Interventional Audiology: Broadening the Scope of Practice to Meet the Changing Demands of the New Consumer

Brian Taylor, Au.D.1

ABSTRACT

Given the growth in the aging population, low hearing uptake rates and the emerging science indicating that age-related hearing loss has long term consequences to health and wellness, an interventional audiology strategy is needed. This paper will define interventional audiology and offer guidance on bringing an interventional audiology to life in clinical practice.

KEYWORDS: Interventional audiology, co-morbidity, patient-centered communication, stage-of-change model, participatory care, late-stage diagnosis, physician outreach

Learning Outcomes: As a result of this activity, the participant will be able to (1) discuss the need for an interventional audiology strategy; (2) address the need for an interventional audiology strategy; (3) effectively integrate interventional audiology into a clinical practice.

Automated technology, the rising costs of health care, and the growing aging population are on a collision course requiring audiologists to rethink their value proposition in the health care marketplace. Today, sustaining an audiology practice primarily through the provision of hearing aids is becoming more difficult as the landscape for services changes. Given the rising popularity of self-guided testing and use of smartphone apps, audiologists need to embrace new service delivery mechanisms to meet the demands of a marketplace that is likely to want to engage with professionals when they are younger and have milder degrees of hearing loss. Furthermore, audiologists have a significant opportunity to become an integral part of a physician’s team of trusted advisors and play an essential part in this effort to provide the right care at the right time. With interventional hearing health care strategies that seek to

1Turtle Beach Corporation, Fuel Medical Group, A.T Still University, Arizona College of Health Sciences, Mesa, Arizona.

Address for correspondence: Brian Taylor, Au.D., 4113 Beverly Ave., Golden Valley, MN 55422 (e-mail: brian.taylor.aud@gmail.com).

Delivery of Audiology Services: Differentiation in an Evolving Health Care Marketplace; Guest Editor, Ian M. Windmill, Ph.D.

minimize impairment and maximize daily function, the audiologist will play an increasingly prominent role in the future in controlling health care costs while delivering timely, cost-efficient, and highly effective care. Interventional audiology is the delivery of hearing care services to patients at an earlier stage of their hearing impairment. Many patients typically wait more than a decade from the time they first notice a hearing problem until they receive care and treatment for it. Practicing interventional audiology encourages involvement at a much earlier stage of the condition when a wider range of treatment or management options may be beneficial. In short, interventional audiology warrants clinical involvement with patients at a younger age when hearing loss is often of a milder degree.

Before going into the details of the role of audiology in an interventional delivery model, it is helpful to review the history of interventional medicine. Although the origins of interventional medicine can be traced back to ancient Egypt and the Babylonian Period, interventional medicine evolved as a system with the rise of interventional radiology treatment in the 20th century. New technological advances and innovative procedures have accelerated the improvement of interventional medicine. Interventional medicine techniques and applications have gone beyond the initial use in radiology. Other specialties include interventional oncology, chemotherapeutic drug-eluting systems and bland beads for the targeted treatment of liver cancer, interventional cardiology, pulmonology, nephrology, pain management as well as interventional otology and neuro-otology. The concept of interventional audiology may soon be added to this list, as it offers tremendous promise in helping audiologists expand their reach to greater numbers of patients.

According to MarkeTrak data, the average age of a patient in the United States who is fitted with their first pair of hearing aids is just shy of 70 years of age, and the patient is likely to be seen for the first time by an audiologist for a hearing test shortly before his initial purchase. This suggests that society categorizes hearing loss as a disease of the aged. Recent research, however, demonstrates that hearing loss is now a disease for all ages. Evolving to an interventional audiology model would change the following example. A 21-year-old with a hearing disability caused by the comorbid condition of type 2 diabetes may spend over 60 years of their life with communication disorders, an increased risk of depression, enhanced social isolation, and reduced employment opportunities because of a lack of systematic interventional strategies by both primary care specialists and audiologists. Earlier intervention from an audiologist has the potential to turn a lifelong handicap into a long-term improvement in quality of life that benefits the public good.

Hearing loss is the second leading cause of years living with disability, second only to depression. John Bakke, of Zolo Healthcare Solutions, refers to acquired hearing loss of adult onset as a triple threat to patients. First, clinically significant hearing impairment is itself a disability and is an indication for effective remediation in its own right. Two, hearing loss interferes with a patient’s ability to be treated for other medical conditions because it hinders an individual’s ability to engage with physicians and understand treatment advice and directives. Finally, emerging research suggests that hearing loss may actually accelerate some disabilities such as cognitive dysfunction and vestibular impairment. The prevalence, comorbidity, and disabling effects of hearing loss underscore the need for aggressive preventive programs that identify conditions such as hearing loss that threaten health outcomes. Audiology may be an emerging interventional discipline within medicine that has an important role in breaking the cycle of morbidity and mortality associated with a patient’s inability to hear. The treatment of hearing loss by audiologists can provide interventional assistance by providing routine hearing evaluations for patients of patient-centered medical care homes that seek to focus on prevention, early detection and evidence-based treatment. This is likely to result in improved quality of care, patient compliance, improved outcomes, and reduced overall cost of care. The audiologist is now being increasingly viewed within the wider medical community as an essential component of patient care for a broad range of disease processes that previously were not considered relevant to hearing impairment.
An example of the value of interventional audiology being included in the comprehensive team of primary caregivers who seek to minimize impairment and maximize function can be seen in the recently published research by Lin and Ferrucci documenting the robust association between high frequency hearing loss, and an increased risk of falls. The researchers found for every 10-dB increase in hearing loss, there was a 1.4-fold (95% confidence interval 1.3 to 1.5) increased odds of an individual reporting a fall over the preceding 12 months. Early interventional audiological assessment as well as balance testing may allow primary care physicians (PCPs) to prevent unnecessary falls, hospitalizations, and even death associated with complications of hip fracture and other fall-related trauma. Additionally, the diabetic patient is at greater risk due to neuropathies in the feet that may cause ataxic gait, along with a twofold increase in the risk of high-frequency hearing loss. Physicians and hearing health care specialists may jointly counsel this patient type on preventive care strategies that intervene in possible trauma-related health concerns related to falls.

