

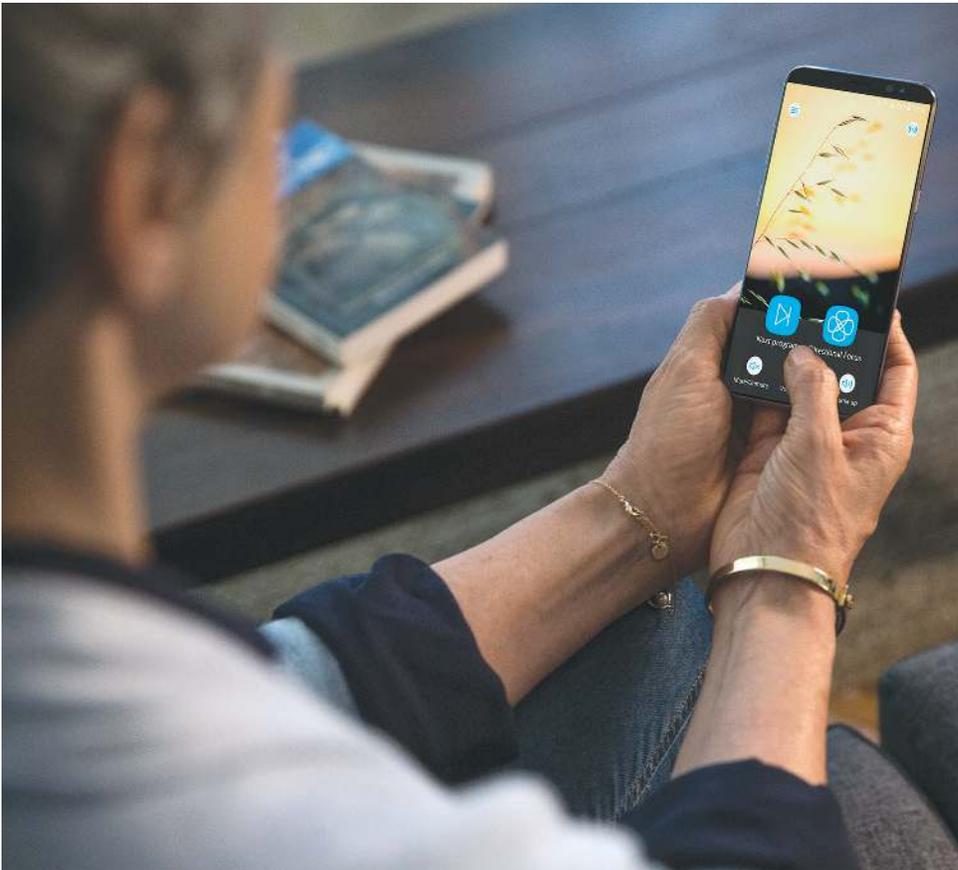
ASSOCIATED
AUDIOLOGISTS



TECH TALK:

**The Latest Breakthroughs
in Hearing Aid Technology**

Artificial Intelligence (AI) in Hearing Aids



*TODAY'S HEARING AIDS
DON'T JUST MAKE
SOUNDS LOUDER—
SOME ADVANCED OPTIONS
ARE EQUIPPED
WITH TECHNOLOGY CALLED
ARTIFICIAL INTELLIGENCE (AI)
THAT HELPS TARGET THE
SOUNDS YOU NEED AND WANT
TO HEAR, MAKING THOSE
SOUNDS MORE PROMINENT.*

AI in hearing aids is relatively new to the industry. This technology is programmed to solve complex problems with intelligent solutions. It is able to “learn” from experience and can adjust in complex listening situations. It’s something many of us are already taking advantage of, whether we realize it or not, when we use our smartphones and a variety of phone applications.

Now, AI is set to change the hearing aid industry, bringing a wide range of capabilities to the technology that helps you hear. According to the Hearing Industries Association, hearing aids built with AI can detect your environment and learn your preferences for listening via machine learning.

For example, when seated in a noisy restaurant with a friend or spouse, hearing aids with AI can automatically shift to provide more comfort or more clarity to help you hear and communicate your best. If desired, these hearing aids can remember your preferred settings and automatically adjust when you enter locations you frequently visit.

AI hearing aid features recently released include step trackers, an engagement tracker, and fall detection.

Newer models of hearing aids may also connect to other smart devices so you can benefit from seamless TV and computer streaming, doorbell notifications, and smartphone notifications. There’s even a “Find my hearing aid” app!

Bluetooth Technology

Bluetooth is the technology used to send signals between electronic devices. Its original purpose was to help us get rid of all the cables connected from our computer to our keyboard, mouse and monitor.

