the audiologist. Those holding the second position in the Goldstein and Stevens categorization also bring a positive outlook toward hearing loss intervention but may present a complicating factor (e.g., a hearing loss that may be difficult to fit with hearing aids or a concomitant complicating health condition). While those with the third posture may be generally negative toward the idea of hearing rehabilitation, they demonstrate a willingness to work within the process. Audiologists are fortunate that those holding forth this third posture, and those of the fourth posture, who present an open rejection of hearing aids and hearing rehabilitation, constitute the minority of the patients we see. Those in these latter two groups present our greatest challenges and our greatest disappointments, as they frequently depart from the clinical visit without committing to the steps they must take and their family members strongly desire. It is for these latter two groups of patients that motivational engagement strategies are most useful.

Audiologists must combat common human emotions and behaviors that may adversely impact the services they deliver.

Audiologists, just as other health-care professionals, must combat common human emotions and behaviors that may adversely impact the services they deliver. We frequently see patients with long-standing denial, a resistance to change, skepticism toward diagnostic findings and recommendations, or ambivalence toward the actions they know they should take (Clark, 1999). We may even perceive these individuals as negative or unmotivated. Yet all such emotions and behaviors are normal responses to unwanted change. As Rogers (1951) advises, we must grant a full acceptance of our patients and the stage they are within on their personal life's journey. We must not only accept patients where they are, but also, though active listening, demonstrate that acceptance and understanding.

It is a sincere understanding and recognition that all patient emotions and accompanying behaviors are normal responses to unwanted change that fosters a positive engagement between audiologists and their patients. However, clinical success is predicated on more than the positive engagements we can establish. For those patients who fall within the third and fourth categories outlined by Goldstein and Stevens, we must also find effective strategies to help patients develop the internal motivation for self-improvement that is at the root of desired clinical outcomes.

Motivational Engagement

As much as health professionals wish to believe to the contrary, clinicians can rarely motivate patients to take sustainable action, as such motivation can only arise from within a person. Through motivational engagement, the audiologist's role becomes one of facilitative coach as patients are guided to reflect on the impact of hearing loss, the costs and benefits of action or inaction toward effective remediation, and patients' willingness and perceived abilities to make positive changes in their lives.

While there are many approaches to guide others in self-reflection toward motivation, a powerful method for clinical audiology is brought forth through three simple geometric figures—circles, lines, and boxes. Hanne Tonnesen, a physician with the World Health Organization's Collaborating Center at Bispebjerg University Hospital in Copenhagen, has used these tools to help patients make powerful changes in their lives when confronting health issues such as necessary dietary changes, medication compliance, smoking cessation, and others. She helped bring these "tools" to audiology's attention through her collaboration with the Ida Institute.

Circles

It is through the understanding gained by listening to patients' stories, often facilitated through discussions of reports on self-assessment measures, that the audiologist can gain insight into how prepared a patient is to make the changes required for improved hearing. The circle of change not only helps the clinician to visualize better the patient's preparedness for change but also to determine if change is required in the attitudinal or behavioral domain (FIGURE 1).

Patients who are not ready for making the changes requisite for success (those who are in the final two categories of Goldstein and Stevens' readiness ranking) fall into one of two areas. Those in the pre-contemplative behavioral stage may fail to admit, or sometimes even recognize, that a problem exists and only come for evaluation at the behest of another. Those in the contemplative stage may recognize that there is a communication problem but may not fully agree where the problem originates (e.g., others mumble). Those in either stage, as well as those who are preparing for change, need further information to help them to move forward, and it is our task to listen effectively and provide information in a clear and concise manner.

During these early stages we often must help patients increase their own appreciation of the personal impact of untreated hearing loss. Unfortunately, if the information and subsequent recommendations we provide are presented when emotions are high (e.g., following confirmation of hearing loss), patients may not be able to attend fully to the problem-solving recommendations the audiologist provides (Cahill et al, 1995; Canli et al, 2000; Richardson et al, 2004). The timing of information delivery suggests that before we proceed with details, we ask patients and attending communication partners if they have any questions about any overview statements we have made, or if they have any other questions on their minds. The questions patients have for us may be related to progression of the loss, hereditary issues, cost of hearing aids, unilateral or bilateral fittings, or any host of other possibilities. But until these are addressed, we fail to have their full attention for any details we may wish to present.

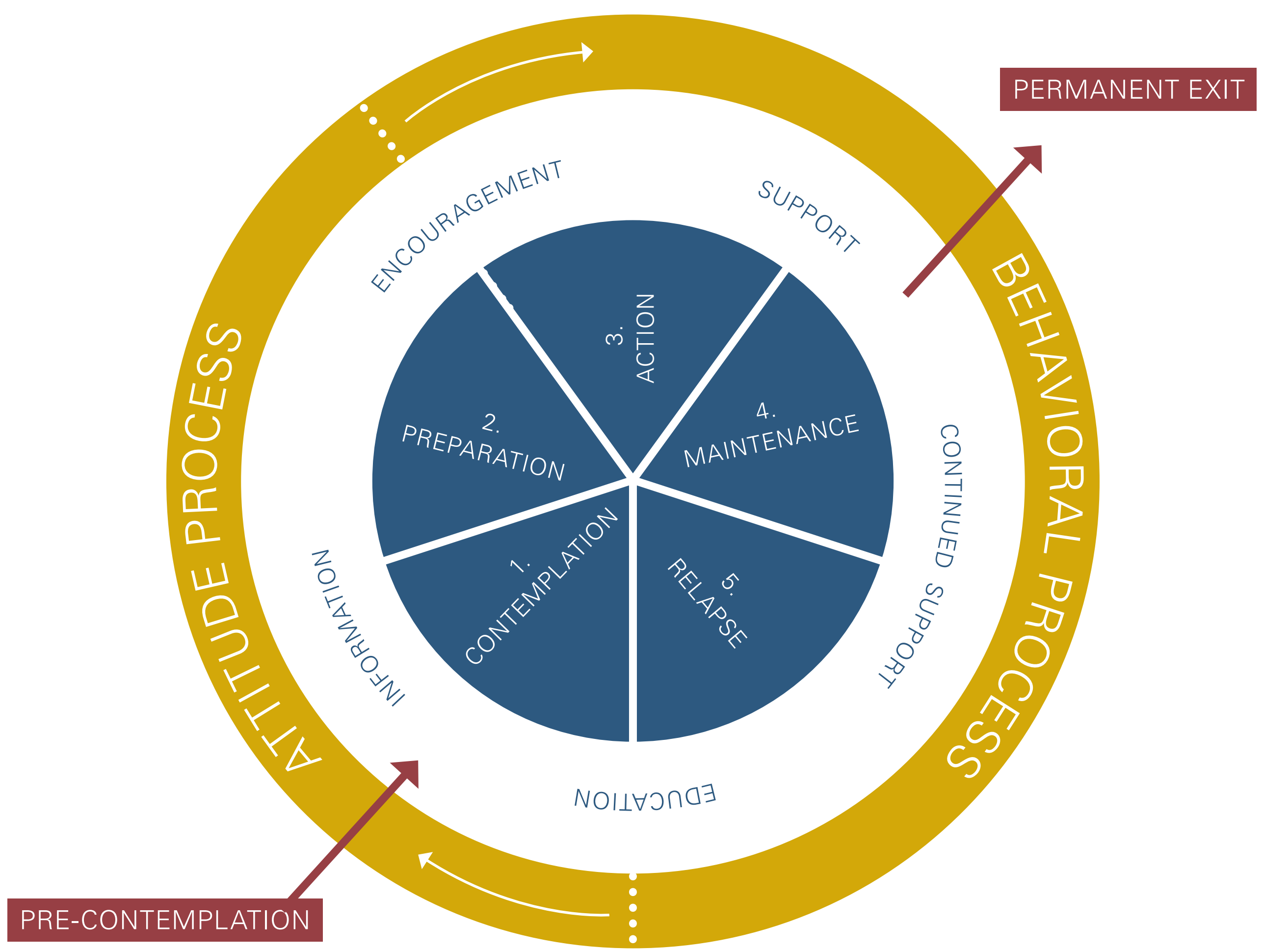

FIGURE 1: A cyclical representation of the stages of change that patients may confront when considering aspects of audiological treatment. Stages one and two require changes in attitude toward hearing loss or treatment avenues. Stages three through five represent stages requiring modification of current behaviors (modified from Prochaska and DiClemente, 1984).

When patients reach a level in which they are either prepared to make a change (move forward) or are actively proceeding with the recommendations given, our greatest assistance comes through encouragement focused on the benefits of the change they are moving toward. Finally, once a patient has been fit with hearing aids, it is vigilant aftercare that ensures continued follow through with hearing aid use and augmentative rehabilitation recommendations so that the patient does not relapse in the efforts that have been made.

While we frequently can tell where a patient resides on the circle of change quite early in a clinic appointment, sometimes we are not aware of his or her readiness ranking until we present our initial recommendation. As stated earlier, when motivation and readiness are low persuasive arguments, celebrity endorsements, third-party stories, and financial incentives frequently do not provide the inducements we may desire. Those within the stages of contemplation and preparation within FIGURE 1 are not quite ready to take action and with guidance need to reflect on the attitudes they hold toward hearing care and the need to change. An effective means to guide patients through constructive reflections can be achieved with the remaining two geometric forms—the lines and the boxes.

Lines

A visual tool to reflect on one's position on a given issue can generate needed focus and an opportunity to explore the directions one is choosing to take in life. The use of a of two lines representing a graduated scale from 0 to 10 (FIGURE 2) allows for a powerful visual "thermometer" to provide a ranking of (1) the perceived importance to make a change in one's life, as well as (2) a ranking of one's perceived ability to make changes (Rollnick et al, 2008). In audiological practice, the use of these lines is most effective in conjunction with discussions that may have evolved through self-assessment tools. The introduction of the lines may be as straightforward as the following:

Clinician: We've been discussing some of the frustrations you've had at home when talking with your wife. She seems to think it's all related to your hearing, but you think it is as much, or maybe more, the way she talks to you. Do I have that right?

Patient: Yeah. Like I said, she starts talking to me when she's in the kitchen and I'm in another room watching TV. Or with her head in the fridge. Nobody's going to hear someone like that.

Clinician: I agree. We also talked about your hearing and the fact that you have some hearing loss. But clearly the frustrations you're having seem to come from more than just your hearing loss alone. Take a look at this scale with me for a second. (Bring out the first line.) Given the frustrations you and your wife are having, how important is it to you to make life better. Zero (point to the 0) means making things better is not important to you or your wife and that everything is fine with the frustrations the way they are. Ten (point to the 10) indicates that it would be highly important to you and your wife to improve the situation at home. Can you take this pen and mark on the scale how important you think making a change would be? (Depending on the comfort level the patient has with the clinician, it may be awkward to ask the patient to mark on the line, but the active engagement of the patient at this point has been shown to strengthen the outcome.)

The key to success in using this first line is the earlier identification of some life issues that are impacted by the decreased communication function the patient/family is experiencing. If properly identified, patients will most

FIGURE 2. Use this scaling line with patients in two steps: (1) Have patients self-rank their perception of the importance of change in their lives and then (2) have patients rank their perceived abilities to make a change. The scale ranges from 0 "not at all important" or "not likely to be able to make a change" to 10 "very important to make a change" or "highly likely that a change can be made" (Rollnick et al, 2008).

Acknowledgement simply provides needed recognition and that what we are asking people to do is not always easy for them.

frequently rank importance of improvement relatively high (i.e., seven or above). If the ranking is lower than seven, the clinician may follow up with the question: "What can I do, or answer for you, that might move you higher on the scale?" If the patient has no concrete suggestion, it is time for the clinician and patient to engage the "box" to build better motivation to move forward, and the second line can be bypassed for the present time.

If the ranking on the first question is high, the clinician can move directly to the second question:

> **Clinician:** Let's look at another line scale for a moment. How likely do you believe you will be able to follow my recommendations, which might include using hearing aids, so that we can make your quality of life better? Zero would be not likely at all, and 10 would be highly likely. Can you mark this line for me?

Answering this second question begins to direct the patient toward reflection on the difficult processes often involved in changing behaviors. If the ranking on this question is also high, there is no reason to engage the boxes with the patient.

If the ranking for the second question is low, an appropriate follow up question would be: "Why do you think your abilities for this are so low?" The ensuing dialogue may uncover fears of technology, concerns of what others will think if hearing aids are worn, previous failure to follow through on difficult tasks, or some other concern. The clinician's task at this point is simply to acknowledge these concerns and reassure the patient that to some degree these issues are resolvable and that the clinician will be there to help every step of the way (*"Considering making a change like we are discussing such as using hearing aids can often be very daunting"*). We must recognize that

acknowledgement of another's concerns does not imply that we believe they are valid or that we agree with them. Acknowledgement simply provides needed recognition that we understand that what we are asking people to do is not always easy for them.

Boxes

Like the lines, boxes provide visual tools to help patients place their hearing loss into a more meaningful framework. The boxes are useful primarily for those patients who rank themselves low on the need to make a change. The dialogue may go something like this:

> **Clinician**: You don't seem to believe it's important to make any changes to improve the communication problems you're having, and maybe it isn't. But from what we've talked about (often first uncovered through completion of one of many available self-assessment scales) it seems something needs to change. For a moment, let's look at a framework that can help us sort out the advantages and disadvantages of change. Looking at this box, tell me what advantages you see for your life if you do nothing to address your hearing problem.