Hearing impairment is a hidden disability that is not visible to patients and their support systems, including physicians. Audiologists and other health care professionals would be wise to intervene in the care of individuals with medical conditions and high-risk comorbidities associated with a higher incidence of hearing loss. Although there is a paucity of evidence from randomized controlled trials, early identification, remediation, and treatment of hearing loss are thought to lead to higher overall quality-of-life outcomes. Common sense requires audiologists to educate physicians and other medical practitioners about the linkage between hearing impairment and numerous medical conditions.

HEARING LOSS AND COMORBIDITIES

Cognitive Decline
By 2050, 1 in 30 Americans will suffer from dementia. It is thought that delaying the onset of dementia by 1 year could potentially reduce the incidence of dementia by 15%, thus saving billions of dollars in health care costs. Lin et al at Johns Hopkins University followed 1984 individuals between the ages of 36 and 90 years of age. None of the participants had cognitive impairment as measured on standardized tests at the beginning of the study, but some of them did have hearing loss. The participants were followed over an 18-year period. The effects of age, medical risk factors, diabetes, and hypertension were controlled in the study design. Results of the study indicated that individuals with untreated hearing loss have a greater risk of subsequently developing dementia than do individuals without hearing loss. Specifically, Lin and colleagues found that study participants with hearing loss at the beginning of this longitudinal study have a 40% chance of a greater rate of cognitive decline compared with those with normal hearing at the beginning of the study. Additionally, the researchers surmise that a mild (25-dB) hearing loss equates to a 7-year cognitive decline. These findings should encourage patients to have their hearing screened at an earlier age and to actively participate in the appropriate auditory treatment program, if indicated, which may result in a lower incidence of clinically significant dementia.

Lin et al also explored the relationship between physical changes in the brain and hearing loss. Brain volume changes were monitored for a mean span of 6.4 years in 126 adults between the ages of 56 and 86. Using sophisticated brain volume measurement techniques, and after adjusting for cardiovascular and demographic factors, the researchers found that individuals with hearing loss had accelerated brain volume declines. These declines in brain volume were primarily confined to the right temporal lobe. The findings of this study indicated that peripheral hearing loss is independently associated with accelerated brain atrophy in whole brain and regional volumes concentrated in the right temporal lobe.

Diabetes
Hearing loss is more than twice as common in adults with diabetes compared with those who do not have the disease, according to a new study funded by the National Institutes of Health. Twenty-one percent of the people...
with diabetes surveyed had hearing loss, compared with only 9% of subjects without diabetes in this outcomes-based study that controlled for other variables. Of the people with diabetes tested, 68% of them were found to have hearing loss in the higher frequencies. Bainbridge et al evaluated NIH data with a higher age cutoff and also showed that people with diabetes have about twice the prevalence of hearing loss (20%) in the U.S. population compared with those who do not have type 2 diabetes. A certain degree of hearing loss is a normal part of the aging process for all of us, but it is often accelerated in patients with diabetes, especially if blood glucose levels are not being controlled with medication, diet, and exercise. Eight-five percent of people with diabetes do not achieve their annual health care goals for hypertension, cholesterol, and blood sugar. Poor patient compliance is problematic in this patient population, and this compliance may be negatively impacted by hearing loss, thus reducing their engagement with their caregivers and increasing the risk of further complications. Henry Ford Hospital, Detroit conducted a study showing that women between the ages of 60 and 75 with poorly controlled diabetes had significantly worse hearing than those whose diabetes was controlled. Given these findings, patients with diabetes and those at risk for developing diabetes should have their hearing screened on an annual basis. Recently, the American Diabetes Association recommended that people with diabetes who suspect they may have a hearing loss contact their primary care provider, who may refer them to either an audiologist or a licensed hearing aid dispenser for a hearing screening.

**Smoking**

Approximately 45 to 48 million Americans currently smoke, with female smokers slightly outnumbering male smokers. Current estimates suggest that ~60% of children in the United States are exposed to secondhand smoke each day. Smokers were 1.69 to 2.1 times as likely to have a hearing loss as nonsmokers. Secondhand smoking also appears to have a deleterious effect on hearing, as individuals exposed to smokers have a 1.83 increased risk of sensorineural hearing loss compared to those not exposed to secondhand smoke.

