Hearing loss
How to save and improve the hearing you still have

For months, your family has been encouraging you to get your ears checked — they say you can’t hear anymore. You don’t think it’s a big problem. However, you have noticed that it’s becoming more difficult during conversations to understand all of what’s being said. You have also noticed yourself having to increase the volume on the television, and you don’t always hear the telephone ringing.

Gradual loss of hearing that occurs with age is common. An estimated one-quarter of Americans between the ages of 65 and 75 have some degree of hearing loss, and among Americans 75 and older, three out of four have difficulty hearing.

As baby boomers reach retirement age, the number of people with hearing loss is expected to increase significantly. This is the first generation to grow up with rock concerts, high-tech music amplifiers, jet engine noise and power lawn mowers.

If you’ve already experienced some inner ear hearing loss, you usually can’t get back what’s gone. But with the help of a doctor or hearing specialist (audiologist), you may be able to hear some sounds you’re currently missing. Proper treatment can make communication, social interaction, and work and daily activities easier and more enjoyable.

How you hear
Hearing begins when sound waves are collected by your outer ear and then channeled along the ear canal to the eardrum. The impact of sound hitting the eardrum creates vibrations that cause three bones in the middle ear — the hammer, anvil and stirrup — to move. This amplifies the vibrations as they travel to the inner ear.

In the inner ear, the vibrations pass through fluid located within a snail-shaped structure called the cochlea. This produces a wave-like action affecting thousands of sensory cells called hair cells. Tiny hairs project from the tips of the cells. The wave-like action bends the hairs, setting off patterns of electrical impulses that are transmitted along the auditory nerve that runs from the inner ear to your brain. Your brain interprets the impulses as sound.

Because different sounds produce differing vibrations that affect the tiny hairs in different ways, the patterns transmitted to your brain vary. That’s how you distinguish one sound from another.

Types of hearing loss
Hearing loss results when something goes wrong along the sound pathway from your outer ear to your brain. There are three main types of hearing loss, categorized by where on the pathway signals become blocked or interrupted:

- **Conductive hearing loss** — This occurs when the outer or middle ear fails to work properly. Sounds become “blocked” and aren’t carried to the inner ear. Conductive hearing loss is often treatable — the problem can be fixed with medicine, surgery, or something as simple as cleaning out your ear canal. Common causes are fluid behind the eardrum or wax buildup in the ear canal. This type of hearing loss can also occur when the eardrum or bones of the middle ear don’t function normally, due to an injury or other medical conditions.
Put a lid on noise
The best things you can do to prevent hearing loss are to limit exposure to loud noise and have your hearing checked regularly. Consider:

- **Wearing earplugs or earmuffs** — If you have to shout to be heard by someone an arm’s length away, you’re being exposed to too much noise. In such situations, wear protective earplugs or earmuffs that meet federal safety standards. This guideline applies at work and at home.

- **Avoiding recreational risks** — Activities such as riding a motorcycle or snowmobile, hunting with a gun, cutting wood with a chain saw, using noisy power tools, or listening to loud music for long periods can damage your ears. With the growing popularity of portable music players such as iPods and MP3 players, doctors expect more people will have hearing loss, and at younger ages. Wear hearing protection to blunt the noise.

- **Hold down the noise at home** — It’s easy to overlook the racket at home. To reduce noise, control the volume on the television and stereo, don’t run multiple appliances at the same time and when possible, purchase quieter appliances.

- **Have your hearing tested** — If you work in a noisy environment, have regular hearing tests. Testing can provide early detection of hearing loss so that you can take steps to prevent further damage to your hearing.

- **Sensorineural (sen-suh-re-NOOR-ul) hearing loss** — This results when the inner ear is damaged. The most common causes are wear and tear on inner ear structures due to aging and noise exposure. Sensorineural hearing loss usually isn’t treatable with medication or surgery. Sometimes, hearing loss occurs when the auditory nerve or the nervous system is damaged. One cause of this type of hearing loss is a non-cancerous (benign) tumor, such as an acoustic neuroma, that presses on the auditory nerve. Surgery is generally necessary to remove the tumor.

- **Mixed hearing loss** — This is the description of a condition in which you have a combination of conductive and sensorineural hearing loss.

What puts you at risk
Most hearing loss results from damage to the cochlea, the snail-shaped structure in the inner ear. Tiny hairs in the cochlea may break or become damaged, and hair cells may deteriorate. When the cells or the hairs are damaged or missing, electrical signals aren’t transmitted as efficiently and hearing loss occurs.