Directing the patient's attention to the upper left quadrant of FIGURE 3, the clinician helps the patient explore what the advantages of inaction are. It is important at this point for the audiologist to wait for the patient's lead. Audiologists, like most other health-care providers, are accustomed to leading the dialogue. However, as stated earlier, motivation comes from within. The thoughts that fill the quadrants of the box have far greater motivational power if they are the patient's thoughts. The upper left quadrant may be filled with items reflective of the comfort of leaving things the same, the safety in knowing that there is no need to learn anything new, or the money

BENEFITS OF STATUS QUO	COST OF STATUS QUO
POTENTIAL COST OF CHANGE	POTENTIAL BENEFITS OF CHANGE

FIGURE 3. A decisional balance box to guide patients in their own exploration of the pros and cons of inaction versus. forward movement (Janis and Mann, 1977).

saved by not purchasing hearing aids. The items placed in this square are most likely true concerns for the patient and should be acknowledged as such.

After reflection on the benefits of maintaining the status quo, attention is directed to the costs of inaction (upper right quadrant). Again, it is important that the audiologist takes a backseat and allows the patient to think of the costs of their hearing loss. Surveys reveal that audiologists most frequently do not engage the spouse in the hearing consultation process (e.g., Stika et al, 2002). However, it is readily apparent that reflections will be more fruitful with both communication partners drawn into the process. This quadrant may be filled with items that recognize the continued frustrations at home when misunderstandings occur, arguments arise due to hearing loss, become unable to hear grandchildren or withdraw from social activities, or any number of consequences of hearing loss. Asking the patient to look back at the previously completed self-assessment form can further facilitate this exercise. Completion of the final two quadrants in the box flows readily from the items in the first two quadrants often providing mirror images to the items previously written down.

Once the boxes are completed, it becomes apparent to all parties that the costs of inaction and the benefits of moving forward far outweigh the costs incurred by working toward solutions, or the benefits of the status quo. At this time, a reexamination of the first line will most often reveal a significant shift to the right for those who previously rated a need to change as a low priority.

Conclusion

Audiologists have frequently attempted to motivate their patients through traditional sales techniques, which often include financial incentives, celebrity endorsements, compelling arguments, and persuasion. However, the greatest source of motivation and the convincing arguments for change most always arise from within patients themselves.

Identifying the personal impact of hearing loss through guided discussions and active listening puts the audiologist in the position to ascertain where patients are on the circle of their own personal journeys from pre-awareness of their hearing loss to acceptance and recognition of a need to take action.

When patients believe they are not ready to move forward with a hearing rehabilitation plan, the use of the box tool may help patients plot their own cost-benefit analysis and will frequently give them the opportunity to weigh the pros and cons of inaction versus action, an exercise that most often leads to action.

Further discussion on the use of the circle, lines, and boxes, and other tools to meaningfully engage your patients, are available on the Ida Institute Web site: www.idainstitute.com.

John Greer Clark, PhD, is an assistant professor with the Department of Communication Sciences and Disorders at the University of Cincinnati, Cincinnati, OH.

The Ida Institute, founded with a grant from Oticon in 2007, is housed in Naerum, Denmark. The institute works collaboratively with international hearing care professionals to develop and disseminate tools to help forge professional/patient partnerships for exploration of the personal impacts of hearing loss and the effective rehabilitation of resultant communication difficulties. The author, along with David Fabry, PhD; Lorraine Gailey, PhD; and Hanne Tonnesen, MD, head of the World Health Organization's Collaborating Center in Copenhagen, Denmark, served on the Ida Institute faculty for the series of seminars titled "Motivational Engagement."

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Also of Interest

"Externalizing and Personifying Hearing Loss: A Psychological Tool for Audiologists," by Michael Harvey (*AT* March/April 2010): Log in to www.audiology.org and search key words "Michael Harvey."

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Affordable Genetic Testing

Interview with Gail Lim, AuD

BY TERI HAMILL

It's not uncommon for audiologists to refer parents of newborns with hearing loss for genetic counseling, but all too often, our recommendations are not followed. *AT* sat down to talk with Dr. Lim about genetic testing options.

Gail Lim, ARNP, AuD, is vice president for program development and the clinical director of the Neonatal Screening Program for Pediatrix Medical Group, which screens the hearing of over 480,000 infants per year in the United States. The program also facilitates follow-up on those who do not pass the screening. Clinical data from Pediatrix's hearing screening program indicate genetic etiology for an increasingly large percentage of infants with hearing loss; the incidence of hearing loss associated with the traditional risk factors such as low birth weight and birth anoxia is declining, possibly due to today's improvements in medical care. It's not uncommon for audiologists to refer parents of newborns with hearing loss for genetic counseling, but all too often, our recommendations are not followed. *AT* sat down to talk with Gail about genetic testing options.

AT: If a baby is diagnosed with congenital hearing loss, what's the likelihood that it's genetic?

GL: Let me recommend to you an article, "Newborn Hearing Screening—A Silent Revolution," by Dr. Cynthia Morton and Dr. Walter Nance (2006). It is my favorite article on genetics and hearing; it has the best diagrams, and it brings genetics to a level that people can understand. They estimated that about 65 percent of neonatal hearing loss is attributed to genetic causes. But unfortunately, genetic testing is not routinely performed on children with hearing loss, so the real prevalence may be higher. Our internal data suggest that the three strongest risk factors for sensorineural hearing loss are (1) having a sibling with hearing loss, (2) having a parent with hearing loss, and followed by (3) having any family member with hearing loss; so family history is significant. Other risks that are associated with hearing loss are babies having cardiac defects and eye abnormalities, which as you know, are common with syndromic hearing loss.

I also want to let you know that I am not a genetic counselor or an expert in genetics. My professional background is an audiologist and a neonatal nurse practitioner.

Understood! This is probably a good time to make sure we are clear on our definitions. "Syndromic" means...

"Syndromic" means that distinctive associated clinical features have been characterized, such as Down syndrome.

And not all syndromes that cause hearing loss are genetic, right?

Yes, that's correct, not all are genetic, but most syndromes are genetic. There are more than 300 forms of syndromic hearing loss.

What are the most common syndromic causes of hearing loss?

Some of the most common autosomal syndromes are Usher's, Pendred's, Waardenburg's, and brachio-oto renal syndrome, or BOR.

And remind us what "autosomal" means?

The transmission is on one of the genes that is not the X or Y sex chromosome.

Table 1. Tests Conducted in the SoundGene Screening Panel

Connexin 26 (Cx26) GJB2 Mutations[1]
35delG
235delC
167delT
M34T
Connexin 30 (Cx30) GJB6 Large Deletion
309kb large deletion
Mitochondrial Mutations
7445A>C (A7445C)
7445A>G (A7445G)
7444G>A (A7444A)
961T>C (T961C)
961T>G (T961G)
961deltT+C(n)ins
Pendred SLC26A4 Mutations
L236P
E384G
1001+1G>A
T416P
Cytomegalovirus
Detection of virus DNA

1. Under sublicense with Athena Diagnostics: U.S. Patent Numbers 5,998,147 and 6,485,908 and patents pending.

Generally, syndromes are recognized by physical features more so than by genetic testing?

Yes, but Pendred's is one of the exceptions. While it can be present at birth, it's generally not symptomatic at birth.

And some hearing loss, for example, that caused by Connexin genetic mutations, is not syndromic?

Correct, only about 30 percent of the genetic losses are syndromic, which means most babies do not have clinical features that could clue the practitioner that a problem may exist. Connexin is the most common cause of non-syndromic hearing loss and is usually autosomal recessive, which explains why two hearing parents may have a deaf or hard-of-hearing child. In fact, 95 percent of hearing-impaired babies have parents with normal hearing.

About how many genetic causes of hearing loss have been identified?

There are over 300 syndromic causes of hearing impairment. The incidence of nonsyndromic deafness is higher than syndromic hearing loss; nonsyndromic loss accounts for about 70 percent of genetic hearing loss. Some genetic causes are easier to identify than others through genetic testing. Usher's syndrome is one of the difficult ones; it can be caused by one of 400 mutations on eight different genes. Also, there are mitochondrial causes of hearing loss.

How is mitochondrial DNA different from the autosomal DNA?

The mitochondria are the part of each cell that provides the cell energy, and the mitochondria have their own genes made up of DNA. Those DNA are inherited from the mother, almost never from the father. Mitochondrial defects can be recessive or dominantly inherited, and can result in syndromes or in nonsyndromic hearing loss.

Typically, how has genetic testing routinely been conducted, and why is it that so few hearing-impaired infants receive genetic testing?

Getting genetic testing to become routine has been a challenge. One of the first challenges is obtaining an order from the primary care physician to perform a genetic test. Second, parents and physicians face the challenge of finding a lab to do the testing. Not all labs are licensed to do all the tests. Then, the physician has to decide which genetic cause should be tested for first.

Once the test is ordered (for example, Connexin), 10 cc of blood is drawn from the baby and sent to a laboratory. Approximately four to six weeks later, the physician receives the results. If the results are negative, the process is repeated with the next possible genetic cause. When testing is being performed sequentially like this, it can easily end up taking months or years to find a cause, and, of course, sometimes the cause will still not be known. That means the advantages of knowing the cause at an early age are lost. Because the process can be lengthy, expensive, and frustrating, physicians may be hesitant to order genetic testing.

How expensive is that form of genetic testing?

It ranges, generally from $300 to $1,500 per test.

But I understand that an alternative is now available, that allows less expensive, easier genetic testing.

Yes, physicians can order SoundGene™ testing, which was developed in conjunction with Pediatrix Medical Group, the organization I work for. SoundGene is based on a panel of the most common genetic and environmental risk factors for congenital hearing impairment. With just one test order, multiple common causes of hearing loss are tested for simultaneously—one environmental cause and 15 common genetic causes (SEE TABLE 1).

Which environmental cause are you looking for with the blood test?

We are testing for Cytomegalovirus (CMV) DNA.

You aren't doing an antibody titer?

No, we use polymerase chain reaction to amplify the circulating viral DNA in the baby's blood, and we target conserved areas of two viral genes. Only infants with high viral loads will be detected. CMV is thought to account for about 30 percent of the environmental causes of hearing loss, and it may be even more prevalent. This blood testing will allow identification of this environmental cause. So, let me step back and recap the process that I have described so far.

The incidence of deafness can vary over time and in different geographical regions; however, data from newborn screening programs suggest that the incidence of hearing loss is approximately 2–3 per 1,000 births. These hearing losses are thought to be caused by environmental factors 40 percent of the time and genetic factors the remaining 60 percent.

The SoundGene panel is comprised of testing for both the CMV environmental cause and common genetic causes. Congenital CMV infection is the most common environmental factor causing hearing loss. CMV affects on average one percent of newborns in the United States. Of course, not every baby with CMV infection has hearing loss. The overall risk of hearing loss in CMV-infected infants averages about 10 percent. The hearing loss caused by CMV may be unilateral, fluctuating, progressive in nature, and can be delayed in onset for months or even years. CMV is a DNA virus that circulates in the blood and other body fluids. This testing detects the CMV DNA, not the antibodies to the virus.

The Connexin 26 gene defect is the most common form of genetic deafness in the United States. The Connexin 26 and 30 mutations account for about 24 percent of all congenital hearing loss cases in newborns. The Connexin 30 and the four common Connexin 26 mutations included in this panel detect approximately 60–70 percent of all Connexin deafness, and approximately 14–17 percent of all congenital hearing loss cases.

The Connexin 26 mutations 35delG and M34T are most common in Caucasians; the 167delT is common in Ashkenazi Jews; and the 235delC mutation is common in Asians. Newborns with Connexin 26 deafness may have profound hearing loss at birth; however, some newborns with possible combinations of Connexin mutations and other mutations may pass the newborn hearing screen test but have hearing loss later in life.

Let's stop for a moment. You've used a lot of numbers. What do those numbers like 35delG mean?

