Successful Aging and Our Hearing

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Our society is growing older, and at a pace that continues to accelerate. The number of individuals over the age of 65 will double in the next 15 years—an immense population of Americans who are beginning to face the challenges of aging. The concern is not only that more of us will be facing the realities of aging, but also that the challenges themselves now play out longer than in past generations. This change is due, of course, to longer life expectancy. Organ systems critical to sustaining life—the heart, lungs, kidney, liver and even the brain—can be supported by medications or artificial means for years, and even replaced if needed.

As a result, modern medicine can enable us to live well beyond what used to be considered an average lifespan. The challenges of aging are therefore likely to last a much longer time, making it necessary to find new strategies to counter threats to our quality of life. Aging is now assuming a greater priority on the American health care agenda, and for good reason. Given our changing demographics, an agenda that promotes successful aging will be essential to our nation’s future.

The importance of a mission to support older adults relates not just to the monetary costs involved. Seniors do have nearly universal dependence on the health care system, so those costs are substantial. But there is something more basic at stake. We believe the way we, as a nation, care for our seniors reflects our system of values. A recent CBS Sunday Morning program addressed the issues from a perspective of the looming threats of the high costs of caring for the elderly. The central issue was posed: “How could the best thing that ever happened to us, a near doubling of the American average lifespan over the last century, be the worst thing that ever happened to us?”

To develop and maintain control in life, we need to:

• avoid disease and thus compress disability in the latest stages of life possible,
• maintain high physical and cognitive function, and
• stay engaged in social and productive activities.

Growing evidence suggests that a hearing loss can affect each and every one of these dimensions.

As we researched this topic further, we’ve been impressed with how effective communication can have a positive impact on every other life domain. We shouldn’t be surprised. Though our ability to communicate with one another may seem like a lifestyle option, an abundance of information shows that good communication is important, if not essential, in supporting general health as well as our quality of life.

We know that at a basic biological level, our brain needs constant renewal of all kinds of stimuli through sensory experience. Conversely, we know that sensory deprivation is devastating. When our senses are not stimulated for prolonged periods, the personality disintegrates.

An Unfortunate Collision: Hearing Loss and Aging

In terms of the prevalence of chronic (long-term) disorders, severe hearing loss that prevents an individual from understanding routine speech is the third most common condition affecting elderly people. Moderate hearing loss affects 30 percent of those aged 65 to 74 years and 50 percent of those between 75 and 80. Only high blood pressure and rheumatoid arthritis affect more seniors.

In this article we want to share some of my views on the hearing loss that now affects millions of seniors, and will affect many more millions to come. My views come not just from my perspective as a hearing care physician, but also as a son whose mother’s hearing loss has progressed.

We will also review research on aging and the prevalence of hearing loss in seniors. Because it is such a common disability, it is impossible to ignore the impact that hearing loss has on society as well as on individuals. Finally, we will examine the role played by hearing aids and cochlear implants for those who seek to take action in addressing their hearing loss.

New World, New Communications

The new millennium has brought on smarter, faster devices that carry more...
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It has been offered that, in modern American society, our schedules and expectations leave less and less time and space for those who don’t participate. One result is something the New York Times termed a bifurcation of society—a growing isolation of those who do not participate from those who do. With our population aging at an accelerated rate, we are entering a period in which our culture marginalizes non-participants.

An important question for seniors, then, is how to maintain vital connections in a highly dynamic communication environment. For many, this challenge is more difficult because of age-related hearing loss. The common condition of hearing loss, known as age-related hearing loss, requires that a senior maintain the ability to communicate in a world filled with noise and echoes, and with acquaintances who too often mumble. In a world that moves swiftly and rarely looks back.

Hearing and Listening

Communication relies on our ability to organize the complex information of the auditory world. During effective listening, we sense the power (loudness) of an environmental or voiced sound, sort out the pitches contained in speech components, and track changes in the power and pitch of sounds over time.

To process sound information, our hearing pathway, from the ear to the brain, is continually breaking down sounds into their components, feeding the brain with a supply of signals that reveals the identity of speech sounds. In doing so, our brain addresses the immense task of comprehending what the ear has sensed. And while our ears hear and our brain listens, we naturally keep tabs on what sounds arrived previously, where we are as we listen, what’s being said and who is speaking.