How it Works

Bluetooth technology was designed to be used for short distances. For example, many Bluetooth devices have a range of about 30 to 40 feet. In some cases, you can get Bluetooth devices that have a range up to 100 feet. When you use a Bluetooth device, it encodes information in a signal and broadcasts it to other Bluetooth-enabled devices within range. The other devices can then pick up the signal.

Bluetooth Devices

Today, many devices are Bluetooth-enabled. For example, most cell phones have Bluetooth capabilities. Most computers also are compatible with Bluetooth technology. Besides computers and phones, you can also find it in headphones, speakers, home entertainment systems, printers, keyboards, computer mice, new vehicles, and yes, hearing aids.

Bluetooth Hearing Aid Technology

When your hearing aids are Bluetooth-compatible, it allows you to connect with specific Bluetooth-enabled devices, such as your smartphone or iPad. In fact, Bluetooth technology has made it possible for your phone to ring and for you to hear directly through your hearing aid(s). This allows for

convenient hands-free communication, as well as hearing in both ears, which results in a much clearer signal than when using a phone on one ear.

Most hearing aid manufacturers now have hearing aids that utilize Bluetooth technology compatible with Apple and some with Android phones. More sophisticated hearing aids have a streamer built in, so no additional devices, streamers or wires are necessary in order to connect from your hearing aids to other devices, like your phone. You just have to pair the devices, as long as they are compatible.

Digital Adaptive Directional Microphones

Newer digital hearing aids typically include two microphones, helping detect which direction a sound is coming from. Adaptive directional microphones are designed to prioritize speech coming from in front when other sound may interfere. This may help you hear speech better in a complex listening situation. Advanced hearing aids are actually equipped with adaptive microphones that follow the source of the sound, allowing you to keep track of conversations even as someone's voice moves, and resulting in a more natural listening experience.





Pros and Cons of Small Hearing Aids

Many people equate smaller hearing aids with being technologically advanced or superior, but that's not necessarily the case. It is true that they have improved over time. Smaller, completely in-the-canal (CICs) or invisible in-the-canal (IIC) hearing aids, are less visible, but patients can be bothered by the "plugged up" sound and full feeling they have with these devices because they fit deep in the ear canal.

Smaller Doesn't Always Mean Technologically Advanced

There are several styles of hearing aids, such as open-fit behind-the-ear, or receiver-in-the-canal that are often "invisible" and offer many advantages over other in-the-ear styles. Sometimes, the technology you think you want may not be available in the tiniest in-the-ear style, but is an option in another style that is just as cosmetically appealing.

For example, small in-the-canal hearing aids have room for just one microphone, while most other styles have two advanced, adaptive directional microphones. This can provide advantages when communicating in more complex listening environments, like places with background noise.

Understand the Many Hearing Aid Options before Deciding

All styles of hearing aids offer unique advantages, so remember to keep an open mind when discussing the options with your audiologist. There are many great discreet options such as open fit behind-the-ear or receiver in-the-canal (RIC) devices that fit behind the ear and are connected to the ear canal via a very thin, clear tube or wire that is unnoticeable. The colors of these devices are designed to blend with almost any hair or skin color and they are lightweight, comfortable, and often work better for individuals with more significant hearing loss.

Pros and Cons of Small Hearing Aids

What are some other pros and cons to these tiny hearing aids that you may not have considered?

PROS

- ▶ Attractive and discreet—these devices are often nearly invisible—a feature that appeals to many hearing aid wearers.
- ▶ There are no external tubes or wires running from the hearing aid to your ear.
- ▶ These hearing aids are custom molded to your ear canal and some wearers find them comfortable or easy.
- ▶ Since these hearing aids sit inside the ear canal, they don't interfere with holding a telephone to your ear, or wearing a headset.
- ▶ They're protected by the outer ear, and may be less likely to pick up wind noise when outside.

CONS

- ▶ CICs and IICs aren't suitable for individuals with more severe or advanced hearing loss. They work best for mild to moderate hearing loss.
- ▶ How well they fit in your ear canal depends on the shape of your ear canal. These aren't a good solution for everyone and sometimes physical comfort can be challenging.
- ▶ Batteries last less time in these smaller hearing aids and can be more difficult to replace.
- ▶ The small size limits some of the features many hearing aid wearers want, such as directional microphones or Bluetooth. These devices simply don't have enough room in them to hold the technology components. If you experience difficulty in noisy backgrounds or groups, this may not be the best option for you.
- ▶ Since these devices fit deeper in the ear canal, they often have higher repair rates due to their exposure to body oils, ear wax and moisture/perspiration.