The numbers refer to a certain place, or location, on a specific gene. If you were doing what is called gene sequencing, you would be looking at every unit of the gene for a possible

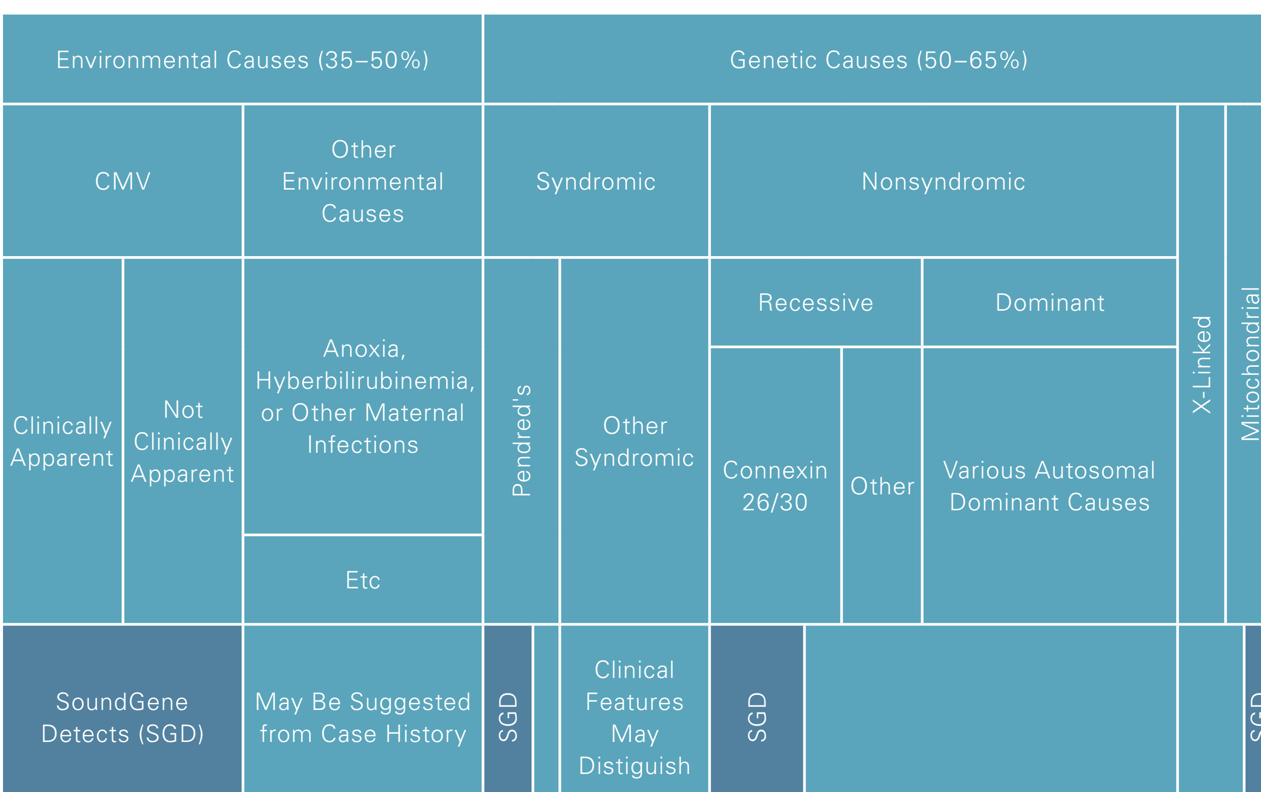

FIGURE 1. Approximate percentage of causes of neonatal hearing impairment and the relative proportion of each detected by SoundGene.

mutation of that gene along the way. In the SoundGene's genetic testing, we know that common genetic mutations occur in specific points in the gene. So SoundGene is looking at specific points or locations on the gene that are known to be places where mutations may occur.

So, you don't sequence the entire gene, you take your "genetic magnifying glass" out and look at specific locations to see if there is a genetic defect at that point?

Exactly. SoundGene looks at 15 specific points to see if a genetic mutation is present in those common problem areas. This also means that if the results are negative, there still could be a genetic mutation at a different location. Additionally, some genetic causes are harder to identify. For example, Usher's syndrome can involve multiple genes and therefore is not considered a "single gene mutation." As a result, it's significantly more challenging to detect through any genetic testing. While SoundGene does not currently test for Usher's, it does test for Pendred's, which is a syndromic cause.

Pendred's syndrome is caused by the SLC26A4 gene and accounts for about three percent of all congenital hearing loss cases, or about five percent of the genetic deafness causes. The hearing loss associated with this disorder has a variable age of onset from infancy to early childhood, and the hearing impairment can be severe-to-profound but tends to be progressive.

The disease also causes thyroid enlargement that may not be apparent until adolescence or adult life, thus complicating attempts to anticipate the hearing loss. The common mutations (L236P, 1001+1G>A, T416P, and E384G) have been shown to cover approximately 60 percent of Pendred's syndrome in the United States. These common Pendred's syndrome mutations will cover 1.8 percent of all congenital hearing loss cases. There are other genetic mutations for Pendred's that SoundGene does not currently test for.

I am looking at the list of tests included in the screening panel (SEE TABLE 1), and it also lists six mitochondrial mutations.

That's correct. Testing for the presence of six mitochondrial mutations will be included in the SoundGene panel. Mitochondrial mutations account for 0.6 to 20 percent of all congenital hearing loss cases in the United States (0.6 percent in Caucasians, 3.5 percent in Asians, and 20 percent in Hispanics). SoundGene tests some, but not all, of the mitochondrial mutations that have been associated with hearing loss. It's also possible that some of these mutations (SEE TABLE 1) might be false positives—they may occur in non–hearing-impaired persons as well. The field of genetics is not yet certain how common it is to find mitochondrial-caused hearing loss.

I am fascinated by the mitochondrial causes and often wonder if they are more common than previously thought. I believe that this is an important area for us in the future management of children with hearing loss.

Interesting.

Genetic causes of hearing loss is a topic that captures many physicians' attention—as well as how hearing loss etiology may relate to other body functions. When I speak to physicians about genetic testing, it gives me the opportunity to remind them of the importance of NOT considering a passed newborn hearing screen as the end of the story, especially in high-risk infants.

Physicians already recognize that their high-risk infants are at increased risk for motor development problems, vision problems, etc., and this provides me with an opportunity to reiterate the importance of being vigilant about monitoring the child's hearing health. I urge them to send high-risk children and their families to an audiologist to monitor and follow up on their conditions.

I love your passion about pediatric management! Returning to this specific test panel, the SoundGene panel will tell us the cause in what percentage of cases?

The figure in this article shows the estimated relative frequency of different causes of hearing loss. It's really not possible to know exact percentages at this point. There hasn't yet been enough genetic testing to know how common different etiologies are, but we think that SoundGene can be used in conjunction with other diagnostic approaches to help parents understand the cause of the infant's hearing loss, and know more about the prognosis for hearing loss progression.

How much blood needs to be drawn from the baby to do this testing?

A couple of drops, just enough to fill just two or three circles, each filled with a drop of blood. The filter paper has space for four circles, but really, we only need two.

Wow!

This is called dried blood spot testing. Although there is an array of DNA extraction kits commercially available, few can be used for dried blood spot testing. I believe that SoundGene is a highly efficient, cost-effective solution for screening the population for common causes of hearing loss.

I have heard of dried blood spot testing for newborn metabolic screening—where they take the sample of the baby's blood collected at birth to see if there were inborn metabolic errors. Can the same birth dried blood spot be used for other genetic testing as well?

Yes. The birth sample can be used for the SoundGene testing and is better for CMV testing when determining congenital versus acquired CMV infection. That birth sample can be used as long as the birth sample was stored properly and the blood hasn't been used up. When the blood spot is analyzed, for example, for metabolic disorders, tiny samples are punched out of the filter paper to perform testing. Some laboratories may need to perform repeated testing, so it depends on how many punches have been taken, and how the sample was stored. You can extract DNA for a long time, unless the sample has been stored in a harsh environment, such as extreme heat.

How long is the birth sample retained?

This can vary from state to state. Some states keep the sample only a couple months and then destroy it, while other states may keep the sample as long as 21 years.

In general, the reason the birth sample is used is for the CMV part of the test, since CMV can be acquired after birth.

Let me just be sure I'm understanding correctly. You say you test for the cytomegalovirus's DNA—if the baby is older than a couple days, then you can't determine if the exposure was prenatal?

Correct. To determine whether a positive CMV is congenital, if it occurred before birth, versus acquired after birth, the blood for the screen should be collected within two weeks after birth. The panel can test for CMV at any age but will not be able to determine whether the positive for CMV is congenital versus acquired. If the birth bloodspot can be retrieved and there is enough blood to collect from the birth sample, the panel can run all tests on the sample.

What does it cost to have SoundGene testing? Is the cost typically covered by insurance?

The cost of the entire SoundGene screen, which tests for most forms of Connexin, and Pendred's, and for select mitochondrial causes and for the presence of CMV, is $198. I really don't know if insurance covers the test; we do not bill insurance companies. We are billing the hospital laboratory, the patient, or the physician office. But I have been told that if it is a "medical necessity," it has a higher likelihood of receiving payment from third-party payers.

In some cases, it's not just the baby who is tested, but parents and/or siblings are also sometimes tested. In fact a lot of our testing is being done on adults and older children.

So, SoundGene tests for the more common nonsyndromic genetic causes from most of the Connexin defects and looks for the presence of CMV DNA in the blood, but you don't test for syndromic causes because those can be detected from clinical signs?

Also of Interest

In the News article: "Genetic Counseling, Connexin Genes, and the Role of the Audiologist: Interview with Ali A. Danesh, PhD"

Log in to www.audiology.org and search key words "genetic counseling."

If the SoundGene panel results are negative, this does not necessarily mean that the patient is negative for genetic or environmental causes.

Basically, yes, that is correct, except for Pendred's, which is syndromic, and we do test for that. It can be hard to recognize from clinical features alone at birth, and because it's important to monitor and treat that baby if and when the hypothyroidism becomes an issue.

And the total cost is $198? That's great; that's less than the traditional test for one single cause of genetic loss. If a genetic defect is found, what happens? Does a report go to the physician, the parent, or the audiologist?

SoundGene testing must be directly managed by a physician. There are genetic counselors who call the physician in the event of a positive result. The physician will manage the care of the patient and also discuss the results with the patient's parents. The patient's parents cannot be given the results directly from the lab.

I don't suppose that I, as an audiologist, can draw the baby's blood and order the test?

No, it is not within the professional scope of an audiologist to order, draw blood, or manage the SoundGene screen. However, the audiologist can make the SoundGene packets available to their patients or the patient's parents, which they can then take to the physician to have the test ordered and the blood drawn. This makes the process easier for parents and physicians by having the packets available to be able to do the test.

Furthermore, the physician can write the test order for the patient so blood can easily be drawn either in the physician office or in a laboratory. Again, only a few drops of blood are needed from the patient's heel, if a baby, or finger, if a child or older person. Alternatively, the physician can arrange to have the birth blood spot used if it is available.

You mentioned SoundGene "packets"?

The SoundGene packet is an envelope that contains the filter paper for the actual blood spot collection, educational letters for the parent and physician, payment information, and a prepaid postage envelope for overnight delivery to send the sample to the lab for testing. Once the sample is received at the lab, results are usually available in less than 72 hours.

So I can keep the "packets" in my office, and give it to the parents to take to their pediatrician or ENT, or send it with my report to the physician?

That's correct.

How do I order the packets, and what do they cost me?

You can order by contacting SoundGene at 877-220-1070 or gail_lim@pediatrix.com or www.soundgene.com.

There is no charge for packets to have them available for your patients.

I hope you have staff ready to answer that toll-free number!

Actually, that number rings directly to me. I am available to answer questions 24 hours a day, and the primary reason for that is because the SoundGene test is fairly new to some physicians, so I want to be available to help answer questions from genetic counselors, audiologists, pediatricians, or neonatologists.

So, if I'm understanding correctly, this is great, SoundGene looks for 15 of the most common genetic causes and for a common environmental cause: CMV. But there are hundreds of genetic causes of hearing loss, so a negative test doesn't mean that the hearing loss is not genetic?

Correct. If the SoundGene panel results are negative, this does not necessarily mean that the patient is negative for genetic or environmental causes. There may be yet another type of genetic or environmental cause that was not tested in the panel.

It sounds like what SoundGene does is a lot like the metabolic testing done at birth.

Yes, it's a very similar process. In the genetic metabolic disorder screening they are examining for genetic defects for things like fatty acid disorders, cystic fibrosis, etc., and they are looking for point mutations for these common genetic metabolic disorders. Also, in metabolic genetic screening, a negative does not necessarily mean a negative result. There still can be disorders caused by other mutations that were not tested.

State newborn screening programs look for genetic metabolic disorders, but I am not aware of any state that is routinely testing for genetic causes of hearing disorders. There is a state metabolic test that is associated with hearing loss called Biotinadase. There are significant benefits for testing for genetic hearing loss, as well as for all the reasons audiologists well know about early identification and treatment of hearing loss.

You've mentioned Pendred's as one of those disorders where knowing the cause of the hearing loss helps with medical management.

Yes, and CMV is another. This is a disease that may affect neurological and motor development and vision as well as causing hearing loss. The baby with CMV needs to be monitored by a physician for medical management, and also needs ongoing audiological evaluations.

And knowing if the loss is due to Connexin, which often progresses to severe-to-profound loss, might impact hearing habilitation.

Yes, if you know a baby has Connexin-related deafness, the baby may need cochlear implants as a management choice, and more knowledge about the cause of hearing loss leads to better audiology management.

In the interest of full disclosure, you mentioned that SoundGene is a product from your company, Pediatrix. Where else can I go for this sort of blood spot genetic analysis?

I am not aware that there are any other "bloodspot" screens currently available for detecting causes of hearing loss other than SoundGene. The purpose of developing this screen was to make the testing of the most common genetic and the most common environmental causes of hearing loss easily available for physicians and patients.

Thank you, Dr Lim. I think audiologists will appreciate knowing about the availability of this test.

My pleasure speaking with you. A frequent question that parents may ask the audiologist is: "What caused my child's hearing loss?" I think SoundGene gives audiologists an avenue to facilitate testing for causes of hearing loss. Hopefully this will also help close the gap from detection to diagnosis and ultimately toward intervention.

Teri Hamill, PhD, is a professor of audiology with Nova Southeastern University, in Ft Lauderdale, FL.