Different mechanisms play a role in hearing loss due to exposure to smoking. The first may be related to tissue hypoxia (lack of oxygen); nicotine and carbon monoxide may actually deplete oxygen levels to the highly vascularized cochlea, which is bathed in electrolytic fluids. If oxygen is depleted, tissue damage can occur.

**Depression and Social Isolation**

Depression also is associated with the elderly individual who has acquired hearing loss. Jones and White conducted a meta-analysis on studies that examined the relationship between hearing loss and mental health. They concluded that individuals with hearing loss were more vulnerable to depression than people from the general population. More recently, Garnefski and Kraaij examined the relationship between cognitive coping strategies, anxiety, depression and acquired hearing loss. Their results suggested that maladaptive coping skills and symptoms of anxiety and depression are related issues among individuals with acquired hearing loss. Simply stated, patients with hearing loss tend to suffer more from the ill effects of depression and anxiety when compared with individuals with normal hearing. It seems that hearing loss adds to the complexity of the situation for patients suffering from these conditions.

Mick examined the relationship between hearing loss and social isolation in a large group of adults between the ages of 60 and 84. The objective of their study was to determine if age-related hearing loss is associated with social isolation and whether factors such as age, gender, and hearing aid use moderate this association. There were 1,453 male and female participants in this study, all between the ages of 60 and 84 years. Social isolation was defined using the social isolation score. Results indicated that greater amounts of hearing loss were associated with increased odds of social isolation in women aged 60 to 69. Other groups did not show a significant relationship between hearing loss and social isolation. These results suggest that women within this age range are more likely to alter their lifestyle due to their
hearing loss, and thus are more likely to become socially isolated.

Chan-Ming estimated the prevalence of depression among adults with hearing loss. Using the nine-item Patient Health Questionnaire, the prevalence of depression among 18,318 participants of the National Health and Nutrition Examination Survey was examined. The prevalence of depression increased as hearing loss became worse, except among those self-reported as deaf. Among individuals over the age of 70, no significant association between self-reported hearing loss and depression was found. Adults under the age of 70, particularly women, had a significant association between moderate hearing loss and depression. These two studies suggest that there is a relationship between age-related hearing loss and social isolation and depression.

Aging in Place
The importance of interventional audiology goes beyond its relationship to chronic medical conditions. There are also lifestyle necessities requiring the practice of interventional audiology. The Center for Disease Control defines aging in place as the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level. Of course, most adults would prefer to age in place; in fact, 78% of adults between the ages of 50 and 64 report that they would prefer to stay in their current residence as they age. One-third of American households are home to one or more residents 60 years of age or older. Considering the growing population aging in place and the fact that nearly two out of every three adults over the age of 70 have hearing loss, hearing health care providers certainly have a significant role to play in the aging in place movement and it is reasonable to hypothesize that proper treatment of hearing loss in the elderly population may result in a higher percentage of that population being able to remain in their own homes until a more advanced age.

Healthy Aging
Other patients who could potentially benefit from interventional audiology services are healthy agers. Unlike Baby Boomers who are defined as those born between 1946 and 1960, healthy agers are best described as individuals who want to live to be 100 in the mind and body of a 45-year-old, and they often are willing to spare no expense to accomplish this goal. Healthy aging is defined as the ability to maintain optimal cognitive and physical functioning throughout an individual’s lifespan. It is the ability of people to live a safe, healthy, and socially inclusive lifestyle. Although individuals over the age of 65 are more likely to be diagnosed with chronic conditions such as diabetes, dementia, hypertension, and hearing loss, their outlook toward those conditions is far more optimistic than previous generations of elderly people.

Because healthy agers are defined by lifestyle needs and not year of birth, this segment of the population is comprised of people of various ages. The role of interventional audiology within the healthy aging movement is to raise the awareness of the impact diet and nutrition play on hearing acuity. Additionally, interventional audiologists could demonstrate to healthy agers the use of downloadable apps, which can be used to self-screen hearing. This requires audiologists to rethink their value proposition to the marketplace.

THE FOUR PILLARS OF AN INTERVENTIONAL AUDIOLOGY STRATEGY
Interventional audiology is designed to address one fundamental paradox associated with hearing loss: For clear and obvious reasons, when children are identified with hearing loss there is usually an abundance of services available to manage the intellectual and social consequences of even a mild loss. Take this same mild hearing loss, however, and place it on a 65-year-old adult and key players in that patient’s social and workplace network are likely to ignore the consequences of age-related hearing loss of gradual onset. For the myriad reasons cited above, there is now ample evidence to suggest age-related hearing loss has serious long-term consequences that require early intervention. Given the evolving needs of consumers of health care services, namely that they have
access to more information and possess a desire to be more directly involved in the decision-making process, audiologists would be wise to adapt an interventional audiology strategy in their practice. Regardless of the target population, there are four primary components of an interventional audiology strategy that are thought to engage patients, regardless of age in the process of self-measuring their hearing and seeking the guidance and support of audiology at earlier ages. Let us examine each of the four pillars of an interventional audiology strategy in more detail.

