

# Hearing Aids

## What Is a Hearing Aid?

A hearing aid is an electronic, battery-operated device that amplifies and changes sound to allow for improved communication. Hearing aids receive sound through a microphone, which then converts the sound waves to electrical signals. The amplifier increases the loudness of the signals and then sends the sound to the ear through a speaker.

## How Common Is Hearing Loss and What Causes It?

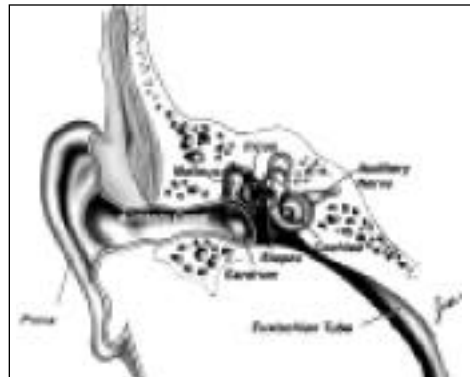
Approximately 28 million Americans have a hearing impairment. Hearing loss is one of the most prevalent chronic health conditions in the United States, affecting people of all ages, in all segments of the population, and across all socioeconomic levels. Hearing loss affects approximately 17 in 1,000 children under age 18. Incidence increases with age: approximately 314 in 1,000 people over age 65 have hearing loss. Hearing loss can be hereditary, or it can result from disease, trauma, or long-term exposure to damaging noise or medications. Hearing loss can vary from a mild but important loss of sensitivity, to a total loss of hearing.

There are different types of hearing loss. Conductive hearing loss occurs when sound waves are prevented from passing to the inner ear. This can be caused by a variety of problems including buildup of earwax (cerumen), infection, fluid in the middle ear (ear infection or otitis media), or a punctured eardrum. Sensorineural (nerve) hearing loss develops when the auditory nerve or hair cells in the inner ear are damaged by aging, noise, illness, injury, infection, head trauma, toxic medications, or an inherited condition. Mixed hearing loss is a combination of both conductive and sensorineural hearing loss. A conductive hearing loss can often be corrected with medical or surgical treatment, while sensorineural hearing loss usually cannot be reversed.

## How Do We Hear?

Hearing depends on the following series of events that change sound waves in the air into electrical impulses that the auditory (hearing) nerve carries to the brain. The ear has three major parts, described as the outer ear, middle ear, and inner ear.

- Sound waves enter the outer ear (pinna) and travel through a narrow tube (ear canal) that leads inside the ear to the eardrum (tympanic membrane). The eardrum vibrates from the incoming sound waves and transmits these vibrations through three tiny bones called the ossicles (the malleus, incus, and stapes) in the middle ear. They amplify the sound and send it through the entrance to the inner ear (oval window) and into the fluid-filled hearing organ (cochlea).
- The vibrations create ripples in the fluid that bend projections from tiny hair cells in the cochlea, causing electrical impulses that the auditory nerve, or eighth cranial nerve, sends to the brain.
- The brain translates these impulses into what we experience as sound.



(over)

People with hearing loss may experience some or all of the following problems:

- Difficulty hearing conversations, especially when there is background noise.
- Hissing, roaring, or ringing in the ears (tinnitus).
- Difficulty hearing the television or radio at a normal volume.
- Fatigue and irritation caused by the effort to hear.
- Dizziness or problems with balance.

## How Can I Find Out If I Have Hearing Loss?

If you think you might have hearing loss, visit your physician, who may refer you to an otolaryngologist or audiologist. An otolaryngologist is a physician who specializes in ear, nose, and throat disorders, and will investigate the cause of the hearing loss. An audiologist is a hearing health professional who identifies and measures hearing loss and will perform a hearing test to assess the type and degree of loss.

## How Can Hearing Aids Help?

On the basis of the hearing test results, the audiologist can determine whether hearing aids will help. Hearing aids are particularly useful in improving the hearing and speech comprehension of people with sensorineural hearing loss. When choosing a hearing aid, the audiologist will consider your hearing ability, work and home activities, physical limitations, medical conditions, and cosmetic preferences. For many people, cost is also an important factor. You and your audiologist must decide whether one or two hearing aids will be best for you. Wearing two hearing aids may help balance sounds, improve your understanding of words in noisy situations, and make it easier to locate the source of sounds.

## What Are the Different Kinds of Hearing Aids?

There are several types of hearing aids. Each type offers different advantages, depending on its design, levels of amplification, and size. Before purchasing any hearing aid, ask whether it has a warranty that will allow you to try it out. Most manufacturers allow a 30- to 60-day trial period during which aids can be returned for a refund.