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DO MIDDLE SCHOOL STUDENTS SET SAFE VOLUME LEVELS FOR ROUTINE IPOD USE?

A COMPARISON OF MONAURAL VERSUS BINAURAL LISTENING TRENDS

BY CAROLINE K. SNOWDEN AND DAVID A. ZAPALA

A middle school student researches the habits of her peers when selecting the volume level on personal listening devices. The study concludes that most middle schoolers select unsafe volume levels, and their monaural listening behavior results in further risk to their hearing health.

This study investigates whether middle school students set safe volume levels for routine iPod use and whether monaural listening, as opposed to binaural listening, affects selected volume levels. Results show that the majority of middle school students set unsafe volume levels, and chosen monaural volume levels are significantly greater than binaural volume levels. Age and sex had no significant effect on selected volume levels.

Background

Apple iPods have become increasingly popular as personal listening devices that are less bulky and able to hold more songs than their predecessors. However, as other authors have noted, the iPod could potentially pose a weighty threat to auditory safety (Fligor, 2007; Kean, 2010). Some iPods have been found to reach volumes as high as 111 dBA, a volume that can potentially damage hearing after one minute of exposure (Fligor, 2006). With 22,727,000 iPods sold in the first quarter of the Apple corporation's 2009 fiscal year (Apple Inc., 2009), these ubiquitous listening devices have become a potential health issue demanding further exploration.

Recent studies have revealed that the majority of iPod owners are younger than 30 (CNET News, 2005; Dwase, 2006; Kleinschmit, 2006). Of particular interest is the ownership of iPods among teenagers and children. A 2008 survey reported that 73 percent of respondents aged 12–17 owned an iPod/MP3 player (Rose and Lenski, 2008). One study reported a 12 percent incidence of noise-induced hearing loss (NIHL) in child and teenage subjects (Wang, 2008). However, few studies have been conducted to determine whether these statistics are related; those that test the volumes that individuals select generally focus on young adults, aged 18–30 (Fleming, 2007).

Of additional interest is a new trend observed among the teenage community: monaural listening. Many individuals with a set of in-the-ear headphones, or "buds," attached to a single portable music player utilize one bud in each ear as intended. However, a practice commonly observed among teenage users is the sharing of a pair of earphones with a friend, so that each listener employs only one bud. Alternatively, some listeners use only one earphone in order to remain at least partially aware of their surroundings. The effect of monaural listening on volume selection, particularly among this age group, has also not been studied.

Purpose

This study sought to determine whether the average 12- to 14-year-old chooses safe volume levels for routine iPod listening and whether the use of one headphone (monaural listening) or two headphones (binaural listening) affects the volume that is set. This study also sought to establish the possible effect of age and sex on selected volume levels, listening duration, and subjective assessment of intensity.

Methods

All procedures in this study were approved by a school district-designed human subjects review process as outlined in the *International Rules for Precollege Science Research: Guidelines for Science and Engineering Fairs 2008–2009* for middle school science fair projects set forth by the Society for Science and the Public (www.societyforscience.org/isef).

Test Participants

Subjects were recruited from the population of middle school students attending the school of the researcher. Written informed consent was obtained from each subject and a parent or legal guardian of each subject.

Test Setup

Subjects were tested in a quiet environment, with a background volume level of approximately 54–57 dBA. A Fonix FP40-D precision sound level meter with spectrum analyzer (Frye Electronics Inc., Tigard, OR) was used to collect measurements. Input was obtained through a microphone attached to a HA-1 2 cc coupler.

Two pairs of iPod headphones (Apple Inc., Cupertino, CA) were labeled Set 1 and Set 2. They were plugged into an iPod splitter, the two jacks of which were labeled Jack 1 and Jack 2. Each pair of headphones was plugged into the jack with the corresponding numbers. Before subject testing, tests verified that the earphones of both sets emitted the same intensity of sound when the same song clip was played at the same level of iPod volume setting by comparing the overall level of each transducer on the FP40-D.

The right earphone of Set 1 was centered and attached over the “canal” of the HA-1 coupler. Plastic modeling clay (Silly Putty, Crayola Inc., Easton, PA) both attached the headphone to the coupler and acted as a barrier to outside sound.

With each testing session in a new location, the researcher verified that the right earphone of Set 1 was consistently emitting the same level of volume as it had during other tests of the same clip of music at the same volume. The researcher also ensured that the output of the iPod did not exceed 110 dBA by using the volume lock feature of the iPod. Subjects were thereby prevented from setting the volume of the iPod above 110 dBA, the safe volume level established by NIOSH (National Institute for Occupational Safety and Health) (Wang, 2005) for 80 seconds of exposure. The maximum time of sound exposure for each subject was 80 seconds.

Volume Selection Procedure

Each subject was asked to listen to a 20 second music clip and to set the volume of the iPod to the volume to which they would listen on an iPod of their own. Each subject was read the same script directing him or her through the testing procedure. The same 20-second trial was conducted four times: twice with both earphones and once each with a right and left earphone only. Four calculated

Table 1. Selected Subjective Volume Levels vs. Selection of Safe Volume Levels

Subjective Volume Level	Percentage Who Set Unsafe Volume Levels
2	14%
3	33%
4	74%
5	100%

volume levels (CVLs) were measured: two binaural CVLs and a right and left monaural CVL.

Self-Estimation of Volume Levels and Weekly Listening Habits

Immediately after the selection of volume levels, the subjects were asked to complete a survey asking them to self-assess their overall selected volume level and to estimate their weekly listening time. The surveys were completed outside of the room and later collected for analysis.

Data Collection

At the completion of each trial, a spectrum analysis was printed and labeled with the appropriate trial and subject number. These printouts were affixed to the corresponding subject's survey, which was collected after testing.

Analyses

Data were tabulated using Microsoft Excel. All statistics were calculated using GB statistics software, version 9 (Dynamic Microsystems, 2002), with a p value of <0.05 indicating significance.

Average Monaural, Binaural, and Overall Selected Volume Levels

The researcher developed an average binaural SVL (BSVL) for each subject from the two binaural trials and an average monaural SVL (MSVL) for each subject from the monaural trials of the right and left ear. An overall selected SVL was calculated by averaging the results of all four trials.

Calculation of a Safe Level of Volume

The researcher calculated a safe level of volume for each subject based on his or her reported exposure time, using the formula

$$t = 28{,}800/2(L - 85)/3,$$

solved for L, where t = the duration of sound exposure in seconds per day and L= the intensity of the sound in dBA. This formula was the basis for guidelines published by NIOSH (1998). When solved for L, it became the equation

$$L = \log 2[(28{,}800/t)^3] + 85.$$

Determination of Safe/Unsafe Volumes

The calculated safe volume level L, hereafter called the CSVL, was compared to the average SVL of each subject. If SVL > CSVL, then the researcher concluded that the subject was listening to unsafe volume levels. If SVL ≤ CSVL,

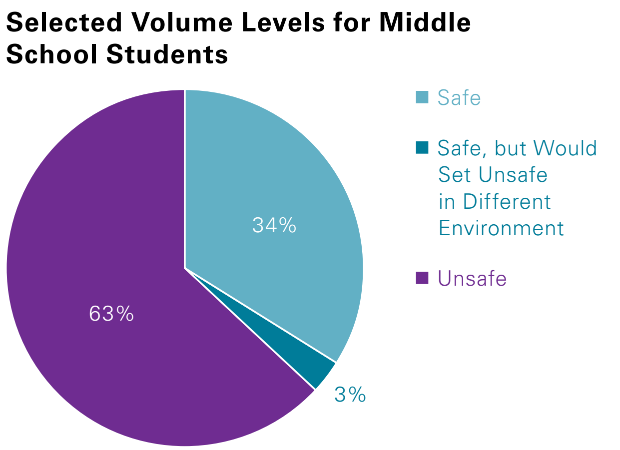

FIGURE 1. The majority of subjects set unsafe volume levels.

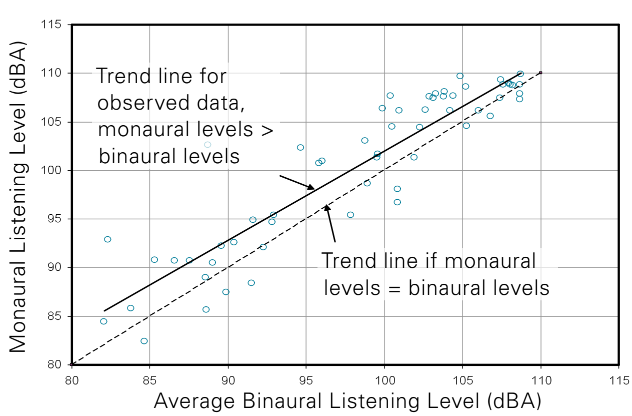

FIGURE 2. The difference between these two trend lines shows that monaural volume levels are greater than binaural volume levels. Without the ceiling effect, the slopes of these lines would probably be approximately equal and separated by 3 dB.

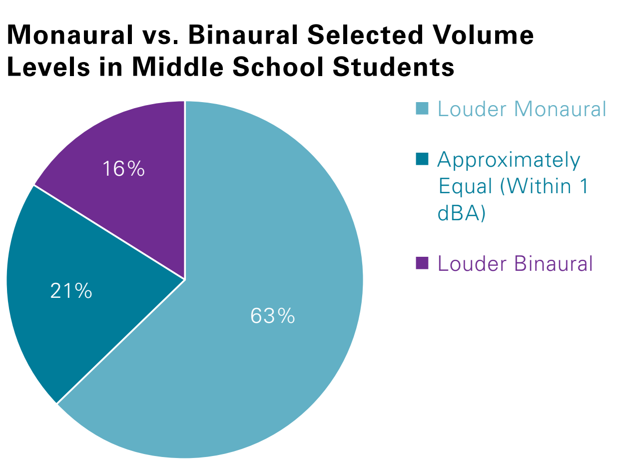

FIGURE 3. The majority of subjects had greater monaural volume levels than binaural volume levels.

then the researcher concluded that the subject was listening to safe volume levels. Safety ratios were calculated, using the formula

SR = CSVL/(MSVL, BSVL, or SVL).

Safe/unsafe volume could also be determined using these ratios: if SR ≥ 1, the volume level was safe, and if SR < 1, the volume level was unsafe. Safety ratios were statistically analyzed.

Comparing MSVLs and BSVLs

MSVLs and BSVLs were compared and statistically analyzed to determine whether the subjects selected greater monaural or binaural volumes.

Analyzing Judgment of Intensity

The self-reported intensity of each subject's SVL was expressed as an integer on a scale of 1–5 (1 being the least intense and 5 being the most). The researcher tabulated these data to show the percentage of subjects within each subjective level that set unsafe listening volumes.

Determining Effects of Sex and Age

The BSVLs, MSVLs, overall SVLs, safety ratios, and exposure time of males and females were compared and statistically analyzed. The influence of subject age (in years) was similarly analyzed.

Results

A total of 58 middle school student subjects (24 males and 34 females) volunteered to participate as subjects. Subject ages ranged from 12 to 14 years. Overall, 63 percent of subjects set unsafe volume levels (FIGURE 1). Breaking this down by listening configuration, 65 percent of monaural selected volumes were unsafe, and 53 percent of binaural selected volume levels were unsafe. Additionally, 31 percent of subjects set or wished to set the testing iPod to its maximum volume setting of 110 dBA.

Monaural selected volume levels were significantly higher than binaural selected volume levels ($t = 4.87$, $p < 0.0001$), with a consistent approximate 2 dBA difference (FIGURE 2). Selected monaural volume levels were greater than binaural levels in 63 percent of subjects. Binaural volume levels were greater than monaural in 21 percent of subjects. Binaural and monaural levels were approximately equal in 16 percent of subjects (FIGURE 3).

Of subjects whose self-reported intensity estimates were 2 out of 5 (listening level judged to be not very loud), 14 percent set unsafe volume levels. Further, 33 percent of subjects who rated themselves a 3 out of 5 set unsafe volume levels; 74 percent of subjects who rated themselves a 4 out of 5 set unsafe volume levels; and 100 percent of those who rated themselves 5 out of 5 set unsafe volume levels (TABLE 1). Even among those who judged themselves as setting volume levels that were average (3) or below average (2), a relatively large percentage still set unsafe volume levels.

Age and sex had no statistically significant effect on the variables tested. Age and sex had no effect on the difference between monaural and binaural volume levels ($F = 0.622$, $p > 0.1$), no effect on exposure duration ($F = 0.662$, $p > 0.1$), and no effect on the safety of selected volume levels ($F = 0.417$, $p > 0.1$).

Discussion

Noise exposure can speed the process of hearing degeneration, resulting in NIHL (NIDCD, 2008). With 63 percent of subjects in this study setting unsafe volume levels, the data suggest that the listening habits of middle school students may be increasing their risk of NIHL. The volume selection habits of 12- to 14-year-olds have not previously been studied. One may speculate that as age and personal autonomy increase, iPod ownership and selected listening volumes will also increase. The unsafe listening habits in 12- to 14-year-olds are particularly significant because of the cumulative nature of NIHL. Previously, one might begin to risk hearing loss during young adulthood, as one entered the workplace. As these data show, iPod listeners of only 12–14 years of age are regularly exposed to unsafe volume levels. If this usage trend continues, hearing loss in the future population may not only be more widespread but also occur earlier in life.