**Exert More Social Pressure to Get Patients at Risk for Hearing Loss to Act Sooner**

As the data in Fig. 1 show, there is a clear disconnect between the ages when an individual first notices a hearing loss and when they complete their first audiological assessment. By the age of 60, ~80% of men and 70% of women notice some amount of hearing difficulty. Yet, only 41% of U.S. adults aged 70 years or older report having had a hearing test in the past 5 years.20 A key to engaging younger individuals in the process of checking their hearing at a younger age when the loss is milder is commonly referred to as making the imperceptible perceptible. Hearing loss of gradual onset is the imperceptible. An interventional audiology paradigm requires audiologists to identify ways to raise the condition of hearing loss to the top of the mind in the individual affected.

Taking an imperceptible condition and making it top of the mind can be done by what Alcock refers to as creating positive triggers to action.21 Positive triggers to action have five distinct steps and can be used in marketing campaigns to encourage individuals who first notice a hearing loss to take action. The five steps to creating a positive trigger to action include:

1. Draw attention to a perceptible occurrence that people can relate to.
2. Assign meaning to this occurrence to link it to the imperceptible.
3. Highlight the hidden risk.
4. Offer a solution that minimizes that risk by promoting an action that is easy to perform.

![Figure 1](image-url) The age at which individuals report the first indication of hearing loss (NIDCD 201219).
5. Increase self-esteem through taking that action.

Rather than portraying hearing loss as a medical condition associated with old age that needs to be avoided, the aim of a positive trigger is to take an imperceptible hearing loss and associate it with a reason to take action. Audiology’s task is to link an easily perceptible situational trigger (e.g., loss of control associated with missing parts of a conversation) to the imperceptible (sounds outside a patient’s hearing range). The first pillar of interventional audiology encourages motivation to act by presenting an avoidable risk (unknowingly mishearing) that can be reduced through regular professional hearing checks.

Engage Younger Patients in the Process of Self-Testing and Preventive Services with Audiologists

Once an individual is triggered to take action, it is necessary that he or she has the ability to quickly and discretely monitor his or her hearing. Given that most individuals do not perceive their hearing loss as a medical condition warranting personal attention from a medical practitioner, audiologists should not expect these individuals to actively seek them out for a comprehensive hearing assessment when they first notice possible hearing difficulties. For this reason, the process of patient engagement in early monitoring of their hearing is likely to include the use of self-testing apps and automated screening kiosks (e.g., Ultimate Kiosk). Furthermore, because the majority of individuals with early hearing loss have a virtually undetectable condition, automated, self-guided testing is a discrete way to monitor their hearing over time, and in alignment with how today’s consumer wants to participate in their health care. Thus, audiologists are encouraged to embrace the use of independently validated self-testing apps and kiosks as part of an interventional audiology strategy. As we look to the future, self-testing apps and kiosks need to have clear pass-or-fail criteria that prompt those who fail to make an appointment for a comprehensive evaluation with an audiologist.

Another aspect of preventive services rests with the ability of audiology to champion online learning communities. Online learning communities are informational Web sites that allow patients, family members, and professionals to exchange ideas and seek educational information. Many professionals treating other chronic medical conditions, such as type II diabetes, have used online learning communities to raise awareness and explore treatment and management options for all of the stakeholders within a community.

The second pillar of interventional audiology should not be confined to screening adults at younger ages. A significant portion of interventional care involves getting middle-aged adults who struggle with communication in specific listening situations, such as television viewing or restaurant communication, to embrace alternative technology that may benefit them. These alternative technologies include items such as directed audio devices and personal sound amplification products that can be customized to the patients’ listening requirements.

Center Patient–Provider Interaction around the Stages of Change Model

Interventional audiology strategies certainly are not confined to our marketing efforts, as recent reports have indicated that a recommendation for a hearing screening often does not prompt individuals to take action to resolve a suspected hearing problem. This inability to take swift action can be explained through the lens of help-seeking behavior. Over the past few years, several studies have enriched our knowledge of how adults with chronic medical conditions, such as age-related hearing loss, manage their condition and what cues to action may influence their behavior change. Various models have been proposed to explain the process of coping with chronic conditions, some of which have been applied to age-related hearing loss.

The transtheoretical stages of change model has been used to describe how adults with hearing loss cope with their condition. The stages of change model, shown in Fig. 2, suggests that an individual’s ability to change passes through four distinct levels. These levels are best summarized as: 1) precontemplation, at
which time the individual cannot even consider acknowledging a problem exists and that behavior change is needed; 2) contemplation, at which time individuals are ambivalent about the existence of a problem and the need to change behaviors; 3) preparation, at which time an individual is preparing to make changes by seeking information and talking about this possible change with others; 4) action, during which time individuals make actual changes to their behaviors. The literature also mentions two additional stages, called maintenance and relapse, at which time the individual makes a deliberate attempt to maintain their changed behaviors or revert back to previous counterproductive behaviors.

Another line of research attempting to explain the underlying decision making process of individuals with hearing loss was proposed by Carson. The Spiral of Decision Making model explains the push–pull between seeking and not seeking help that many patients with hearing loss of gradual onset experience. Carson based her Spiral of Decision Making model on the longitudinal study of a group of women between 72 and 82 years of age. Her model suggests that individuals with gradual hearing loss evaluate, analyze, and make decisions around three themes that define self-assessment: comparing/contrasting, cost versus benefit, and control. Carson’s model proposes that this spiral of decision making is ongoing, even after remediation for hearing loss has begun.

