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*Professional update:*  
*Otolaryngology*

**Amplifying the Quality of Life**  
*Advances in technology bring improved hearing to millions*

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Hearing loss is the third most prevalent chronic condition in older Americans, following hypertension and arthritis. In 2004, 31.5 million Americans suffered from hearing loss and the numbers are rising, particularly within the baby boomer and elderly age brackets. Projections show the hearing loss population will grow to more than 33 million by 2010 and 41 million by 2025.

Today, more than a quarter of the population 65 years or older is hearing impaired, with many relying on hearing aids to improve the quality of their life. The good news for these people is that hearing aids are no longer cumbersome and bulky. With the advent of the digital age, hearing aids have moved from analog to digital technology, allowing for more individualized, detailed programming and adjustments, as well as multi-memory capabilities that can handle more varied listening environments.

With more of those who need hearing aids actually purchasing them (the user adoption rate has increased to 39 percent), and the average age of users climbed to nearly 70, it has become more important than ever that the technology keep up with the demands of its users.

## **Common causes of hearing loss**

Hearing loss can be congenital, hereditary, noise induced, age related, or a result of using certain medications. All of these causes can be classified in one of two major categories: conductive hearing loss and sensorineural hearing loss.

*Conductive hearing losses* usually involve abnormalities of the middle and external ear, and generally have a mechanical cause such as a perforated eardrum or fluid accumulation. Treatment for this type of loss is often medical such as antibiotics or surgery.

*Sensorineural hearing losses* related to aging, also known as presbycusis, and noise exposure are the most common causes of hearing loss in the U.S. Hearing loss due to aging typically is gradual, bilateral, and characterized by high-frequency deficit. People who suffer from presbycusis have difficulty filtering background noise, which makes listening especially challenging in common social settings. Sensorineural hearing losses are typically treated with amplification devices such as hearing aids.

Because the clarity of speech comes from high-frequency consonant sounds in our language (e.g., sounds such as f, sh, s, th, t, k, p, and c) and hearing loss usually first manifests itself in the high frequencies, hearing-impaired people are left with a sense that others are mumbling or not speaking clearly. With this type of hearing loss, it is usually a family member who will point out that the television is too loud or that the person is misunderstanding what is said—particularly if the speaker is a woman or child with a higher-pitched voice.

Children often experience hearing loss due to middle ear infections. In this case, the resulting hearing loss is related not to clarity, but rather to volume—meaning that if the sounds are loud enough, the person will be able to hear them. This type of hearing loss can almost always be treated medically; however, early diagnosis is very important as the condition can worsen and have long-term consequences, e.g., eardrum rupture or deterioration of the middle ear bones.

## **Options in hearing aids**

Over the past ten years, hearing aids have moved from analog to digital technology. Older, analog hearing aids have fewer tuning capabilities and, in most cases, only one setting for all listening environments. Digital hearing aids can be customized to the individual user and also provide access to multiple memories, or individual settings for different situations. For example, a person can have one memory set for general use, one for speech in noise, another for the telephone, and perhaps yet another for large meeting rooms. Having customizable settings allows the hearing impaired person to hear better in a multitude of listening situations. Digital technology also provides high-fidelity sound quality, much like what the natural ear provides, when compared to analog processing.

Among the digital hearing-aid options are custom in-the-ear (ITE), completely in-the-canal (CIC), behind-the-ear (BTE), and open-ear (OE) hearing aids (see Fig. 1). ITE and CIC hearing aids are molded to the individual's ear and sit in the ear canal and, at times, the bowl of the outer ear. BTE hearing aids sit behind the ear and attach to a custom ear mold, which anchors the aid to the ear and delivers the amplified signal from the hearing aid into the ear canal.

OE hearing aids are generally smaller than BTE hearing aids, but they do not use custom ear molds. A small, thin acoustic tube comes down from the unit and rests in the ear canal, leaving the canal open. This allows for more natural hearing as occlusion is not an issue. Each type of hearing aid is specific to the varying degrees of hearing loss; however, OE hearing aids tend to be favored because they provide a more natural sound quality.

OE hearing aids are ideal for patients who have good low-frequency hearing and exhibit a mid- and high-frequency loss, while ITE hearing aids are best for patients who experience a hearing loss at all or most frequencies. BTE hearing aids are generally used for more severe or profound hearing loss, when significantly higher gain is needed. The separation of the microphone from the

hearing aid and ear canal allows more amplification with less chance of feedback.

The best candidates for hearing aids are those who are motivated to wear them and those who have good speech-understanding ability. A person who is motivated will enjoy amplification more than the person who considers it only because his spouse or child tells him he cannot hear. If the person is not motivated to use amplification, the hearing aid will likely sit in a nightstand drawer. The second group, those who have good speech understanding ability, will usually be quite successful with amplification. However, anyone whose speech understanding is less than 40 percent will likely have difficulty with hearing aids. Hearing aids will indeed make sounds louder and therefore, easier to hear, but if a person's ability to understand is compromised, a hearing aid essentially will just be amplifying what is perceived as distortion.

It is estimated that up to 30 percent of people who receive hearing aids do not use them, primarily due to the aging of the actual instrument and inadequate programming. Other reasons for not wearing a hearing aid include having problems with inserting it in the ear, switching it on and off, changing the battery, cleaning the ear mold, and changing the volume. Given that the size and shape of hearing aids can influence user satisfaction, it is becoming even more important that manufacturers consider what styles and attributes users are finding most useful and likeable.

### **Screening tests**

Surprisingly, less than 13 percent of the U.S. population is screened annually for hearing loss by physicians. This trend that needs to be reversed—especially considering that hearing loss is often underdiagnosed and undertreated.

Primary care physicians play a key role in helping to identify patients who do not even realize they are experiencing hearing loss. Before referring a patient for amplification testing, it is important for the physician to check a patient's ears to rule out any medical issues that might be corrected (e.g., excessive ear wax, ear drum perforation, a foreign body in the ear).

After an initial screening and examination, a complete audiogram is usually necessary. The complete audiological evaluation includes air and bone conduction, speech audiometry, and tympanometry. Each of these tests will help the hearing specialist determine the appropriate type of hearing aid and programming, and will help the patient set realistic expectations in wearing a hearing aid.

#### **Sidebar: Misconceptions about hearing aids**

Here are a few common misconceptions that people have about hearing aids.

- *Everything will sound electronic or unnatural.* The ability to fine tune the frequency response, along with a hearing aid that fits appropriately, can provide a very natural sound quality.
- *You will be able to hear like you did when you were 10 years old.* Hearing aids are not like eyeglasses; they do not “correct” your hearing. They are an aid that will make it easier and less stressful to communicate.
- *Hearing aids work perfectly in every situation.* Situations that are difficult for people who hear normally can be just as difficult for people using amplification.
- *Hearing aids are for old people.* Anyone at any age can experience hearing loss. The earlier you begin using amplification, the more successful you will be as you age.
- *Hearing aids will help you to hear someone in another room.* Hearing aid microphones function best when used within a six-foot radius.

#### **A valuable investment**

The gradual hearing loss that occurs in everyone as we age is a common condition; however, it is becoming even more common among baby boomers. Hearing loss cannot be reversed, but thanks to ever-improving technology, hearing can be maintained for many years, and those who suffer from hearing loss no longer have to compromise their quality of life.

Beyond the diminished ability to hear and communicate, hearing loss can adversely affect a person's physical and mental health. Therefore, it is important that anyone experiencing hearing difficulties receive a hearing screening and be encouraged to pursue amplification. After all, an investment that will literally amplify a person's quality of life is an investment of immeasurable value.

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