There are four basic styles of hearing aids for people with sensorineural hearing loss:

- **In-the-Ear (ITE)** hearing aids fit completely in the outer ear and are used for mild to severe hearing loss. The case, which holds the components, is made of hard plastic. ITE aids can accommodate added technical mechanisms such as a telecoil, a small magnetic coil contained in the hearing aid that improves sound transmission during telephone calls. ITE aids can be damaged by earwax and ear drainage, and their small size can cause adjustment problems and feedback. They are not usually worn by children because the casings need to be replaced as the ear grows.
- **Behind-the-Ear (BTE)** hearing aids are worn behind the ear and are connected to a plastic earmold that fits inside the outer ear. The components are held in a case behind the ear. Sound travels through the earmold into the ear. BTE aids are used by people of all ages for mild to profound hearing loss. Poorly fitting BTE earmolds may cause feedback, a whistle sound caused by the fit of the hearing aid or by buildup of earwax or fluid.

- **Canal Aids** fit into the ear canal and are available in two sizes. The In-the-Canal (ITC) hearing aid is customized to fit the size and shape of the ear canal and is used for mild or moderately severe hearing loss. A Completely-in-Canal (CIC) hearing aid is largely concealed in the ear canal and is used for mild to moderately severe hearing loss. Because of their small size, canal aids may be difficult for the user to adjust and remove, and may not be able to hold additional devices, such as a telecoil. Canal aids can also be damaged by earwax and ear drainage. They are not typically recommended for children.
- **Body Aids** are used by people with profound hearing loss. The aid is attached to a belt or a pocket and connected to the ear by a wire. Because of its large size, it is able to incorporate many signal processing options, but it is usually used only when other types of aids cannot be used.

## Do All Hearing Aids Work the Same Way?

The inside mechanisms of hearing aids vary among devices, even if they are the same style. Three types of circuitry, or electronics, are used:

- **Analog/Adjustable:** The audiologist determines the volume and other specifications you need in your hearing aid, and then a laboratory builds the aid to meet those specifications. The audiologist retains some flexibility to make adjustments. This type of circuitry is generally the least expensive.
- **Analog/Programmable:** The audiologist uses a computer to program your hearing aid. The circuitry of analog/programmable hearing aids will accommodate more than one program or setting. If the aid is equipped with a remote control device, the wearer can change the program to accommodate a given listening environment. Analog/programmable circuitry can be used in all types of hearing aids.
- **Digital/Programmable:** The audiologist programs the hearing aid with a computer and can adjust the sound quality and response time on an individual basis. Digital hearing aids use a microphone, receiver, battery, and computer chip. Digital circuitry provides the most flexibility for the audiologist to make adjustments for the hearing aid. Digital circuitry can be used in all types of hearing aids and is typically the most expensive.

Approximately 28 million Americans have a hearing impairment. Hearing loss is one of the most prevalent chronic health conditions in the United States, affecting people of all ages, in all segments of the population, and across all socioeconomic levels.

(over)

## What Can I Expect From My Hearing Aids?

Using hearing aids successfully takes time and patience. Hearing aids will not restore normal hearing or eliminate background noise. Adjusting to a hearing aid is a gradual process that involves learning to listen in a variety of environments and becoming accustomed to hearing different sounds. Try to become familiar with hearing aids under nonstressful circumstances a few hours at a time. Programs are available to help users master new listening techniques and develop skills to manage hearing loss. Contact your audiologist for further information about programs that may suit your individual needs.

## What Questions Should I Ask Before Buying Hearing Aids?

Before you buy a hearing aid, ask your audiologist these important questions:

- Are there any medical or surgical considerations or corrections for my hearing loss?
- Which design is best for my hearing loss?
- What is the total cost of the hearing aid?
- Is there a trial period to test the hearing aids? What fees are nonrefundable if they are returned after the trial period?
- How long is the warranty? Can it be extended?
- Does the warranty cover future maintenance and repairs?
- Can the audiologist make adjustments and provide servicing and minor repairs? Will loaner aids be provided when repairs are needed?
- What instruction does the audiologist provide?
- Can assistive devices such as a telecoil be used with the hearing aids?

## What Problems Might I Experience While Adjusting to My Hearing Aids?

- **Become familiar with your hearing aid.** Your audiologist will teach you to use and care for your hearing aids. Also, be sure to practice putting in and taking out the aids, adjusting volume control, cleaning, identifying right and left aids, and replacing the batteries with the audiologist present.
- **The hearing aids may be uncomfortable.** Ask the audiologist how long you should wear your hearing aids during the adjustment period. Also, ask how to test them in situations where you have problems hearing, and how to adjust the volume and/or program for sounds that are too loud or too soft.
- **Your own voice may sound too loud.** This is called the occlusion effect and is very common for new hearing aid users. Your audiologist may or may not be able to correct this problem; however, most people get used to it over time.
- **Your hearing aid may “whistle.”** When this happens, you are experiencing feedback, which is caused by the fit of the hearing aid or by the buildup of earwax or fluid. See your audiologist for adjustments.