Changes in the primary care delivery model and implementation of knowledge-based marketing tactics intended to foster a deeper relationship between audiologists and physicians does not change the fact that hearing loss of adult onset is a stigmatizing condition. Putting the stages of change or spiral of decision-making model into practice requires audiologists to view the condition of age-related hearing loss through the lens of the social model of disability. Given the ambivalence of all stakeholders—patients, families, professionals, and others—toward hearing loss of adult onset, the social model of disability, shown in Fig. 3, is the common thread that ties together the spiral of decision-making and the practice of interventional audiology.
The social model of disability identifies systemic barriers, negative attitudes, and exclusion by society for individuals suffering from a chronic condition, such as age-related hearing loss. Although physical, sensory, intellectual, or psychological variations may cause individual functional limitation or impairments, these do not have to lead to disability unless society fails to take account of and include people regardless of their individual differences. In an evolving health care system, the role of physicians, audiologists, hearing instrument specialists, and others is to ease, reduce, or eliminate environmental, attitudinal, and societal barriers of patients. Specifically, easing the social barriers of hearing loss involves the application of motivational interviewing tactics that allow patients to be guided by the audiologist through behavior and outlook change toward their hearing loss.

**Leverage Changes in the Health Care System to Partner Directly with Primary Care Physicians and Other Medical Gatekeepers**

There are ~260,000 PCPs in the United States, who influence 19% of the gross domestic product. This amounts to $2.7 trillion dollars spent per year on health care in the United States. Each one of these PCPs has ~2,000 patients in his or her practice. Based upon a review of National Institutes of Health data, Lin et al estimated that 20.1% of Americans (48 million) cannot pass a 25-dB hearing screening in either one or both ears using the World Health Organization’s standard hearing screening regimen. Most audiologists would agree that this degree of hearing loss is severe enough to interfere with daily communication. Finally, other health care professionals, particularly physicians, are beginning to recognize the growing epidemic of age-related hearing loss and its impact on public health. The pertinent question is whether the relatively small and obscure profession of audiology will influence the practice of primary care medicine and nearly a fifth of a nation of more than 200 million people’s gross domestic product.

The marvels of modern medicine are so ubiquitous that we often take them for granted. For example, average life expectancy of an American now approaches 79 years—an increase of more than 30 years since 1900! Individuals aged 70 to 75, those who are just now beginning to seek the services of audiologists on a massive scale, have scarcely
experienced the premature death of siblings, friends, or neighbors, making this group unlike any other generation in history. Thanks to antibiotics, science-based clinical practices, and vaccinations, infectious diseases such as scarlet fever and influenza are no longer a possible death sentence for those afflicted with them. A consequence of this much longer life span is the challenge to our ability as a society to manage the expenses of a rapidly aging population. The combination of a rapidly aging population, along with significant increases in the cost of medical care, has necessitated the changes we are beginning to see in how medical care is delivered in the United States.

The growing awareness of age-related hearing loss as a public health concern represents a monumental opportunity for audiologists to touch the lives of more patients in need of their services. This can only occur if audiologists are willing to form partnerships with PCPs around the triple threat of untreated age-related hearing loss and the co-morbid conditions associated with it. From a business perspective, a strategic alliance between audiologists and PCPs in communities across the country represents a sustainable revenue stream for clinicians willing to unbundle and charge for professional services. More importantly, from a patient’s perspective, early intervention of age-related hearing loss has the potential to allow individuals the ability to maintain an active and participatory life as they age.

This provides an incredible opportunity to build bridges with the PCP community. Should a hearing health care provider establish a defined market of primary care doctors within a 5- to 10-mile radius from her practice, say 50 physicians, with 2,000 patients per practice, the target market is actually 100,000 patients, of whom 20.1% have a potentially treatable loss. That amounts to 20,000 patients. Approximately 25% have already been treated for hearing loss, so 15,000 patients remain for audiologists to find mutually beneficial ways to partner with the PCP in the comprehensive care of their patients.

**MODERN HEALTH CARE: PREVENTIVE, PARTICIPATORY, PREEMPTIVE, AND PERSONALIZED**

Due to changes in the American health care system, the practice of medicine is expected to see a marked increase in demand for services, especially for primary and preventive care. Because it is not possible to increase the supply of physicians in the short term (and in the long term, increasing the number of physicians is likely to increase the costs of delivering these types of services), the American health care system needs strategies for maintaining access in the face of increasing demand. In view of these proposed changes to the American health care system, physicians are now being encouraged to implement the following changes:

1. Create primary care teams in which each member of the team functions at the highest level of her license.
2. Encourage self-care through better education of patients about their condition.
3. Organize seniors who can no longer live independently into patient-centered primary care homes in which the same physician or team of physicians orchestrates delivery of health care, so that the appropriate type of preventive services can be delivered in a consistent manner and duplication of services is minimized.
4. Use alternatives to a single patient-physician visit when possible, such as group visits for diabetic patients and the use of telemedicine.
5. Eliminate unnecessary testing and overuse of medications.