There is a paucity of research about the effects of monaural listening. Anecdotally, this trend appears to be increasingly widespread: sometimes a student may wish to share music with a friend, or retain partial awareness of one's surroundings. This practice is more likely than traditional binaural use to lead to the selection of unsafe listening levels.

These data suggest that many of the subjects in this study, though risking NIHL by setting unsafe volume levels, did not see their behavior as risky. They inaccurately judged the intensity of their selected volume level. Because adolescent judgment is not sufficient to protect students from sounds of dangerous intensity, perhaps it is now necessary to use objective volume limits. For the present, it may be wise to use the volume lock feature on the newer iPod models, establishing a safer maximum volume setting. Manufacturers of portable personal listening devices like the iPod could also limit the output of their units and headphones in future models.

Another potential way to aid listeners in setting safe volume levels would be to develop an iPod application visually indicating safe and unsafe volume levels. As a treadmill is programmed with a person's weight and then able to calculate that individual's calorie output, an iPod could be programmed with a person's listening duration, and then calculate that person's safe volume level. Ideally, just as all songs on iTunes currently list an artist name, title, and genre, they could also come with a dBA level of the song at each volume setting. Then, the volume bar on the screen of the iPod would turn red when set to a volume level above the individual's safe level, and green when set below it.

None of these changes will occur without education. People must be made aware of NIHL and helped to differentiate safe from unsafe sound. Unlike other injury, hearing loss shows no symptoms until its permanent manifestation. Without education and action, many 12- to 14-year-olds may one day discover that their teenage listening habits carried a higher price than they imagined.

Conclusion

The majority of middle school students in this study, regardless of age or sex, did not set safe listening levels for routine iPod use. Monaural volume levels are significantly greater than binaural volume levels. Accuracy of subjective judgment of intensity among middle school students is poor. These results suggest that without additional feedback, many middle school students will self-select listening levels that are loud enough to risk hearing loss, and they will not perceive that this sound exposure may be damaging to their hearing. Moreover, the practices of listening with only one ear bud or sharing an ear bud with a friend may increase overall sound exposure to more damaging levels.

Caroline K. Snowden is a freshman at Ponte Vedra High School in Ponte Vedra Beach, FL.

David Zapala, PhD, is an assistant professor in the Mayo School of Medicine and a senior consultant in audiology at the Mayo Clinic in Jacksonville, FL. This project was completed as a middle school science fair project. It won first place in the 2009 Florida State Middle School Science Fair Competition.

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Also of Interest

"Stereos, MP3s, and Hearing Loss: Interview with Brian J. Fligor, ScD." Log in to www.audiology.org and search key words "MP3s and hearing loss."

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ARC10 IN WITH THE OLD: NEW RESEARCH ON AGING AND HEARING HEALTH

PART 1 OF 2

IN REVIEW

By Larry Humes

It was my pleasure to chair the Academy Research Conference (ARC) 2010 Program Committee, with Robyn Cox, Judy Dubno, Sandy Gordon-Salant, Benjamin Hornsby, and Beth Prieve as committee members, and to chair the actual program on April 14, 2010, as well. The Program Committee put together an excellent slate of presenters, beginning with a broad overview of the problem of age-related hearing loss, and the risk factors associated with this increasingly common disorder, by the conference keynote speaker, Karen Cruickshanks, and then progressing through the auditory system from the periphery to the cortex. It is my additional pleasure to report that ARC 2010 was supported, in part, by a conference grant from the National Institutes of Health (NIH) (R13 DC010934), the Academy's first NIH grant.

In what is hoped to become a regular feature of future ARC meetings, these excellent presentations have been summarized for *Audiology Today (AT)* in a series of brief synopses, beginning in this issue with Karen Cruickshanks' presentation on the epidemiology of age-related hearing loss and underlying risk factors, followed by the two presentations on age-related changes in the auditory periphery. For the latter two, Richard Schmiedt presents an overview of his group's work on an animal model of presbycusis and Pam Souza and Kathy Arehart discuss age-related changes in auditory perception, including implications for treatment.

In the September/October 2010 issue of *AT*, the remaining four presentations will be summarized, including two on age-related changes in the auditory portions of the central nervous system, with Robert Frisina focusing on neurobiological changes in animal models and Kelly Tremblay describing observed deficits in the responses evoked by complex sounds in the central pathways of humans. That issue of *AT* will conclude with two presentations concerning age-related changes in higher levels of processing, including cognitive and linguistic processing, with summaries by Mitchell Sommers and Kathy Pichora-Fuller.

On behalf of the ARC 2010 Program Committee, I hope you find these brief summaries of value. I believe you will find each to provide a reasonable summary of the presentation of information that may assist you in your research or in your clinical work with older adults. If they pique your interest, as I'm sure they will, they should also provide a gateway to additional, more detailed sources of information on each topic.

Larry E. Humes, PhD, is a distinguished professor, Department of Speech and Hearing Sciences, Indiana University, Bloomington, IN. Dr. Humes was the chair for ARC10 and the principal investigator for the conference grant. He received one of the American Academy of Audiology's 2010 Presidential Award for service to the Academy.

AGE-RELATED HEARING LOSS: DEMOGRAPHICS AND RISK FACTORS

By Karen J. Cruickshanks

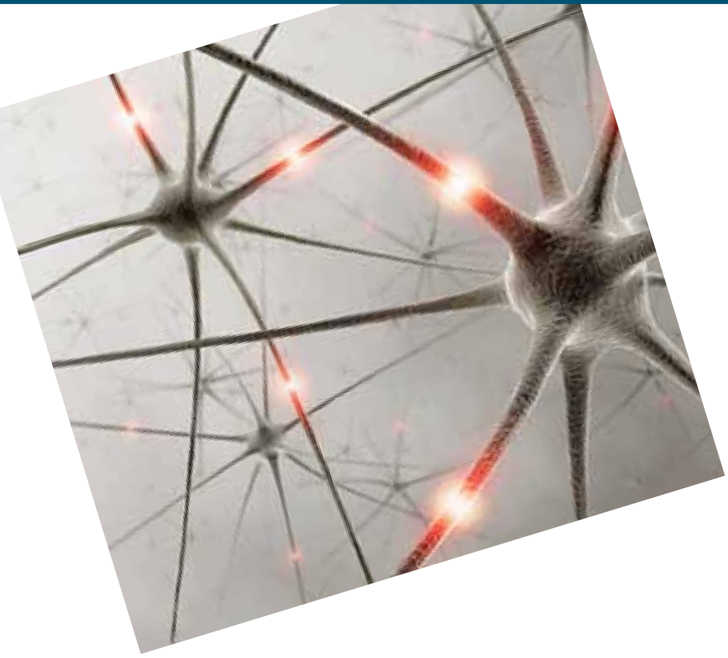
The project described was supported by R37AG11099 from the National Institute on Aging and R01AG021917 from the National Institute on Aging, National Eye Institute, and National Institute on Deafness and Other Communication Disorders. The content is solely the responsibility of the authors and does not necessarily reflect the official views of the National Institute on Aging or the National Institutes of Health.

Age-related hearing loss (ARHL) has been recognized as a problem for older adults since the ancient Egyptians and Greeks (Ptah-Hotep and Hippocrates), but with the aging of baby boomers, a large number of adults will be at risk for hearing loss and need hearing health-care services. The patterns of ARHL in populations can provide important evidence that ARHL is at least partially preventable if there is variation in the rates of disease by characteristics such as gender, race or ethnicity, time, geographic location, or other exposures/behaviors.

Population-based epidemiological studies have demonstrated that the prevalence of ARHL is high, affecting 46 percent of adults over age 48, and the incidence is high as well with 1 in 25 older adults developing ARHL in a five-year period (Cruickshanks et al, 1998 and Cruickshanks et al, 2009). Other epidemiological studies have reported that African Americans and Latinos may be less likely to have ARHL than non-Hispanic whites (Agrawal et al, 2008; Cruickshanks et al, 2010).

Early epidemiological studies by Rosen and his colleagues demonstrated that rural Africans maintained good hearing thresholds at older ages, perhaps because of their quieter environment, low prevalence of hypertension, and healthier lifestyles (Rosen et al, 1962). He later studied ARHL in countries with high and low rates of cardiovascular disease (CVD), and ARHL was more common in areas with high rates of CVD compared to those with low rates of CVD (Rosen and Olin, 1965; Rosen et al, 1970). Finally, he added hearing testing to a dietary trial to lower cholesterol in Finns, and found that a less atherogenic diet appeared to protect, and possibly improve, hearing during the follow-up (Rosen et al, 1970).

Population-based epidemiological studies have demonstrated that the prevalence of ARHL is high.



More recent epidemiological studies have added to the evidence that cardiovascular disease, its risk factors such as smoking and lower socioeconomic status, and diabetes may be associated with ARHL (Cruickshanks et al, 2010). However, not all studies have found consistent results, perhaps because of differences in selection criteria for study subjects, measures of ARHL, or analytic methods. Nonetheless, there is fair evidence that vascular factors are associated with ARHL although longitudinal data are needed to confirm these patterns.

Taken together, the data reviewed support the notion that ARHL is not a necessary and inevitable consequence of aging, but like heart disease and dementias, have multiple determinants. Genetic factors also are important, and several groups have found suggestive regions in recent genetic studies (DeStefano et al, 2003; Huyghe et al, 2008; Friedman et al, 2009; Raynor et al, 2009). Nonetheless, identifying the modifiable lifestyle factors associated with the development of ARHL might lead to effective interventions more quickly than gene-based approaches.

One key piece of evidence that ARHL is preventable comes from a recent paper by Zhan et al (2010), which demonstrated that the age-specific prevalence of ARHL declined for people born between 1905 and 1964. For each five years later in birth, men were 13 percent and women were six percent less likely to have ARHL than people born in earlier periods. Thus, the age-specific prevalence of ARHL in men was almost 50 percent lower for baby boomers born in the 1950s than men born 20 years earlier. This birth cohort pattern is a type of temporal change and likely is due to modifiable exposures/behaviors as genetic changes occur more slowly.

Comparing participants ages 50–59 who were examined in 1993–95 as part of the Epidemiology of Hearing Loss Study and similarly aged participants during 2005–2008 in the Beaver Dam Offspring Study, we know that the use of lipid-lowering statin medications has increased from 3.4 to 21.1 percent, total cholesterol levels are lower (236 vs 208 mg/dl), and smoking rates are lower (56.5 vs. 49.2 percent).

While we do not know if these cardioprotective changes have contributed to the lower prevalence of ARHL in more recent generations, it is possible that changes made to prevent other disorders of aging may have the unexpected side effect of helping to preserve hearing as we age. Although much work remains to be done to understand why hearing worsens with aging, the epidemiological evidence to date shows there is significant variation in the rates of ARHL by characteristics such as gender, race, or ethnicity; time; geographic location; and other exposures or behaviors, providing exciting directions for future research as we work to improve hearing health for tomorrow's older adults.

Karen J. Cruickshanks, PhD, is a professor with the Department of Ophthalmology and Visual Sciences and Department of Population Health Sciences, School of Medicine and Public Health at the University of Wisconsin, in Madison, WI.

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Also of Interest

ARC 2010 PowerPoint presentations are available online.

ARC 2011 takes place in Chicago, April 6, the first day of AudiologyNOW!® Mark your calendars for this event focusing on the evaluation and treatment of tinnitus.

www.academyresearchconference.org

AGING AND THE AUDITORY PERIPHERY

By Rick Schmiedt

Age-related hearing loss, as its name implies, refers to hearing loss (HL) that comes about solely because of age. For the audiologist, human clinical observations and interpretations are complicated by previous exposures to noise, ototoxic drugs, diet, other life-style choices, and genetics. Recent results obtained from nonmutant animal models are now helping us understand how the cochlea declines with age in a controlled environment. Other animal models have shown us the anatomical and functional deficits that occur after exposures to noise and drugs. Can we use the different animal models to help us ascertain more clearly the human condition from audiological tests such as the audiogram? We believe it is now possible to do just that.

In short, noise and drug injuries are largely confined to the outer hair cells (OHCs) that form the basis of the cochlear amplifier. Yes, there is some random loss of OHCs with age, even in non–noise-exposed animal models; however, the models have shown that presbycusis is typically not a sensory problem. In quiet-raised animal models, many show the greatest age-related OHC losses in the apical (low-frequency) region of the cochlea, rather than at high frequencies where it is normally seen in humans, especially after noise and drug exposures.

Not much appreciated until recently is that aging is more likely to affect the power supply to the cochlear amplifier; that is, the 90 mV endocochlear potential (EP) found in the scala media fluid (endolymph). This DC potential is maintained by cells within the lateral wall and the stria vascularis. Because of their high metabolic rate, aging preferentially kills off these cells, gradually reducing the EP from 90 mV down to 60–30 mV throughout the cochlear duct. This latter scenario essentially describes metabolic presbyacusis.

So how does the reduced EP affect HL? It turns out that the cochlear amplifier is exquisitely sensitive to the EP in a manner dependent on cochlear place. In the cochlear base, the relationship is at least 1 dB HL per 1 mV decline in EP, and the cochlear amplifier can have a gain of between 50–70 dB at high frequencies. In the apex, the amplifier is less sensitive to changes in EP and has a total gain of and about 20 dB. Putting these results together yields the classic audiogram configuration seen with pure age-related hearing loss: a flat loss between 10 and 30 dB up to about 1 kHz, coupled with a gradually increasing loss at higher frequencies.