Memory and ongoing thinking (cognition) thus play an important role. In fact, the wide spectrum of sounds in our environment and in our speech requires that our brains untangle and organize this information from a background of distractions in order to make sense of the complex soundscape in which we live.

This remarkable system of analytics of sounds requires, however, that sounds are first captured by our outer, middle and inner ears. Unfortunately, our ears are under siege from a variety of factors and the sensitivity and refinement with which the ear operates is subject to age-related decline. Studies indicate that the decline in hearing sensitivity begins to accelerate beyond the age of 20 in men, and above age 50 in women.

Loss in hearing sensitivity is more than twice as fast for men than women. The hearing loss that accompanies aging can reflect any of several potential problems along the hearing pathway. As soundwaves strike the ear drum, hair cells within the inner ear detect incoming sounds when they are jiggled by the waves of energy. Toxic substances, trauma, infections, overactivity of the immune system, and errors in the genetic code can affect the hair cells’ function. Hair cell injury produces sensorineural hearing loss and is by far the most common cause of all hearing impairments. One of eight people with a hearing loss has a sensorineural hearing loss (SNHL).

Most—75 percent of people over the age of 75 years have a significant SNHL. Damage to our hair cells is one part of the aging process. It produces SNHL. Damaged hair cells are less able to detect specific sounds. As a result, the ear has reduced ability to decipher codes of information in speech and other complex sounds.

What Do People with Sensorineural Hearing Loss Notice? The first and most obvious change is reduced sensitivity to soft sounds. Here, the highest frequencies are most affected. Results from hearing the outer cell of the cochlear spiral are usually thought to be impaired. In fact, the rate of hearing loss affecting the higher pitches is generally twice that of the lowest pitches of the speech sounds.

One important consequence of age-related hearing loss is difficulty in understanding the higher-frequency sounds of speech—generally in the class of consonant sounds (vowel sounds in the lower registers). Sounds that carry the acoustic energy of speech and other complex sounds are critical to understanding spoken words. Speech sounds in the higher pitch range are pivotal for understanding about 75 percent of all words.

When given complex hair cells are, it’s not surprising that there are other consequences as well. Sensorineural hearing loss also involves:

- Our ears failing to sort out tones. In fact, sounds are distorted as the sensation of pitch (whether a sound is high or low) is “smearred.” Such smearing prevents us from separating streams of sound that are heard. It becomes more difficult to sort out speech signals from background noise.
- Unusual growth in how we perceive a sound becoming louder. All sound contains varying levels of loudness. Even in the simplest of sounds there are loudness cues that help us in recognizing a particular sound. Malfunction of hair cells within the cochlea distorts perceptions of changes in loudness. The sound might be louder to hear it, but increasing levels of loudness produce discomfort. This problem, known as recruitment, requires that hearing aids be adjusted in a strategic way to prevent uncomfortable listening.
- Sounds that occur spontaneously. Tinnitus is the phantom sounds that occur when the brain loses its supply of signals normally provided by the ear. Usually this produces a ringing or humming sound in the ear and occurs when a sensorineural hearing loss is present.

In addition to age effects on the inner ear, other factors can challenge effective hearing and listening for seniors. The characteristics of a talker, particularly the rate of speaking, can affect how well speech is recognized. Normal conversation occurs at a rate of about 250 words per minute. In experiments using faster speech pinnimations, elderly listeners’ recognition of speech signals decline. This effect does not occur with young listeners. These challenges can be greater when trying to understand someone discussing an unfamiliar topic (i.e. with reduced “context”) when compared with attempts to recognize common, everyday sentences.

Elderly Listeners Experience Further, Inordinate Difficulty in Common Settings

Elderly listeners experience difficulties understanding others because of impairments with the mechanics of transmitting the vibrational energy contained by sound. However, the environments in which we listen to others—acoustics—also play an important role. A senior listener is likely to experience deficits in understanding speech when reverberation (echoes) and background noise are present. These factors commonly encountered in restaurants, meetings and other large room environments “corrupt” listening conditions.

Reverberation has a “smoothing” effect on the waves of a speech signal, thus removing some of the distinctive properties of a sound’s “signature” that is key in differentiating words. Large rooms with high ceilings and hard walls accentuate reverberation. This is a problem in age-related SNHL because of the inability to filter sounds and suppress environmental echoes.