These recommended changes in medical practice are a golden opportunity to demonstrate how audiology contributes to improving the overall quality of care of patients at risk for hearing loss while reducing the overall costs to the entire health care system. This process starts with how audiologists fit into the larger picture of health care from the perspective of the gatekeeper, the PCP.

The transformation of health care to personalized, preventive, preemptive, and participatory is encouraging audiologists to rethink how they create value in the marketplace. In
short, the future of audiology may depend less on dispensing a device and more on our ability to offer personalized, preventive, preemptive, and participatory services to younger patients with milder hearing losses. At the heart of this transformation from the device being the center of our universe to a myriad of diverse rehabilitative services taking center stage is the audiologist’s ability to effectively communicate with the medical community using the three traits depicted on the outer edges of Fig. 4: authenticity, visibility, and credibility.

**Authenticity**
Ensuring to the primary care physician that you have the best interests of the patient as your highest priority begins with the ability to be authentic. Authenticity is best described as the ability to engender trust and respect in another person by putting your true self forward. Due to our increasingly transparent world where information travels at lightning speed to anyone with an Internet connection who happens to be paying attention, the rhetoric of your marketing efforts must be congruent with the reality of how you interact with patients, the community, and other professionals, including PCPs. Other people quickly recognize when a marketing campaign centered around the promise of delivering a transcendent patient experience is overshadowed by the reality of an ordinary, high-pressure sales pitch revolving around hearing aids. In simple terms, authenticity means that you deliver on the promise of your marketing and advertising campaigns. Any disconnect between the two is likely to damage your reputation or brand. Being perceived as authentic can only occur if you are visible within your community and credible in your communication.

**Visibility**
In a world in which your brand centers on the professional and not the devices you dispense, it is imperative you are visible to the entire community, including PCPs. Despite all the efforts of hearing aid manufacturers, industry consultants, and buying groups to create glossy physician outreach materials, these materials still need to be delivered by the person who is going to be seeing the patient. Taking no more than 2 hours per week to personally visit a PCP practice is a proven approach to becoming more visible and building your brand image.

**Credibility**
The final section of the PCP relationship triangle is credibility. In short, a credible professional is one who knows the latest science as it relates to hearing loss and amplification and can apply it to clinical practice. From the perspective of building relationships with the PCP community, credibility relates to the fact that you can read, evaluate, apply, and articulate the peer-reviewed research pertaining to age-related hearing loss and its myriad comorbidities.

When developing a communication strategy for PCPs and their staff, be mindful of the quality of the data you will communicate and the image you are projecting. It is helpful that you address each of the questions below and have a plan for how you will address each one with the physician that you are meeting. Frequently asked questions of PCPs when making a referral to an audiologist:

- Does the audiologist have enough expertise with the problem requiring consultation?
- Do other physicians also refer their patients to this audiologist?
- Is the audiologist affiliated with a well-respected institution where the patient will receive outstanding care?
• Can the patient be scheduled for an appointment in a reasonable time frame?
• Does the audiologist accept the patient’s insurance, and what are the expected out-of-pocket costs?
• Does the audiologist have genuine concern for the well-being of his or her patients?
• What is the quality of the audiologist’s support staff?
• Will the audiologist provide high-quality continuous care and support?
• How well does the audiologist communicate with the referring physician?
• Is the audiologist’s location easy to get to?

Primary care physicians can be very approachable and respectful of the audiologist’s expertise, if one is mindful of all of the items listed above. Considering the growing geriatric population, often presenting to the PCP with one or more chronic conditions associated with hearing loss, it is critical for audiologists to intervene in the care of these patients so that they may experience better communication and a higher quality of life. Armed with succinct, evidence-based, and ethical information, audiologists are sure to form strong bonds with PCPs based on mutual respect and trust.

IMPLEMENTATION OF AN INTERVENTIONAL AUDIOLOGY STRATEGY
Audiologists can work in partnership with physicians and other medical professionals to deliver preventive, interventional patient care. Because 80% of older adults make at least one annual physician visit and sections of the Affordable Care Act incentivize younger adults to see their health care provider for routine checkups, it is vital for audiologists to educate PCPs, nurse practitioners, and physician assistants about the type of services delivered by an audiologist. By adapting an educate to obligate communication strategy between audiology and primary care medicine, audiologists can partner with physicians to provide more rapid and effective diagnosis and treatment of hearing loss.

The Core Message
Using the evidence reviewed earlier in this article, it is imperative for audiologists to develop a finely tuned, principled message to physicians as well as other stakeholders about the need for their services. Each audiologist should create a message similar to the following: “Age-related hearing loss is a public health concern of very high priority. It is a high priority because several recent studies using randomized controls show age-related hearing loss (ARL) contributes to the acceleration of cognitive and physical decline in adults. Hearing loss imposes a heavy social, economic burden on individuals, families, and communities, as a hearing loss isolates people. Given these findings, all individuals over the age of 50 should have a baseline hearing screening, and patients with a history of depression, cardiovascular disease, diabetes, and dementia should have their hearing screened annually.”