What about suprathreshold tests? It is well-known that OHC lesions severely reduce or eliminate cochlear nonlinearities such as otoacoustic emissions (OAEs). But in animal models of metabolic presbyacusis, emissions are reduced somewhat, but they are very much still present. Thus, another delineator between sensory and metabolic presbyacusis is the absence or presence of OAEs, respectively.

Putting this all together suggests the following interpretations of audiogram configurations with regard to age-related hearing loss. First, normal low-frequency thresholds coupled with a sharp transition to a high-frequency HL of between 50–70 dB are the result of substantial OHC lesions in the cochlear base. Moreover, OAEs at high frequencies in the region of OHC loss will be largely absent but should be robust at low frequencies. These results strongly suggest sensory presbyacusis with a demographic of more males than females.

Second, a mild flat 10–30 dB HL below 1 kHz coupled with a gradually increasing loss at higher frequencies is indicative of EP reduction, not OHC loss. OAEs in this case should be reduced but still present across frequency. These results strongly suggest metabolic presbyacusis with a demographic of more females than males and advanced age.

And third, a mild flat HL below about 1 kHz combined with a sharp loss at higher frequencies is suggestive of a

AGING, AUDITORY PERCEPTION, AND HEARING AIDS

By Pamela Souza and Kathryn Arehart

A longstanding body of research demonstrates that older listeners have more difficulty hearing speech in noise and that this difficulty is due in part to reduced audibility that accompanies peripheral threshold changes. However, recent work shows that older adults without significant hearing loss also have difficulty recognizing speech in the presence of other talkers. For example, we found that compared to younger listeners, older listeners required a larger signal-to-noise ratio to understand speech-in-speech task, and reported that they had more difficulty hearing in such situations in their daily life, even when those listeners had normal or near-normal audiograms.

We have explored the possible role fine structure might play in age-related changes in speech perception. The ability to separate a target and competing speech combination of the above configurations. Obviously, OAEs will be largely absent at high frequencies in areas of OHC loss but may still be present at low frequencies. These results denote a combination of both sensory and metabolic presbyacusis with a demographic of more males than females and advanced age.

Evidence to support these hypothesized configurations and related changes in auditory function may be found by analyzing our large database of audiometric tests of older adults participating in an ongoing longitudinal study of age-related hearing loss. Those studies are ongoing (see Humes and Dubno, 2010; Schmiedt, 2010).

Rick Schmiedt, PhD, is a professor emeritus with the Department of Otolaryngology-Head and Neck Surgery at the Medical University of South Carolina in Charleston, SC.

Acknowledgments. We thank Judy Dubno, Lois Matthews, Jayne Ahlstrom, and Jack Mills for their contributions. Work was supported by grants from NIH/NIDCD and NIH/NIA.

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signal depends, in part, on the ability to perceive fine structure. Fine structure refers here to the ability of the auditory system to resolve low-frequency harmonic cues. Among other things, fine structure provides cues to voice pitch and for tracking intonation. When there are multiple talkers, the ability to perceive voice pitch enables us to follow one talker in the presence of another—exactly the situation that older listeners are reporting. Accordingly, we explored fine structure perception by older listeners as a possible source of reduced speech-in-speech perception (Souza et al, submitted; Arehart et al, in press).

We reasoned that in a real conversation, listeners would have to detect differences in voice pitch between talkers, track voice pitch over time, and follow one talker in the presence of another talker. Accordingly, in our first task, the fundamental frequency (F0) difference limen was measured for vowels. In the second task, listeners relied on variations in F0 to judge intonation. In a third task, listeners were asked to identify competing vowels where the F0 separation between concurrent vowels was varied.

For all tasks, three conditions were created: (1) vocoding, which preserved periodicity cues to F0 but eliminated fine structure; (2) a simulated electroacoustic condition, which consisted of high-frequency vocoding combined with low-pass filtered speech and offered both periodicity and fine-structure cues to F0; and (3) an unprocessed condition.

Results showed that older listeners had more difficulty distinguishing between voices that were similar in pitch and had more difficulty tracking voice pitch over time. When there were two competing voices, separation of the voices in pitch was more helpful to the younger listeners than the older listeners. All of the younger listeners were able to use fine structure to improve performance (relative to the vocoded condition), but some older listeners were not.

We next reviewed data on device settings for older listeners. We expected that older listeners who were less sensitive to fine structure might rely to a greater extent on envelope cues to speech. We know that older listeners' performance is poorer with more extreme compression settings, particularly for low-redundancy speech (Jenstad and Souza, 2007). Other investigators found that some older listeners performed more poorly with fast-acting than with slow-acting WDRC, particularly in noise (Gatehouse et al, 2006; Lunner and Sundewall-Thoren, 2007). Critically, that work also pointed out that the determining factor was not age per se but reduced cognitive ability, which may accompany aging.

We can summarize the work in this area as follows. As a group, older listeners have poorer perception of fine structure, although there is also variability among older listeners. This likely makes them more susceptible to distortion of the speech envelope by signal processing such as WDRC. It is unclear whether this is due to peripheral deficits, such as reduced neural synchrony, or to a change in higher-level cognitive processes. It is possible that older adults with higher cognitive ability may be able to compensate for peripheral distortion.

With regard to hearing aid settings, a conservative approach is to simply avoid envelope distortion (from fast-acting or high compression ratios) in older listeners. Indeed, some hearing aid manufacturers have already adopted this approach in their fitting software. However, this means potential loss of improved audibility for those older listeners with tolerance for envelope distortion. Instead, our work suggests a different direction: to identify the factors that underlie variability among older listeners. A better understanding of the variability among older adults with hearing loss may guide development of tests that identify individuals who cannot benefit from "standard" device parameters. With that information, we could fit a hearing device as part of a comprehensive rehabilitation plan that considers individual peripheral and cognitive abilities. Such tests are not yet available, but our work in that area continues.

Pamela Souza, PhD, is a professor with the Communication Sciences and Disorders Department at Northwestern University, in Evanston, IL.

Kathryn Arehart, PhD, is an associate professor with the Speech, Language, and Hearing Sciences Department at the University of Colorado, in Boulder, CO.

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Advocacy: What Is That?

Kari Morgenstein

Hometown: Long Grove, IL

Current School: 2nd-year AuD student, University of Florida, Gainesville, FL.

Undergraduate Degree: BS in Speech and Hearing Science, Indiana University in Bloomington, IN

Why Audiology? For many years, I have worked with children with various disabilities and been passionate about helping others. Audiology is a field that will allow me to use my passion for helping others and to make a difference in the lives of many people.

Role Models: My parents.

Quote to Live by: "When you do the common things in life in an uncommon way, you will command the attention of the world."
—George Washington Carver

What does it mean to advocate? I think when students hear the word advocacy they think of talking to a congressional representative or marching to the Capitol. There is more to advocacy than that. The best thing about advocating is that it does not take an enormous amount of time to be effective. So, why is it that students and professionals don't take just a few minutes to send an e-mail or inform a patient on the issues in our field? Maybe the answer is simple—we all think someone else is doing it. That assumption, however, is not correct; not enough people are active in advocacy. Too many times, people look to others to take action. In the end, no one's voice is heard. As Gandhi said, "You must be the change you wish to see in the world."

How do we, as students, take action? It begins with being aware of the issues and being educated on them. This does not mean we need to obtain a law degree or know the minute details of all issues pertaining to audiology. It means that we should be up to date on key issues that affect our profession and patients. Spending a few minutes on the Academy's Web site is a good place to start. There are brief descriptions on legislation and updates on current issues as well.

To get started, choose two key issues that interest you and take action. You can log on to the Academy's Legislative Action Center (http://capwiz.com/audiology/home) and, in less than three minutes, your letter is on its way via e-mail to your representative. It is that easy! Also, you can inform your patients by explaining the issues, providing them with the contact information for their representatives, and encouraging them to write or e-mail their representative. Patients can easily advocate and send a letter through the Academy's consumer Web site, www.howsyourhearing.org.

You can also arrange a meeting with your representative. Grab another student in your program, a professor, or patient, and give it a try! When meeting with a representative, it is important to not only show why passing certain bills is crucial and beneficial for the representative's constituents, but also for him- or herself personally, along with his or her family members, who might have or develop a hearing loss.

I know it is rather cliché, but true—we are the future of audiology. Audiology is a rapidly changing profession, and if students, audiologists, and our patients take action now, we can make a positive impact on our field for many years to come. By taking action today, we can all create the change we wish to see in the world!

Securing the Future of Audiology

Dustin Richards

Hometown: Vilonia, AR

Current School: 2nd-year AuD student, University of Arkansas for Medical Sciences, Little Rock, AR

Future Plans: At this point, it is difficult to tell, but I would say that the ultimate goal is private practice. Regardless of the setting, I want to ensure that no knowledge accumulated over my academic tenure is wasted. I will be an activist for the field of audiology.

Favorite Sports Teams: Los Angeles Lakers, Chicago Cubs, Green Bay Packers, and the Arkansas Razorbacks

Quote to Live by: "If a great thing can be done, it can be done easily, but this ease is like the ease of a tree blossoming after long years of gathering strength."
—John Ruskin

Audiology students know too well the sheer amount of straining it takes to commit knowledge and procedures to memory in the clinic and classroom. It is important to have a vast base of knowledge at your disposal upon entering the field as a professional. Reasoning cannot occur without such knowledge. This knowledge should not be seen as a barrier standing in the way of your desired outcome (hopefully an "A"), rather it should be seen as an opportunity to further extend your professional ability. All of this is important, but I believe that professionals and students alike are neglecting a deeper issue.

When was the last time (or even the first time) that you put a lot of thought into the future and well-being of the field? Dr. Kris English, past president of the American Academy of Audiology, recently noted a particular instance where thousands of audiologists had access to a tool that allowed for an already written letter to be sent to Congress protesting medical reimbursement cuts with just one click of the mouse. Out of thousands of audiologists, only one percent put forth what amounts to roughly 15 seconds to use the tool. If you happen to be an avid supporter of reimbursement cuts, the point still remains. This same scenario has occurred on less divided issues, such as direct patient access. It makes little sense to devote so many hours, resources, and our non-gray hairs to becoming experts on hearing, and yet show apathy toward the longevity of the field itself. The hard-of-hearing population continues to grow, but the ratio of the treated to those who remain untreated seems to remain stagnant. The best way to ensure that this changes is to secure the future of audiology, because helping those who remain untreated is what we have committed our livelihoods to. It is what we have worked so hard to be good at.

At the conclusion of our studies, we will have accumulated an enormous amount of knowledge on the function and care of hearing. That is what will make us students hearing experts. If apathy continues to prevail, though, current audiology students may live to see the day where nonhearing health-care professionals manage hearing health care. I call to all of my fellow students to become advocates of audiology before even entering the profession. If you are not made aware of current professional issues in the classroom, take the initiative to do it on your own, for the sake of yourself—and more importantly—for those people we are being trained to help. Eventually, we will have the knowledge and skills to assist the hard of hearing. Take the steps to ensure that our ability to provide such service is never taken away.

My Best Day in Audiology

New this year at AudiologyNOW! 2010 (April 14–17) in San Diego was a memory wall where attendees shared experiences and events about their best days in audiology. Here are the postings from that wall. We look forward to seeing you in Chicago for AudiologyNOW! 2011, April 6–9.

Standing in the operating room and realizing I was now part of a cochlear implants team! A total best day.

Helping my first three-year-old with hearing aids. Nothing like looking into those big blue eyes.

The first day I turned the key in the door of my own office.

The first day I worked as a licensed audiologist. Realizing that I can make a difference. I have been living that day over and over for the past 14 years.

Michelle, MA

The patient who cried at the realization that she could be helped to hear again no matter what her doctor had been telling her for years.

Allen, AR

When a lady in a SNF labeled as "demented" and "unable to communicate" suddenly smiled and began conversing after being fitted with hearing aids.

John, San Diego, CA

A man with tears in his eyes said, "I had no idea what I was missing." Had AN removed from one ear and hearing loss in the other ear.

When I heard Gordon Hempton's sounds.

When a patient went from red-faced angry about his hearing loss to "I can do this."

When I fit my mom with new hearing aids, and she cried and told me it was the first time in her life she's ever felt normal.

Tears of joy in my office. Random hug from a stranger who stopped me on the street, hugged me to thank me for giving her husband back!

Humanitarian trip to Vietnam—I will never forget the children at the school for the Deaf in Lai Thieu. Also teaching sign language to a three-year-old Indian girl and her mom in Kuwait.

Dawn, Canada (currently in Saudi Arabia)

Having a seven-month-old baby with bilateral atresia attend to my voice after fitting him with a bone conduction aid. And the first time I signed "AuD" after my name.

Troy, CA

When Janelle decided to come to the VA, and then Kim did as well.

When a patient returned for his first check-up and said he had "heard birds sing for the first time in 20 years."

When my patient/student was mainstreamed and subsequently received a full scholarship to college and subsequently became a teacher and was then accepted as a PhD candidate...by the way, they said she would never be able to talk!