A wealth of research now indicates that elderly listeners perform more poorly than younger counterparts (with comparable hearing) in reverberant conditions. Thus, the greatest difficulties in understanding others encountered by seniors are experienced not just as a result of the inability to hear, but also because of the inability to sort out the critical speech sounds from the echoes. Speech is also harder to understand in the presence of a background.
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of complex noise (e.g. room ven-
til-tion systems, music or multiple
talkers). Competition from noise is an
even greater problem when the
listener is surrounded by the noise
or when background noise and a
garker’s voice come from the same
direction.

Unfortunately, the acoustics of
listening environments mean that
the greatest impact of age-related hearing
loss occurs in difficult listening envi-
nronments. Such listening environ-
ments are important to understand-
ing of why some groups in family
and social environments, when there
is often a dynamic interplay of spoken
communications—such as when people
assemble for social gatherings, formal
meetings, for dining, and for worship.

The psychological implications of
challenges in communicating in
group settings are obvious. While
hearing aids, assistive listening de-
vice, and cochlear implants attempt to
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The Options for Managing a Relat-
red SNHL is the use of amplifica-
tion. The goal is to enhance the power
of selected pitches and to provide that
enhancement in a way that provides
for comfortable listening. Contem-
porary hearing aids also compress
overly loud signals, and attempt to
to reduce background noise through
filtering systems that adapt to the
listening environment and through
directional microphones. Substantial
improvements in speech recognition
are achievable in quiet, ideal listen-
ing. But speech recognition in noise are less consistent, though
significant benefit is still reported.

Hearing aids may provide addi-
tional benefit by masking tinnitus, if
present, by supplying improved per-
ception of environmental and speech
sounds, allowing the individual to hear
better in more difficult conditions.

However, keep in mind that hear-
ing aids cannot cure hearing loss.
What hearing aids can do is lessen
the barriers to verbal communication,
allowing the listener to access more
of the key information to effective
listening of everyday communications.

Cochlear Implants
When a hearing loss is profound
(beyond treatable with hearing aids),
the hearing loss carries substantial,
measurable effects on multiple
domains that are important to quality
of life (Francis et al, 2001). My col-
league, Dr. Howard Francis used a
well-tested survey of the things that
people consider crucial to the quality
of their life. The survey results revealed
that impaired communication with
others made people vulnerable to low
mood and depression, and to some ef-
fects on thinking ability. All contributed
to a significant reduction in the quality
of life experienced by seniors with
hearing loss.

For those with more advanced,
severe-to-profound sensorineural hear-
ing loss, the cochlear implant provides
a physiologically useful code of electri-
cal signals. These signals trigger trains
of impulses in nerves within the ear in
severe-to-profound deafness. The “co-
chlear implant” is actually a system of
subcutaneous electrodes that receives
coded signals and trans-
From a cochlear implant to discrimination
of environmental and social networks are basic to con-
ceptualizations of disability and the extent to which an individual
may accumulate, two factors have emerged as
key in predicting the ability to use restored hearing from a
cochlear implant to discriminate
words, and
may moderate effects that might occur with senescent changes in
elderly implant recipients.

These observations are further underscored by assessments of ulti-
mate outcome. Implant recipients
report significant satisfaction ex-
pressed as improvements in quality
of life after receiving a cochlear im-
plant. What these studies indicate
is that elderly people achieve the
same or nearly the same level of
benefit in speech-recognition as do
younger recipients. Elderly cochlear
implant users may have a slower
learning curve.

For people over the age of 70, the
cochlear implant may produce,
on average, slightly lower speech-rec-
ognition scores than younger people. These differences may reflect some
limits in processing information
that is presented at a rapid rate by
the cochlear implant. Fortunately,
however, these effects appear to be
small. This is me!

Decision to Do Something About a Hearing Loss
Despite the clear benefits of ampli-
fication for elderly individuals with
SNHL, the number of elderly individ-
vals who actually purchase a cochlear
implant pursue the intervention. The
reasons for this low rate of device use
are multiple and complex. But
much of the resistance seen in SNHL
is often minimized or denied because
it typically evolves slowly and lacks
visibility. Attitudes toward SNHL and
its rehabilitation vary among affected
individuals, but several are commonly
encountered in surveys of individuals
with hearing loss (Kochkin, 2000):

• Perceived level of loss
  • Level: “I hear well enough”
  • Psychosocial: “Fine hearing is
unnecessary”