Factors that may damage or lead to loss of hairs and hair cells in your inner ear include:

- **Aging** — Normal wear and tear over the years from sound can damage the cells of your inner ear. Age-related hearing loss (presbycusis) is the most common cause of hearing loss.

- **Loud noises** — Occupational noise, such as from construction, factory work or farming, and recreational noise, such as from shooting firearms, snowmobiling or listening to loud music, can contribute to damage inside your inner ear.

- **Heredity** — Your genetic makeup may make you more susceptible to ear damage.
Special Report

Tinnitus

Tinnitus is a condition that commonly affects older adults and may be associated with hearing loss.

Tinnitus involves the annoying sensation of hearing noise in your ear when no external sound is present. The noise may vary from a low roar to a high squeal. Many people describe it as a ringing, hissing or buzzing sound.

Tinnitus may result from a number of medical conditions, including excessive noise exposure, age-related hearing loss, head injuries or an ear injury. High doses of some drugs, including aspirin or certain antibiotics, as well as diseases such as high blood pressure or atherosclerosis, may also produce the condition. Treatment is dependent on the cause, but in some cases there’s little that can be done to lessen the symptoms. The focus of treatment then becomes learning how to tolerate the noise.

Sound levels of common noises

<table>
<thead>
<tr>
<th>Approximate decibels</th>
<th>Noise</th>
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<tbody>
<tr>
<td>30</td>
<td>Whisper</td>
</tr>
<tr>
<td>60</td>
<td>Normal conversation</td>
</tr>
<tr>
<td>80</td>
<td>Ringing telephone, heavy traffic</td>
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<tr>
<td>90</td>
<td>Hair dryer, power lawn mower</td>
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<tr>
<td>105</td>
<td>Bulldozer</td>
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<tr>
<td>110</td>
<td>Chain saw</td>
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<tr>
<td>120</td>
<td>Ambulance siren</td>
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<tr>
<td>140</td>
<td>Jet engine at takeoff, outside the cabin</td>
</tr>
<tr>
<td>165</td>
<td>12-gauge-shotgun blast</td>
</tr>
</tbody>
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Source: National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, 2006

- Some medications — Drugs such as the antibiotic gentamicin and certain chemotherapy drugs can damage your inner ear. Usually temporary effects on your hearing — ringing in the ear or hearing loss — can occur if you take very high doses of aspirin, certain types of diuretics such as furosemide (Lasix) or some drugs used to treat malaria.
- Some illnesses — Certain diseases or illnesses that result in an infection, such as meningitis, can damage the cochlea.

Treating hearing loss

Treatment for hearing loss depends on the cause and severity of the loss. If your hearing loss is the result of earwax blockage, your doctor or audiologist can remove the wax. If an ear infection is at fault, medications are often prescribed. If the eardrum is perforated, it may heal itself or may be “patched” surgically. For excess bone growth or tumors in the middle ear, surgery is usually necessary.

The most common remedy for sensorineural hearing loss is a hearing aid or another assistive listening device. A hearing aid can make sounds stronger and easier for you to interpret and understand.

Many people with hearing loss are hesitant to wear a hearing aid because of worry about how it will look and whether it will really help. But wearing a hearing aid is much less noticeable than is constantly asking people to repeat themselves or responding to a question with an unrelated answer. In addition, the devices have become so automated in recent years that they require little, if any, adjustments. Furthermore, hearing aids don’t look much different from the portable music devices and tiny phones commonly seen these days in the ears of young people.

Knowing more about the types of hearing aids available, what to look for when buying them and how to get accustomed to them can help alleviate some of your concerns. An audiologist can assist you with this information. Hearing aids can’t help everyone with hearing loss, but they can improve hearing for many people.
There are many different hearing aids available. However, all hearing aids need certain basic parts to carry sound into your ear — a microphone to pick up sounds, a battery-powered amplifier to increase volume and a means of transmitting the sound to your ear. Most hearing aids transmit sounds through a small speaker.

While the basic components of a hearing aid are similar, the technology inside the devices differs. All hearing aids amplify sounds in the frequencies in which you have hearing loss, making those sounds louder so that you can hear them better. Hearing aid electronics control how sound is amplified for delivery to your inner ear. Various technologies do this differently. Technologies include:

- **Basic analog** — This conventional technology amplifies soft and loud sounds an equal amount. An audiologist adjusts the “bass” and “treble” controls and the overall strength of the amplification. Loud sounds might require you to manually turn down the volume on your hearing aid. This type of technology may work well for people who do most of their communicating in relatively quiet situations. Basic analog is the least expensive technology, but this type of hearing aid is slowly being phased out.