- **You may hear background noise.** Keep in mind that a hearing aid does not completely separate the sounds you want to hear from the ones you do not want to hear, but there may also be a problem with the hearing aid. Discuss this with your audiologist.

## **What Are Some Tips for Taking Care Of My Hearing Aids?**

The following suggestions will help you care for your hearing aids:

- Keep hearing aids away from heat and moisture.
- Replace dead batteries immediately.
- Clean hearing aids as instructed.
- Do not use hairspray or other hair care products while wearing hearing aids.
- Turn off hearing aids when they are not in use.
- Keep replacement batteries and small aids away from children and pets.

## **What Research Is Being Done on Hearing Aids?**

The National Institute on Deafness and Other Communication Disorders (NIDCD) supports more than 30 grants for scientists to conduct studies on hearing aid research and development. These studies cover areas such as the application of new signal processing strategies and ways to improve sound transmission and reduce noise interference, as well as psychophysical studies of the impact of abnormal hearing function on speech recognition. Other studies focus on the best way to select and fit hearing aids in children and other difficult-to-test populations, and on reducing bothersome aspects such as feedback and the occlusion effect. Further research will determine the best ways to manipulate speech signals in order to enhance understanding.

To improve hearing aid performance, especially in noisy situations, NIDCD has entered into two collaborative ventures. The first was formed between NIDCD and the Department of Veterans Affairs (VA) to expand and intensify hearing aid research and development. The program includes a contract for the development of hearing aids as well as clinical trials. The knowledge gained will be used to help people choose the best hearing aid for their particular type of hearing impairment.

In the second collaboration, the National Aeronautics and Space Administration (NASA) and the VA have joined NIDCD in surveying all Federal laboratories for acoustic and electronic technologies that might improve hearing aids. The most promising technologies have been presented to auditory scientists and hearing aid manufacturers in the hope of forming research partnerships that will lead to commercial application of these technologies.

(over)

## Where Can I Get Additional Information?

### **Alexander Graham Bell Association for the Deaf (AGBell)**

3417 Volta Place, NW  
Washington, DC 20007-2778  
(202) 337-5220 (Voice/TTY)  
(800) 432-7543 (Toll Free)  
(202) 337-8314 (Fax)  
AGBELL2@aol.com (E-mail)  
www.agbell.org (Internet)

### **American Academy of Audiology (AAA)**

8300 Greensboro Drive, Suite 750  
McLean, VA 22102-3611  
(703) 610-9022 (Voice/TTY)  
(800) AAA-2336 (Toll Free)  
(703) 610-9005 (Fax)  
www.audiology.com (Internet)

### **American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS)**

One Prince Street  
Alexandria, VA 22314  
(703) 519-1589 (Voice)  
(703) 519-1585 (TTY)  
(703) 299-1125 (Fax)  
entinfo@aol.com (E-mail)  
www.entnet.org (Internet)

### **American Association of Retired Persons (AARP) Disability Initiative**

601 E Street, NW  
Washington, DC 20049  
(202) 434-2477 (Voice)  
(877) 434-7598 (Toll Free TTY)  
(202) 434-6406 (Fax)  
www.aarp.org (Internet)

### **American Speech-Language-Hearing Association (ASHA)**

10801 Rockville Pike  
Rockville, MD 20852  
(301) 897-5700 (Voice)  
(301) 897-5700 (TTY)  
(800) 638-8255 (Toll Free)  
(301) 897-7355 (Fax)  
actioncenter@asha.org (E-mail)  
www.asha.org (Internet)

### **Better Hearing Institute (BHI)**

5021-B Backlick Road  
Annandale, VA 22003  
(703) 642-0580 (Voice/TTY)  
(800) EAR-WELL (Toll Free Voice/TTY)  
(703) 750-9302 (Fax)  
mail@betterhearing.org (E-mail)  
www.betterhearing.org (Internet)

### **Hear Now**

4248 Park Glen Road  
Minneapolis, MN 55416  
(800) 648-4327 (Toll Free)  
(612) 828-6946 (Fax)  
cbetz@harringtoncompany.com (E-mail)  
www.hearingaid.org (Internet)

### **Hearing Industries Association (HIA)**

515 King Street, Suite 420  
Alexandria, VA 22314  
(703) 684-5744 (Voice)  
(703) 684-6048 (Fax)

### **Self Help for Hard of Hearing People, Inc. (SHHH)**

7910 Woodmont Avenue, Suite 1200  
Bethesda, MD 20814  
(301) 657-2248 (Voice)  
(301) 657-2249 (TTY)  
(301) 913-9413 (Fax)  
national@shhh.org (E-mail)  
www.shhh.org (Internet)