• Occupation: “My loss is not
a disability”

• Association: perceived man-
ifestation of aging

• Perception of harassment:
“People make fun of my hearing”

• Difficulties in admitting
the loss and pride: “It ages you”

• Expectations and prior experience
  • Amplification does not per-
form as promised
  • Skepticism: “Won’t work for
near deafness/tinnitus or in
noisy settings”

• Hearing rehabilitation is not cheap,
and often not a covered benefit
with health insurance

Studies of seniors demonstrate that
impairments in listening under
demanding circumstances produce
deficits in speech recognition.
Understanding that the hearing loss fits the true defini-
tion of a “disability”—an impairment of a person’s capacity to function in
addressing personal, social, or occupa-
tional demands. However, the percep-
tion of the hearing loss as a disability
is highly variable.

Although SNHL coupled with
other effects of aging limits an elderly
person’s ability to communicate effec-
tively, the extent to which an individual

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Recent technological developments provide some solutions. As ear worn devices are now commonplace in transmitting information via telephones and entertainment devices, hearing aid and cochlear implant manufacturers have moved into these devices to offer telephone contact and access to music. Assistive listening devices, including FM and infrared transmitter systems, offer a cleaner signal and improve speech understanding in challenging listening environments. Transmissi

In a society that marginalizes its seniors, we need to embrace a concept that advancing age remains a time for continued growth and development. Aging successfully is about entering a new stage of adulthood with the tools to navigate this critical transition. Simply put, successful aging is about using all of life's stages to continue to live boldly.

Seniors can use their experience to augment the sound inputs offered by hearing aids and cochlear implants. This allows for more relaxed and more effective use of health care. Through the use of hearing aids and cochlear implants, we need to understand the hearing loss that these seniors carry the responsibility of documenting.

It's important that we also recognize the impact of hearing technology on the senior listener. As mentioned, when a hearing loss is present, the ability to understand speech when wearing a hearing aid varies. The level of benefit a senior hearing aid user can achieve varies. The level of benefit a senior hearing aid user can achieve depends on several factors, including the severity of the hearing loss, the type of hearing aid, and the person's ability to use the hearing aid effectively.

A Critical Concern: Costs

A Cochlear implant must deliver electrical signals that require more powerful processing with far greater precision than that of a cardiac pacemaker. Given these requirements, analyses have generally supported current costs of $150,000 to $900,000 for cochlear implants. However, both consumers and health care payers are wary of high reimbursement costs. Addressing hearing loss in seniors carries costs. The current mindset of insurers and health care payers is to generally not provide hearing aid coverage. However, this need to understand the benefit of hearing aid and cochlear implant technologies.

SNHL, insurers will generally support only those interventions with a proven track record of benefit for the costs involved. It's important that we also recognize that emerging technologies such as new hearing device configurations are sometimes viewed with skepticism by insurers. Clinicians have been cited as too aggressive in applying new devices to all patients within a disease category, without selecting best candidates (Powell, 2000). Hearing care providers carry the responsibility of documenting the long-term efficacy of the devices and care provided.

To understand the overall impact of hearing loss in seniors we need to understand the impact of the intervention on many levels. First, we need to understand the hearing benefit provided. Beyond this we need to consider the social benefit of hearing aids. The social benefit of hearing aids is measured by the advancement of the social function and the improvement in quality of life. The quality of life measures that survey mental and emotional health, physical and social function and the impact of chronic disease, show strong positive relationships with the use of hearing care.

An advanced level of hearing loss reducing the ability to understand speech is often accompanied by a reduction in the ability to understand speech. The hearing loss represents a challenge. But clinical research increasingly underscores the importance of hearing care. The hearing loss is present. The hearing loss affects all of the principal life domains—such as those domains beyond everyday communication. For example, improved access to speech information may affect daily life activities. Most important from a public health perspective, we can ask the question of whether addressing a hearing loss is achievable in the majority of senior implant users. Quality of life measures that survey mental and emotional health, physical and social function and the impact of chronic disease, show strong positive relationships with the use of hearing care.

The4th Annual Hearing Loss Association of America

We want you! Tell us about your experiences with hearing loss in the workplace and be a part of Hearing Loss Awareness Month. Your insights can be found on our website at www.hearingloss.org. For more information, e-mail Editor Barbara Kelley at Shelley@hearingloss.org.