- **Programmable analog** — Programmable analog means that an audiologist has more flexibility when adjusting the controls. Softer sounds can be amplified more, and loud sounds can be amplified less or not at all. In addition, the bass or treble controls can be adjusted more precisely. If you have this type of technology, you might not need to adjust the volume in loud situations, as you would with basic analog electronics. Some programmable analog hearing aids allow you to have multiple settings so that you can switch settings according to your listening situation. This can be done with a remote control or by pushing a small button on the hearing aid. Programmable analog devices also are being replaced by more flexible digital instruments. A quality analog hearing aid generally costs between $900 and $1,200.

- **Digital** — With this type of technology, a computer chip converts the incoming sound into digital code, then analyzes and adjusts the sound based on your level of hearing loss and your listening needs. The signals are then converted back into sound waves and delivered to your ears. The result is sound that’s more finely tuned to your hearing loss. Digital hearing aids also can better control squealing (feedback) and reduce noise. Digital hearing aids are available in all styles, and the price you pay depends on the features you choose. More advanced digital processing capabilities tend to translate into higher cost. The cost of a digital hearing aid can range from $1,300 to $3,000.

**Hearing aid styles**

What most people worry about when it comes to hearing aids is their appearance. Are they noticeable? Do they make a person look old?

Hearing aids come in various styles, which differ in size and the way they’re placed in your ear. Some are small enough to fit inside your ear canal, making them almost invisible. Others fit partially in your ear canal. However, the type you choose shouldn’t be based on looks alone. You want a style that helps you hear best. Common styles include:
**Special Report**

**Meniere disease**

Meniere disease is characterized by sudden, sometimes severe, attacks of a moving or spinning sensation (vertigo), that’s generally accompanied by hearing loss and tinnitus in one ear.

It results from an increase of fluid pressure in your inner ear, disrupting your balance and hearing. The cause of the disease is unknown.

One theory is that a rupture in the membranes within the inner ear may cause a mixing of fluids that produces vertigo and hearing loss. The disease is generally treated with medication. In more-severe cases, surgery may be necessary.

- **Completely in the canal** — These hearing aids are molded to fit inside your ear canal and are most often used by people with mild to moderate hearing loss. Though these hearing aids are the smallest and least visible, their compact size can be a disadvantage. Completely-in-the-canal aids have little space for add-ons, such as volume controls and directional microphones. They’re generally more expensive than other styles. And the batteries are smaller, so battery life is shorter. One advantage of the small size: The ear helps protect the instrument from wind noise, although it doesn’t eliminate this problem.

- **In the canal** — An in-the-canal hearing aid fits partly in the ear canal, but not as deeply as the completely-in-the-canal aid. In-the-canal aids can accommodate mild to moderately severe hearing loss in adults. This style may contain features not found with completely-in-the-canal aids, but the small size can make the features difficult to adjust. Some in-the-canal aids come with a remote control.

- **In the ear** — An in-the-ear style of hearing aid fills most of the bowl-shaped area of your outer ear. This style is helpful for people with mild to severe hearing loss. In-the-ear aids are more visible, and they may be more vulnerable to picking up wind noise. But the larger size can make these aids easier to adjust and insert. The bigger batteries in these hearing aids are likely to last longer than those in the smallest aids.

- **Behind the ear** — This type includes a component that rests behind your ear. This component amplifies sounds and delivers sound by way of a small tube to an ear mold that fits inside your ear canal. Behind-the-ear hearing aids are appropriate for almost all types of hearing loss and for people of all ages. Most behind-the-ear aids are a larger, more visible type of hearing aid, though some new versions are smaller, streamlined and barely visible. Behind-the-ear hearing aids can be the most powerful and often are the easiest to adjust. This hearing aid style is less prone to squeal (feedback), due to the increased distance between the microphone, at the top of the ear, and the end of the ear mold.

- **Open fit** — The open-fit style is the latest style of hearing aid to hit the market. These are very small devices that fit snugly behind the ear and look more like a tiny cell phone earpiece than they do a hearing aid. Sound travels from the instrument through a small, clear tube or wire to a tiny dome or speaker in the ear canal. Open-fit aids leave the ear open, so they’re best for mild to moderate high-frequency hearing loss where low-frequency hearing is still normal. They appeal to people who want an instrument that doesn’t plug up the ear like the small in-canal models do.