When a 65-year-old patient, with profound hearing loss in one ear and 70 db loss in the other ear said that he "never knew birds chirped differently" after he was fitted with a digital aid (having worn analog aids for 60 years).

Bob, NJ

Telling the parents of a multiple handicapped baby that their son had normal hearing without having to sedate him for the ABR.

Sue, NY, NY

A big smile from a severely dysmorphic child with Treacher-Collins syndrome, who compelled me to kneel and kiss her hand like a princess, and the look of gratitude on her mother's face (we did not speak the same language).

Quitting my ENT job to start my own practice—five years now and things are great!

When I became a private practice owner!

The day I got my AuD.

During a mission trip to Peru, I fitted a hearing aid on a three-year-old boy. When he heard voices for the first time, he began dancing!

When a lady said, with tears streaming down her face, "I thought I'd never hear like this again."

Jennifer, Houston, TX

When a mom e-mailed me that her CI daughter said her first word, "up." (Followed two weeks later by "no" and "moo." She is a champion Moo-er.)

Susan, Las Vegas, NV

When my patient was accepted in the most important university of Mexico in medicine.

Making a grown man cry...with the gift of hearing.

KHD, Tampa, FL

When I proved to ENT residents that impedance audio could really tell what was going on in the middle ear.

When a 10-year-old girl plugged her Nintendo game into her Bluetooth device and started dancing. She'd never heard the sounds before.

TX

Doing an FM fitting with my best friend and Mentor—DPJ.

Janelle K – Pittsburgh, PA

When my patient ran back into the clinic with tears in his eyes saying, "I forgot how beautiful the birds sound!"

The day a five-year-old with traumatic hearing loss loved her hearing aid so much she wanted one for her "dead" ear as well.

When my cochlear implant patient, who had been hit by a car and required extensive physical rehab, commented that she was glad she got her CI before the accident because it gave her the ability to communicate with doctors and family and probably made recovery possible.

Cada dis de trabajo en audiologia es siempre me melor dia.

Jacqueline, Columbia

The day my patient's husband thanked me for giving him back his lovely wife.

Gloria
Coeur d'Alene, ID

When a daughter said, "You gave us our dad back."

Chris, RI

Improved Monitoring for Cisplatin Ototoxicity

By Tiffany G. Baker and Lisa L. Cunningham

Cisplatin-induced ototoxicity causes high-frequency, progressive hearing loss in both adult and pediatric patients. In addition, the ototoxic effects of cisplatin can limit the dose and/or the duration of treatment that a patient may receive. Several grading scales have been established as tools for evaluating ototoxicity in patients undergoing cisplatin therapy. In addition to providing information on ototoxicity in an individual patient, these protocols are useful for developing more effective and less ototoxic treatment protocols, as well as providing a clearer picture of cisplatin-induced ototoxicity across patient populations. This information benefits research aimed at preventing cisplatin-induced ototoxicity. Recently, Chang and Chinosornvatana (2010) outlined a newly proposed grading scale for cisplatin ototoxicity that more accurately predicts audiologists' recommendations for hearing therapy, including hearing aids. The authors emphasize the need for a grading scale that (1) is sensitive to mild hearing loss at lower frequencies, which may have significant impact on social and educational development in children and (2) provides consistent results across clinics and patient populations. Furthermore, in a recent editorial in *Journal of Clinical Oncology,* Edward A. Neuwelt and Penelope Brock (2010) pushed for an international consensus on assessment criteria for monitoring ototoxicity, especially in pediatric populations, which are particularly vulnerable to adverse effects of hearing loss on speech and language development.

An internationally accepted, standardized grading scale for assessing cisplatin-induced ototoxicity is needed.

Prior to the development of the newly proposed Chang scale for grading cisplatin-induced ototoxicity, three other grading scales were in place: the National Cancer Institute Common Terminology Criteria for Adverse Events (CTCAE), the American Speech-Language-Hearing Association Ototoxicity Criteria (ASHA), and Brock (Brock et al, 1991) CTCAE assigns a numeric grade (0–4) to indicate hearing status. This system utilizes both quantitative (i.e., hearing thresholds between 1 and 8 kHz) and qualitative (i.e., whether the patient required therapeutic intervention for their hearing loss) assessments of hearing. The most recent version of the CTCAE has added more quantitative elements to this grading system, which was previously somewhat subjective. However, this grading system may underestimate the prevalence of mild hearing loss and therefore may result in underreporting of ototoxicity (Knight et al, 2005; Zuur et al, 2007; Chang and Chinosornvatana, 2010).

The ASHA criteria were established for the purpose of grading hearing loss resulting from ototoxic therapy. In this system, changes in hearing sensitivity are based on information from a baseline audiogram taken before the initiation of cisplatin therapy. Ototoxic hearing loss is then defined as any one of the following: (1) 20 dB change at any one test frequency, (2) 10 dB change at any two adjacent test frequencies, or (3) loss of response at three adjacent test frequencies where a response was obtained during pretesting. An advantage of this system is that (unlike CTCAE) it includes frequencies above 8 kHz, at which cisplatin-induced ototoxicity is often most severe. However, there are potential drawbacks to the ASHA system. First, baseline data are not always available for patients requiring immediate therapy, and this grading system is limited to those patients for whom baseline data are available. Second, because the ASHA system does not assign a numeric grade to indicate the severity of hearing loss, this system is not useful in comparing hearing losses among groups of patients (as in a clinical trial). Over 70 percent of pediatric cancer patients in the United States are enrolled in clinical trials (Tejeda et al, 1996), thus emphasizing the necessity of a numerical grading scale in order to quantify cisplatin-induced hearing loss in these patients participating in clinical trials.

The Brock grading scale was established in 1991 specifically for the purpose of evaluating pediatric patients receiving platinum compounds, including cisplatin and carboplatin (Brock et al, 1991). This grading scale is widely used to monitor ototoxicity in clinical trials for children undergoing cancer therapy (Brock et al, 1991; Gupta et al, 2006; Kushner et al, 2006). No baseline audiogram is required, as grades 0–4 are assigned by audiometric testing at 40 dB HL (grade 0 = hearing thresholds <40 dB at all frequencies; grade 1 = hearing threshold ≥40 dB at 8 kHz; grade 2 = hearing threshold ≥40 dB at 4 kHz and above; grade 3 = hearing threshold ≥40 dB at 2 kHz and above; grade 4 = hearing threshold ≥40 dB at 1 kHz and above). This grading system does not distinguish between normal hearing and mild hearing loss (since it assigns grade 0 to any threshold <40 dB), and therefore it can fail to identify a mild hearing loss that can be a significant impairment for a child (Neuwelt and Brock 2010). In addition, the Brock system does not include frequencies higher than 8 kHz and does not include measurements at 3 and 6 kHz (Neuwelt and Brock, 2010), frequencies that often reveal useful information about cisplatin-induced hearing impairment (Chang and Chinosornvatana, 2010).

Chang and Chinosornvatana (2010) compared their scale to the CTCAE and Brock scales in 134 patients ranging from four months to 24 years of age. They found that while the Brock system is clinically very useful, it sometimes assigned grade 0 to patients who had more clinically significant audiograms than other patients assigned to grades 1 and 2. The newly proposed Chang grading scale is a slight modification of the Brock system that is designed to be more sensitive to mild hearing loss (i.e., between 20 and 40 dB). Although each of the grading systems correlated with audiologists' recommendations regarding amplification, the Chang scale was the most specific predictor of the clinical significance of the hearing loss, especially at higher grades.

The need for an internationally accepted, standardized grading scale for assessing cisplatin-induced ototoxicity is evident. At the 2010 meeting of the International Society for Pediatric Oncologists this fall, an international consensus conference will be convened to further evaluate this important topic and develop standardized recommendations for ototoxicity monitoring in children receiving cisplatin therapy.

Tiffany G. Baker, MS, is an MSTP student in the Department of Pathology and Laboratory Medicine at the Medical University of South Carolina.

Lisa L. Cunningham, PhD, is an assistant professor with the Department of Pathology and Laboratory Medicine at the Medical University of South Carolina.

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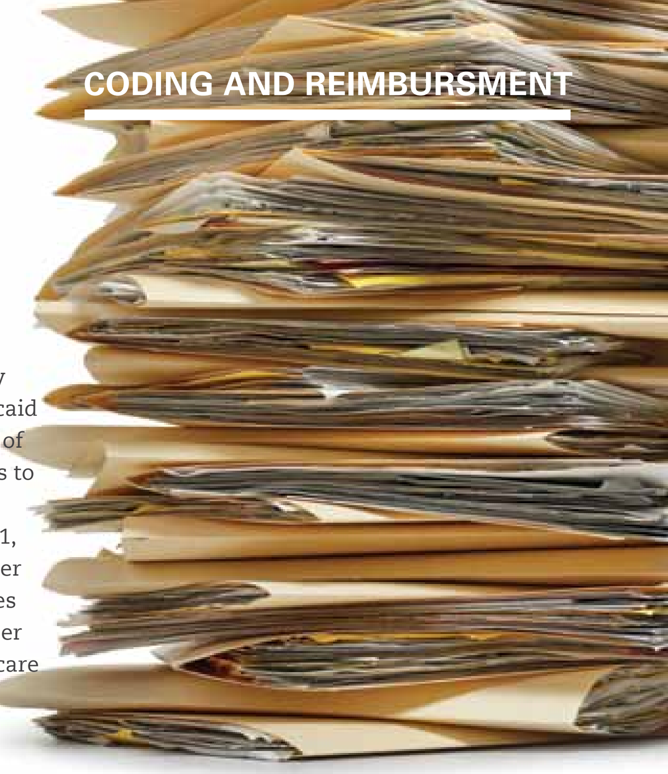

Medicare Claim Filing Update

Due to the Patient Protection and Affordable Care Act (PPACA), commonly known as the health-care reform bill, the Centers for Medicare and Medicaid Services (CMS) has changed the claims filing period to one year for dates of service, effective January 1, 2010. You will no longer have up to 26 months to file a claim to Medicare after the date of service.

Claims after January 1, 2010, will need to be submitted by December 31, 2010. Claims with dates of service on or after January 1, 2010, received later than one calendar year beyond the date of service, will be denied. Services provided before December 31, 2009, will need to be submitted by December 31, 2010, or they will be denied. For further information, look at the Medicare Learning Network publication here: www.cms.gov/MLNMattersArticles/downloads/MM6960.pdf.

Important! Medicare Provider Enrollment Changes

The Centers for Medicare and Medicaid Services (CMS) has changed provider enrollment requirements for referring physicians that could affect your payments. The original date of compliance was to have been January 3, 2011, but claims submitted with non-Medicare-enrolled physicians' National Provider Identifier (NPI) will be denied after July 6, 2010. As of the July date, Medicare claims will be required to have the NPI of the referring Medicare enrolled physician, as well as the NPI of the audiologist providing the service. The referring physician's name should be placed in box 17 of the CMS 1500 form, their NPI in box 17b, and your NPI should be inserted in box 24J.

Updates to the Provider Enrollment, Chain, and Ownership System (PECOS) can be made here: https://pecos.cms.hhs.gov/pecos/login.do. This is a national repository of all Medicare Fee-for-Service providers.

To ensure that your referral sources are enrolled in Medicare, go to www.cms.gov/MedicareProviderSupEnroll/Downloads/OrderingReferringReport.pdf. Physicians who have validly opted out of Medicare are eligible to order and refer for services for Medicare beneficiaries and are in PECOS.

Those employed by the Public Health Service, the Department of Defense, and the Department of Veterans Affairs who refer for services for Medicare beneficiaries are required to have an approved enrollment record in PECOS, even when not submitting claims for Medicare beneficiaries. Pediatricians who have Medicare beneficiaries, such as those children with End Stage Renal Disease (ESRD) and those who are entitled to benefits of other federal programs must also be enrolled.

Also in the final rule for PPACA, CMS is requiring all written and electronic referrals be retained for seven years and submitted if Medicare requests them. Failure to comply will result in a one-year suspension of filing claims to Medicare.

Those who enrolled in Medicare six or more years ago who have not updated their information will need to submit enrollment applications to Medicare or update their information in PECOS. If you prefer to file hard copy, the applicable Medicare provider forms links are here:

For the 855I go to https://www.cms.gov/CMSForms/CMSForms/itemdetail.asp?filterType=dual,%20keyword&filterValue=855I&filterByDID=0&sortByDID=1&sortOrder=ascending&itemID=CMS019477&intNumPerPage=10

For the 855R, to reassign the benefits such as to an employer or contractor, go to https://www.cms.gov/CMSForms/CMSForms/itemdetail.asp?filterType=dual,%20keyword&filterValue=855R&filterByDID=0&sortByDID=1&sortOrder=ascending&itemID=CMS019478&intNumPerPage=10.

CMS 588 form, the *Electronic Funds Transfer (EFT) Authorization Agreement,* was updated in April 2010. If submitting a new or updated enrollment application for your Medicare Provider Transaction Access Number (PTAN), you will also need to refile this authorization agreement.

Medicaid is also requiring the use of NPIs on Medicaid claims. There is no federally required enrollment process for Medicaid providers other than the provider agreements with the state in which you practice if providing services to Medicaid beneficiaries.