Education and Awareness
Before examining the three components of an interventional audiology program, let us recognize the challenge and obstacles associated with building referral networks with PCPs. Audiologists must recognize the busy nature of a PCP practice. Most PCP practices see patients of all ages with a range of conditions, many of which can be life-threatening. For the typical PCP, issues related to hearing loss are a relatively low priority, therefore audiologists need to be sensitive to the practice’s needs. Due to the extremely busy nature of their schedule, audiologists must package educational material so that it is specific and free of jargon. The educational material needs to be in alignment with how PCPs absorb information, thus materials need to be evidence-based and translate research into quality patient care. Finally, the educational material needs to be delivered to the PCP in a familiar format, such as grand rounds or one-page summary sheets.

Systematic, evidence-based targeted education of PCPs is the most fundamentally important component of implementation. Given that most PCPs have had very little formal training on the consequences of untreated
hearing loss, the education process must begin by raising awareness with the PCPs in your area. In short, PCPs need to know that untreated hearing loss impacts their effectiveness with patients with hearing impairments. Some of the aspects of patient–physician communication effected by hearing loss include:

- Review of medication use, dosage, and so on
- Cognitive assessment when dementia or other cognitive deficits are suspected
- Communicate key components of a treatment plan or follow-up care
- Discussion of palliative care and end-of-life issues
- Cognitive or depression screenings as part of routine practice or in advance of a surgical procedure

Educating the community is another important component of interventional audiology. In addition to the use of traditional newsletters, social media and Web sites are useful educational tools that raise awareness within the community of the consequences of untreated hearing loss, especially among the chronically ill. An audiology practice’s Web site can be designed to meet the lay public’s educational needs, as well as primary care medicine’s, with the goal of informing physicians about their interventional capabilities. Audiologists may seek to present the latest preventative and interventional treatment strategies to the medical community through presentations at hospital grand rounds and at PCP teaching institutions. Educational opportunities should seek to provide hearing health educational programs in partnership with the American Diabetes Association, the American Cancer Society, the American Lung Association. In addition, audiologists may attend, display, and educate at cardiology, pulmonology, endocrinology, neurology, trauma, geriatric, and other physician specialty conferences, so that we begin to engage in a more effective partnership with medicine and intervene where it is medically appropriate.

**Identification/Screening**

The second component to implementing an interventional audiology program in your practice is the ability to conduct routine hearing screening. Due to the evolution of digital technology, accurate hearing screenings now can be conducted in an automated fashion using tablet computers or apps on a smartphone. Before using any of these computer-based hearing screening technologies, practitioners are urged to evaluate their reliability and accuracy. When establishing a screening program within a medical practice there are six Ws that need to be thoughtfully considered.

- Who does the screening? It is not feasible for the audiologist to conduct the screening in the PCP’s office; therefore, a nurse or office assistant needs to be trained to conduct the screening or oversee it. Even automated tools (e.g., Ultimate Kiosk system) require the presence of someone to monitor.
- Who gets screened? It is probably not feasible to conduct the hearing screen on every patient examined by the PCP, even all patients over the age of 65. The use of a comorbidity risk assessment tool like the one in Fig. 5 is recommended. Each “yes” response is counted as 1 point. This assessment can be added to a routine patient intake form, and medical assistants can be instructed to refer anyone with a score of 5 or greater, as this score indicates that hearing loss is more likely to occur.
- What hearing screen is used? After consideration of who conducts the screening as well as the target population, the next detail is to determine what screening tool you will use.

![Figure 5](image-url)
There are many choices from smartphone apps (e.g., uHear) to handheld devices to automated hearing screening programs on a tablet computer. In addition, practitioners may decide to forego a pure tone screening and use any number of pencil-and-paper questionnaires. The 10-item Screening for Otologic Functional Impairments (SOFI) can be used to identify patients likely to have hearing loss.31 (See the SOFI in Fig. 6.) The SOFI is high in reliability, is valid, and is highly correlated with similar hearing handicap self-reports. Another pen-and-paper screening tool that has been validated is the Quick Hearing Check,32 which can be found at the Better Hearing Institute Web site.

**Where does the hearing screening occur?** Some of the choices include an examination room, reception area, or even from the comforts of home if an app or questionnaire is used. Locations need to be chosen that minimally impact the normal workflow of a busy practice.

**When does the hearing screening occur?** Options include before or after the patient’s visit with the PCP.

**What is the referral process?** Perhaps the most critical question, you must determine the process in which patients who fail the screening are referred to the audiology practice, including the ability to establish pass-or-fail criteria, scheduling an appointment, and follow-up reports.

Interventional audiology requires hearing health care clinicians to change their orientation toward patient care. Rather than centering on the dispensing of a hearing aid/medical device, interventional audiology revolves around the disease state of hearing loss and its relationship to the chronic medical conditions. For the interventional audiologist to become a valuable and respected member of the physician’s preventive care team, several items and procedures are needed. These are listed in Table 1. Notice there are three distinct phases of interventional audiology: awareness, identification, and treatment/follow-up. Table 1 lists the tasks and procedures that are necessary for successful implementation of interventional audiology strategies.