**Before you buy**

When looking for a hearing aid, explore your options to understand what type of hearing aid will work best for you. In addition:

- **Ask about a trial period** — A hearing aid should come with an adaptation period. It may take you awhile to get used to the device...
Are two hearing aids better than one?
In most cases, it’s better to have two hearing aids if there’s hearing loss in both ears. Wearing two (binaural) hearing aids allows more information to reach your brain and makes it easier to localize sounds and to hear speech against background noise.

In addition, when wearing two hearing aids, neither of the devices needs to be turned up as loudly as when you’re wearing just one. That should prevent some feedback. Still, financial limitations or other problems may prevent some people from wearing two hearing aids. Talk to your audiologist about your options.

and decide if it’s useful and worth keeping. Have the seller put in writing the cost of a trial period and whether this amount is credited toward the final cost of the hearing aid.

■ Check for a warranty — Make sure the hearing aid includes a warranty that covers both parts and labor for a specified amount of time.

■ Beware of misleading claims — Hearing aids can’t restore normal hearing or eliminate all background noise. Beware of advertisements or salespeople who make these claims.

Breaking in your hearing aid
Getting used to a hearing aid takes time. Your listening skills should improve gradually as you become accustomed to the amplification. The sound you hear is different because it’s amplified. Even your own voice sounds strange when you wear a hearing aid.

Discuss with your audiologist the approach you should use to get acclimated to your hearing aids. Work with your audiologist to be sure your hearing aids are adjusted appropriately and be sure you understand how to use and adjust them in different situations. You may find in some situations it is best to use a different setting, reduce volume or even remove or turn off your hearing aid. When background noise is very loud, hearing aids can sometimes be more annoying than useful.

Skills to help you hear better
If you find yourself in difficult listening situations, here are some strategies that can help.

■ Talk face to face — Face the person with whom you’re having a conversation. Whether you realize it or not, you likely do some lip reading when listening to people. When speaking to people on a one-to-one basis or in small groups, you’re better able to read lips than when in a large group.

■ Control background noise — During conversations, find locations with the least background noise. At home, turn down the television, stereo or a noisy appliance when trying to talk and listen.

■ Ask others to speak clearly — One of the best things you can do for better hearing is let other people know that you’re having trouble hearing them.

■ Consider using an assistive device — Hearing devices, such as telephone-amplifying devices and TV and theater listening systems, can help you hear better while decreasing other noises around you. You can also purchase hand-held microphones that transmit signals to specially equipped hearing aids.

Treatment for profound hearing loss
In situations of profound hearing loss, cochlear implants — devices that help compensate for damaged or nonworking parts of the inner ear — may be an option to consider. Cochlear implants have improved dramatically in the last several years. If your hearing loss is severe enough that hearing aids provide limited benefit, you may be a candidate for this type of technology.

A cochlear implant isn’t the same as a hearing aid. Hearing aids amplify sounds so that they can be better detected. Cochlear implants bypass
**Customizing your hearing aids**

Like many things you purchase, you can customize your hearing aids to improve their sound quality. Devices that can be incorporated into your hearing aids include:

- **Directional microphones** — These microphones pick up sounds coming from in front of you better than those sounds coming from behind or beside you. This technology improves your ability to hear when you’re in an environment with a lot of background noise. Typically you’ll have both a regular microphone and a directional microphone, so you can switch between the two types. This might require a larger hearing aid to accommodate the two microphones.

- **Telephone adapters** — This technology, also referred to as telecoils, makes it easier to hear when talking on the telephone. Flipping a switch directs your hearing aid to turn off the microphone and pick up sounds from the telephone. Some hearing aids even have internal switches that change to the telecoil mode automatically, so you don’t have to do so manually. Keep in mind that this technology works only with telephones designated as hearing aid compatible — most cordless phones and cell phones aren’t.

- **Direct-feed devices** — This type of technology allows for hearing aids to be connected directly to a television, stereo, radio or another microphone.

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A cochlear implant is made up of a speech processor, left, which has a microphone that picks up sounds, connects them to electrical signals and delivers the sound by way of a radiofrequency signal to the internal device, at right, called a stimulator. The nickel is included only as a size reference.

Damaged portions of the ear and provide direct stimulation to the auditory nerve.