Physicians Quality Reporting Initiative (PQRI)—Two Percent Reporting Bonus

Audiologists are strongly encouraged to file claims to Medicare for the measures listed below for either of the reporting periods of January 1, 2010, through December 31, 2010, or July 1, 2010, through December 31, 2010. PQRI participation recognizes audiologists as health-care providers in the Medicare and health-care arenas and focuses on audiology services in the care collaboration process. Eligible measures qualify for a two percent reporting bonus.

- Measure #188: Congenital or traumatic deformity of the ear.
- Measure #189: A history of active drainage from the ear within the previous 90 days (for patients who have disease of the ear and mastoid process).
- Measure #190: A history of sudden or rapidly progressive hearing loss.
- Measure #94, Otitis Media with Effusion (OME): Diagnostic Evaluation-Assessment of Tympanic Membrane Mobility, is not eligible for the two percent bonus, as it is specifically for those aged two months through 12 years, but should be reported if the measure is eligible.

For further information on PQRI, visit www.audiology.org/practice/PQRI.

Questions regarding coding, reimbursement, and/or compliance issues may be sent to Debra Abel, AuD, Academy director of reimbursement and practice compliance, at dabel@audiology.org or 703-226-1024.

2010 HIPAA Updates

The American Recovery and Reinvestment Act of 2009 (ARRA, also known as the “Stimulus Bill”) included several HIPAA updates that may pertain to audiology, effective as of February 22, 2010:

- Additional business agreements (BAs) may be required or need to be revised due to HIPAA’s expanded coverage for those entities who use personal health information (PHI),
- Breach of data requirements, and
- Notice of Privacy Practices (NPP) should be updated to reflect the change regarding the expediency in providing records to patients.

To order HIPAA resources through the Academy Store, visit www.audiology.org/pages/store and search for key word “HIPAA.”

To read more about the HIPAA updates, visit www.audiology.org/practice/compliance.

Also of Interest

Check out the new ICD-10-CM section on the Academy’s Web site. Log in to www.audiology.org and search key words “ICD-10-CM.”

A Core Value of the Profession: Education

By ACAE Board of Directors

When Dr. Jerger convened the meeting with the founders of the Academy, they recognized that quality education was a basic tenet and foundation of a successful and independent profession. This led to the doctor of audiology (AuD), and a continuing commitment and recognition that education is a core value and pillar of the Academy. Education provides the foundation upon which everything else is built. We could not have achieved our autonomy, legislative successes, and practice independence without our transition to doctoral education.

Yet, are we satisfied with our current audiology educational system? Are we satisfied with the quality of the academic programs training the future of the profession? Are we concerned that there are not enough graduates to meet future demand for services? Are the current standards for audiology education preparing graduates to meet the needs of our patients?

It only is in recent years that doctoral programs have either received or applied for accreditation by the new and more stringent Accreditation Commission for Audiology Education (ACAE). Until we own the educational process and associated standards that undergird the profession, we will have no claim on the educational process or outcomes (e.g., issues such as certification for supervisors, doctoral-entry with degrees other than the AuD, changes in state licensure, changes in the scope of practice, equitable education across programs, etc.). The profession has transitioned to the doctoral degree, but the transition cannot be considered complete until academic programs adopt standards that represent the core values and pillars of our profession.

Since its inception, and with relatively limited resources, the ACAE has been successful in creating a rigorous, cooperative process of accreditation with value-added data for programs and the profession rather than the typical punitive design. Two programs have already completed the ACAE beta version, and a number more have applied for accreditation and are in various stages of the process.

Our work is just beginning. Like anything else that is new, there are early adopters and those who are more cautious. Certainly, this was true with the entire doctoral-education movement. The majority of programs waited many years before transitioning and the majority began offering the doctoral degree only in the last four to five years. Broader acceptance of the new accreditation system developed for AuD programs is not far behind, especially if clinics, hospitals, and practices give priority to externs and graduates of ACAE-accredited programs knowing that they will be working with students from rigorously evaluated programs.

As a profession, we must continue to strive for quality education and standards that are the foundation of our profession. We must be sure that we do not regress to accepting the status quo and be sure that our future remains controlled by audiologists. It is our responsibility to make our commitment to the educational pillar known to the Academy's board, and our alumni academic institutions through letters and actions that will demonstrate our support for quality and equitable educational standards. It is only through rigorous and standardized educational processes, of and by audiologists, that we will become the truly autonomous and well-respected profession that we all desire—and that consumers deserve.

For more information about ACAE, visit www.acaeaccred.org.

Pediatric Audiology Initiative: The Final Phase

The American Board of Audiology, with the assistance of a panel of subject matter experts (SMEs), as well as many audiologists who took time away from their busy practices or research work to respond to the ABA's survey, has completed the practice analysis phase of the pediatric audiology initiative. The ABA is appreciative of the expertise and time of so many audiologists dedicated to the profession and to the children with hearing impairment and their families that the profession is privileged to serve.

In this regard, the ABA would particularly like to recognize and thank the ABA Board's public representative, Patricia (Patty) Keffer, MBA, who has been involved in issues surrounding hearing loss and hearing health since her youngest child,

For ABA information, contact:
American Board of Audiology
11730 Plaza America Drive
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ABA Board Profile

Patty A. Keffer, MBA

Public Representative, ABA Board of Governors

Patty and her seven-year-old daughter Lydia

Hails from: McLean, VA. Grew up in Akron, OH, and lived in Angers, France, and Chicago, IL.

Degrees: MBA, Northwestern University's Kellogg School of Management

Appointed to Board: January 2010

What I Do for the ABA: My experience raising a daughter with bilateral cochlear implants enables me to share information regarding audiology consumers' needs—especially those of children. My business background equips me to bring financial considerations to mind in advocating for high-quality, cost-effective hearing care. I am also a member of the ABA Marketing Committee.

In My Free Time: I attend my children's many activities as well as volunteer regularly at their school. I am also a Girl Scout leader and enjoy biking, swimming, doing home improvement, visiting relatives, beach vacationing, and taking advantage of what the DC area offers.

Quote to Live by: "We make a living by what we get, but we make a life by what we give."—Winston Churchill

Lydia, was diagnosed as profoundly deaf as a newborn in 2003. Patty's insights and dedication to this initiative have proved invaluable.

In the days ahead, you will be hearing more about the final phase of the initiative and may be called upon by the ABA to play a role in this important project. Thank you in advance for your support of this final critical step.

The American Board of Audiology acknowledges with deep appreciation the expertise and time given to the pediatric audiology initiative by the following:

James Beauchamp, AuD, Chair
Marion Downs, PhD, Honorary Chair

Karen Anderson, PhD
Andrea Bailey, MA
Lindsay Bondurant, PhD
Tamala Bradham, PhD
Judy Elkayam, AuD
Robert Fanning, AuD
Brian Fligor, ScD
Marcia Fort, AuD
Sandra Gabbard, PhD
Alison Grimes, AuD
Melanie Herzfeld, AuD
Lisa Hunter, PhD
Cheryl DeConde Johnson, EdD
Dawna Lewis, PhD
Corinne Macpherson, AuD
Ryan McCreery, MS
Marilyn Neault, PhD
Eileen Rall, AuD
Patricia Roush, AuD
Cindy Simon, AuD
Gail Whitelaw, PhD
Jody Winzelberg, AuD
Christine Yoshinaga-Itano, PhD

The Power of Recognition Is in Your Hands…

2010 AND 2009 ACADEMY HONORS RECIPIENTS

2010

Distinguished Achievement Award
Gail Chermak
Cynthia Compton-Conley
David Hawkins
Sharon Kujawa

Humanitarian Award
Briseida deLeon Northrup

International Award in Hearing
Adrian Davis

James Jerger Career Award for Research in Audiology
Stephen Fausti

Samuel F. Lybarger Award for Achievements in Industry
Elaine Saunders

2009

Distinguished Achievement Award
David Fabry
Robert Keith
Ross Roeser

Humanitarian Award
Aysen Erdil

International Award in Hearing
Stig Arlinger

James Jerger Career Award for Research in Audiology
Sandra Gordon-Salant

Samuel F. Lybarger Award for Achievements in Industry
David Preves

The Academy Honors Committee encourages all Academy members to identify those colleagues they believe have made significant contributions to the audiology profession. If you know someone who should be recognized for his or her efforts, take time to submit a nomination packet to the committee for review. **All nominations must be received by September 24, 2010.**

Nomination Process

To nominate an individual, a nomination packet that includes a letter of nomination addressed to the committee chair and an up-to-date full curriculum vitae of the nominated individual should be submitted by the deadline. Self-nominations will not be accepted. The nomination packet should include sufficient documentation as to how the nominee meets the specified criteria for the selected category. Additional letters (3–5) in support of the nomination and any other documentation that will assist the Honors Committee in their decision are required. Nomination packets will be accepted in hard copy or electronic form. Hard copy packets should be mailed to Academy headquarters and electronic nomination packets may be sent by e-mail to Sarah Sebastian at ssebastian@audiology.org.

Nominations in all categories, except Distinguished Achievement, have a three-year life span, after which an interim of at least one year is required before resubmission. Additional supporting data, if available, should be submitted to the Honors Committee each year a nominee is being considered.

Selection of Honorees

The committee will consider all nominations, and awards will be made to qualified candidates who receive a majority vote of the voting members of the committee pending final approval of the Academy Board of Directors. Not all awards may be given each year. Selected recipients will be presented at AudiologyNOW! in Chicago, IL, April 6–9, 2011.

Guidelines

Nominations should be made in a letter format with a full curriculum vitae and 3–5 letters of recommendation of the candidate enclosed. The nomination and all supporting materials must be received at Academy headquarters by **September 24, 2010.**

Award Categories

James Jerger Career Award for Research in Audiology

This award is given to a senior-level audiologist with a distinguished career in audiology. Candidates must be members of the Academy, have at least 25 years of research productivity in audiology (not a related field), as well as have made significant contributions to the practice and/or teaching of audiology.

Samuel F. Lybarger Award for Achievements in Industry

This award is given for significant pioneering activity (research, engineering, or teaching) within the field of hearing. This award is restricted to individuals whose achievements occurred while employed by a company or corporation in the hearing health-care fields but whose contributions extended beyond their contributions to their company's services or products and served to have a significant impact on the understanding of normal or disordered auditory systems.

International Award in Hearing

This award honors and recognizes the achievements of international significance in audiology by an audiologist, hearing scientist, or audiological physician. Nominees should be nonresidents of the United States who have provided outstanding service to the profession of audiology in a clinical, academic, research, or professional capacity, and be in good standing in their country.

Humanitarian Award

This award is given to an individual who has made a direct humanitarian contribution to society in the realm of hearing. Candidates should have demonstrated direct and outstanding service to humanity in some way related to hearing, hearing disability, or deafness. Candidates should have demonstrated significant and consistent humanitarian contributions, preferably in matters related to hearing.

New! To acknowledge excellence in audiology humanitarianism, the AAAF will make a charitable gift as a tribute to the recipient of this award. The recipient may designate a $1,000 donation to his or her hearing charity of choice.

Distinguished Achievement Award

Recipients of this award may include audiologists who have been exceptional educators in the classroom or clinic, innovative in program development, and pioneering in clinical service delivery, teaching, research, or any combination of these areas. The contributions made by the recipients of this award must have an impact on the profession of audiology as a whole and not just at a state or local level. Recipients must be members of the Academy.

Address the nomination package to:

Brenda Ryals, Chair, Honors Committee
c/o American Academy of Audiology
11730 Plaza America Drive, Suite 300, Reston, VA 20190

Just Joined

New Members of the American Academy of Audiology

Cahtia Adelman, PhD
Mark Bakkum, MS
Wanderleia Blasca, PhD
Cathleen Brueckner, AuD
Sandra Caldwell, MA
Kathleen Campos, MA
Hung-Yue Chang, MS
Brandi Coffin, AuD
Susan Cook, AuD
Katya Freire
Melanie Garner, AuD
Hyunah Jeon, AuD
Wanda Johnson, AuD
Alison Kahn, MA
Vardush Keshishyan, MA
Elizabeth LeBaron, AuD
Ken Madler, MA
Jeffrey Moore, AuD
Jaklin Naghdi, MA
Claudine Palacios, MS
Martine Parekh, AuD
Rene Pedroza, AuD
Melissa Price, AuD
Michelle Quinn, AuD
Kathleen Ryan, AuD
Melissa Santerre, AuD
Jared Teter, AuD
Arturo Villegas, AuD
Carey Williams, AuD
John Young, MA

New Members of the Student Academy of Audiology

Kaori Akashi
Shelby Atwill
Richard Bird
Cori Birkholz
Jillian Blinkoff
Brittany Camillo
Caitlin Chauvette
Sara Davis
Andrea Dunn
Rose Gilani
Katherine Gilmore
Katherine Greening
Kelsey Jackson
Rebecca Jolissaint
Whitney Kidd
Timothy Lim
Josh Luekenga
Clare McClumpha
Kimberly Mentock
Gary Miyasaki
Melissa Mooney
Vanessa Peck
Kimberly Richmond
Christianne Robertson
Jennifer Robinson
Anna Shapiro
Tyler Sorensen
Mark Stevenson
Stephanie Tartaglia
Kristina Thomas
Stacie VanBodegon
Celia Velez Zayas
Trisha Wesely
Colin Wong
Lisa Zagar