### Alternative Solutions to Conventional Hearing Aids

An important interventional audiology strategy is the ability to offer alternative treatment options to patients with hearing loss who may...
not want or need hearing aids. Geared to meeting the needs of younger adult patients with milder hearing loss, alternative solutions need to be part of an interventional audiologist’s repertoire of services. These alternatives are usually geared to improve specific, situational communication needs such as television viewing. Alternative treatment and management options may serve as a gateway to traditional hearing aid use, or they may supplement traditional amplification devices, such as assistive listening devices. Here is a list of possible alternative treatment and management options that may be effectively used to better meet with needs of adults, typically in the 50- to 70-year age range who may not be ready for traditional hearing aids but nevertheless need some help with communication resulting from hearing loss of gradual onset.

- Directed audio solutions
- Personal sound amplification systems
- Hearing education groups
- Auditory training smartphone apps

## PRACTICING INTERVENTIONAL AUDIOLOGY

Let’s end with an all too common situation, which until rather recently has been unreported in the literature: an individual, perhaps in his early seventies with type II diabetes and mild, sensorineural hearing loss, delays medical care because he hesitates to call for an appointment with his primary care provider due to difficulty understanding the appointment clerk on the phone. Once he finally calls, the patient misunderstands the instructions he is given. Thinking he has been told to alter his medication regimen, his diabetes is soon out of control and he ends up in the emergency room. Such patients are perhaps more common than we realize, and as recent research suggests, mild to moderate age-related hearing loss can contribute to poor health in many ways, including delaying appropriate care as well as being a cause of poor patient compliance due to unintended miscommunication.

There is a constellation of forces at work within the American health care system that

### Table 1 Components of an Interventional Audiology Tool Kit

<table>
<thead>
<tr>
<th>Education/Awareness</th>
<th>Identification/Screening</th>
<th>Treatment and Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Web site and social media that provides data on the relationship of hearing loss to various chronic diseases, including links to patient organizations</td>
<td>• Multifactorial risk assessment form</td>
<td>• Comprehensive habilitation services, aural rehabilitation programs—beyond simply dispensing hearing aids</td>
</tr>
<tr>
<td>• Informational newsletters with latest evidence on the disease state of hearing loss, delivered to physicians on a monthly basis</td>
<td>• Screening for Otologic Functional Impairments questionnaire</td>
<td>• Active participation in the health and wellness of patients, including providing support on healthy diets and exercise, consistent with regimens recommended by their physician</td>
</tr>
<tr>
<td>• Public lectures for the community that discuss disease state of hearing loss and what to do about it</td>
<td>• Use of a comprehensive case history form that asks patients about chronic diseases associated with hearing loss</td>
<td></td>
</tr>
<tr>
<td>• Clinical processes and patient materials that facilitate the practice of healthy hearing behaviors</td>
<td>• Referral network of physicians that specialize in various chronic diseases</td>
<td></td>
</tr>
<tr>
<td>• Evidence-based educational materials on the disease state of hearing loss that can be personally delivered to physicians</td>
<td>• Service delivery focused on patient-centered care and the use of motivational interviewing techniques to elicit behavior change, rather than focusing on “selling” hearing aids</td>
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<td></td>
<td>• Detailed reports back to referring physicians, outlining auditory assessment outcome and comprehensive treatment options</td>
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There is a constellation of forces at work within the American health care system that
may enable audiologists to emerge as integral members of a patient’s health and wellness team. As previously mentioned, the graying of the American population, the notion that Baby Boomers want to more actively participate in their health care, the emergence of direct-to-consumer amplification products, the unsustainably rising costs of health care—all of these factors have the potential to profoundly change the way audiology and hearing care are perceived by PCPs and the general public.

Patients are changing and so is primary care in the United States. Both private and public insurance programs, as well as large employers, are changing the way primary care providers are being reimbursed for their services. The reason for these changes is the rising cost of health care and the realization that primary care is the key to reducing those costs. Patients know they have choices with respect to where they spend their money for elective medical services.

The evidence is growing that hearing loss, even mild to moderate hearing loss, interferes with communication and speech understanding at a very basic level. This communication and understanding is critically important for patient compliance with medical care, especially for patients with chronic illnesses and elderly patients. And, of course, these are the very patients who have the highest incidence of hearing loss.

Audiology has a new opportunity to become a partner with primary care providers because the hearing health care specialist can help the primary care provider succeed. Audiologists should understand these new issues in primary care and be clear that the services that audiology offers are not simply services to the patient, but they represent a service that will help the primary care practice as well. In short, interventional audiology can help primary care practices add value in a way that boosts their bottom line as well as improves the quality of life for many of their patients.

Chronic diseases are the most costly health problem in the United States. The conditions mentioned in this article have evidence indicating a higher rate of hearing loss associated with them, thus audiologists need to be directly involved in all phases of identification and remediation. The process must begin with a dedicated effort on the part of every audiologist to educate PCPs, as many of them lack the appropriate knowledge base to effectively identify patients with hearing loss. The broader negative consequences of hearing loss, particularly in older adults, are now beginning to surface. It is the responsibility of audiologists to draw attention to this using the best available evidence. All audiologists are encouraged to practice interventional audiology. As the social norms for aging change, and the primary goal for the majority of individuals aged 65 and older is to stay mentally sharp, physically fit, and financially sound for at least another 30 years, audiologists must identify innovative ways to intervene in the hearing care of this new generation of healthy agers. It is in the best interest of the public, the health care system, the profession, and certainly in the best interest of patients.

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