Regardless of the manufacturer or brand, cochlear implants basically operate in the same way. The speech processor has a microphone that picks up sounds, connects them to electrical signals and delivers the sound across the skin by way of a radiofrequency signal to the internal device called a stimulator. The stimulator transmits the signals through a tiny bundle of wires that are threaded into the cochlea. Electrodes attached to the wires activate nerve fibers in the cochlea by emitting an electrical “pulse” directly to the auditory nerve. The auditory nerve carries the signal to the brain, which interprets it as a form of hearing.

The degree to which cochlear implants can improve hearing varies. However, most adults are able to:

- Hear softer sounds
- Recognize normal, everyday sounds
- Lip-read more easily
- Achieve higher levels of speech perception
- Understand conversation in quiet environments
- Talk on the telephone

The sounds people hear with cochlear implants are initially different from normal hearing or even hearing with a hearing aid. However, over a period of about three to six months, the sounds become more natural and your ability to understand speech improves.

**Looking ahead**

Researchers continue to improve hearing devices. Better instruments and better circuits are continually being developed. A hybrid device that integrates both a cochlear implant and a hearing aid in the same ear is being tested in people who barely hear high-frequency sounds or don’t hear them at all, but have normal hearing or milder hearing loss at low frequencies.

Hearing aid manufacturers also continue to experiment with digital wireless technology. Wireless technology has existed for many years in the form of analog systems. These systems allowed a lecturer’s microphone or a movie theater’s audio system to be linked to a hearing aid.
Cleaning your ears when excessive earwax is a problem

There’s an old saying: “Never put anything smaller than your elbow in your ear.” Your ear canal and eardrum are very delicate. Don’t use cotton-tipped swabs, bobby pins, paper clips or twisted pieces of paper to clean your ears. These items usually don’t remove problem wax and — more importantly — can easily damage your eardrum. In fact, you may push the wax in deeper when you use these items.

Earwax is part of the body’s normal defense system. It traps dust and foreign objects, protects the ear canal, and inhibits growth of bacteria. Generally, you don’t need to remove earwax. Old earwax tends to gradually move from the ear canal to the ear opening on its own.

However, excessive wax can be a problem and you may experience hearing loss if too much wax accumulates. If you feel earwax is interfering with your hearing, see your doctor, who may be able to remove the wax by loosening it so that it falls out. Or, your doctor may use small devices to scoop out the wax or suction it out.

If earwax buildup becomes a recurrent problem, your doctor may provide you with information on how to remove excess wax yourself. Nonprescription products often containing mild forms of peroxide may help, but your doctor may have other suggestions. If your eardrum does not contain a tube or have a hole in it, the following is one method of removing excess wax:

- **Soften the wax** — Use an eyedropper to apply a few drops of baby oil, mineral oil, glycerin or hydrogen peroxide in your ear canal twice a day for no more than four to five days. This will soften the wax.

- **Use warm water** — After a day or two when the wax is softened, use a rubber-bulb syringe to gently squirt warm water into your ear canal. The water should be close to body temperature and not too hot or too cold. Tilt your head and pull your outer ear up and back to straighten your ear canal. When finished irrigating, tip your head to the side to let the water drain out.

- **Dry your outer ear** — When finished, dry your outer ear with a towel or hand-held dryer. Dry your ear canal by applying one full eyedropper of rubbing alcohol, then tip your head to the side to drain the alcohol. Do this only if your doctor advises it. If you have a hole in your eardrum or a sore in your ear canal, the alcohol can be painful and may even damage the inner ear.

You may need to repeat this wax-softening and irrigation procedure several times before the excess earwax falls out. If your symptoms don’t improve after a few treatments, see your doctor.

The disadvantages of these systems are that the signal range is limited and the sound quality isn’t always great.

Digital wireless technology is expected to provide many benefits, including improved sound quality, as well as the ability for a hearing aid in one ear to “talk” to the hearing aid in the other ear, improving hearing by synchronizing their audio processing. In addition, digital wireless hearing aids have the capability to connect to other electronic devices that are transmitting audio wirelessly, such as the television or stereo, or hand-held microphone, reducing the need for cords and connections. Bluetooth digital technology is a type of wireless technology being incorporated into many electronic products — including hearing aids — to allow for wireless communication.

At this point, digital wireless technology is still in its infancy and only a few brands of hearing aids are equipped with such capability. The technology is also expensive. Prices vary, but hearing aids equipped with digital wireless technology can cost $3,000 or more for one aid — and twice that for both ears.

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