Hearing Aid Accessories



Public spaces, such as auditoriums, one-on-one conversations, watching television and listening to phone calls or music can all present listening challenges.

That's where hearing aid accessories come in. Hearing aid accessories and devices can bridge the gap between you and the sound source by eliminating the effects of distance, background noise, and reverberation, bypassing challenging acoustics—sending sound directly to your ears.

Three popular accessories include a remote mic, or spouse mic, that streams your conversation partner's voice directly to your hearing aids; a television listening device that streams program sound directly to your hearing aids; and a device that streams calls directly to your hearing aids. Each of these is sold separately, but can improve listening enjoyment and hearing aid performance significantly.

- ▶ **Spouse mic** – The conversation partner simply clips a discreet remote mic onto their clothing, or places it on a table. The individual with hearing loss may or may not need to wear a wireless Bluetooth accessory around their neck, depending upon their hearing aid model. The mic has a 20 to 30-foot range and the mic and receiver work best when they are within sight of one another. This device also can be used to stream calls and music. It is especially helpful in one-on-one conversations in difficult listening environments.
- ▶ **Television listening device** – This wireless assistive listening device is specifically designed for enjoying TV/audio and streams program sound directly to your hearing aids. The main advantage is the real-time, high-quality stereo sound it provides. Plus, the sound is delivered directly to your ears and programmed exactly for your individual hearing loss needs processed through the digital hearing aids.
- ▶ **Call listening system** – These systems can stream calls directly from your mobile phone to your hearing aids using an ultra-compact device designed specifically for this purpose. The device simply inserts into the jack plug of your phone. You are then free to use your mobile phone normally. No neck loop is necessary, and it is compatible with most mobile phones.



There are many other hearing aid accessories and hearing assistive technologies that can improve your hearing aids' performance and your listening enjoyment. These include:

Personal amplifiers

A personal amplifier is basically a small box with a mic and a listening cord attached to it. Newer versions are all worn at ear-level (such as the Bose HearPhones™). These are most useful for one-on-one, in-person conversations. The corded devices allow the person you are speaking with to attach the mic to their clothing so you can plug it into your personal amplifier and hear more clearly, which can reduce some background noise. The newer ear-level worn personal amplifiers may work with smartphone applications. One advantage to personal amplifiers is that they are relatively inexpensive. Personal amplifiers are not as useful for situations that require you to move around a lot. In addition, they are not as "aesthetic" because of their larger size, and lack flexibility in customizing physical and acoustic settings.

FM systems

Frequency modulation, or FM systems, use radio waves to transmit sound from the sound source to a receiver worn by a person who has a hearing loss. The FM system can be used with behind-the-ear hearing aids with special accessories and receivers that pick up sound directly from a microphone. The microphone can be set up in front of the person speaking or worn around the speaker's neck.



FM systems are useful in many places, including:

- ▶ Classrooms
- ▶ Restaurants
- ▶ Meetings
- ▶ Nursing homes
- ▶ Community or retirement centers

They are also used in theaters, places of worship, museums, public meeting places, corporate conference rooms, and convention centers.

Infrared systems

A high-tech option that affords maximum privacy, infrared systems are like FM systems except that instead of radio waves, they transmit sounds using light waves. Since the light waves do not pass through walls, they are useful for situations in which privacy is needed, such as doctors' offices and court proceedings, etc. Though they are often used for watching TV or in theaters, they have one major disadvantage: any object or person that comes between the listener and the emitter causes the signal to be blocked. Sunlight can also interfere with the signal, making these systems useful for specific situations.

Induction loop systems

Those with t-coils in their hearing aids have another option: an induction loop system, which uses an electromagnetic field to carry the sound to the user's ears. In this system a loop of insulated wire, which can range from a small loop worn around the neck to a loop that encircles an entire room, is connected to a power source, an amplifier and a microphone. Loop systems are inexpensive as well as versatile, useful for a single t-coil hearing aid user or a group. Mobility is not an issue, as the user is not physically connected to the system; even non-hearing aid users can use the loop system with headphones or a receiver system.

Rechargeable Hearing Aids

Whether you're interested in rechargeable hearing aids because you have difficulty handling traditional hearing aid batteries, or you want a "greener" power option, most of the major hearing aid manufacturers now offer rechargeable hearing aid options. But let's take a closer look at the pros and cons of this technology.



In general, rechargeables:

- ▶ Offer technological advances beyond the battery, including improved signal processing and more automatic adjustments. These help you hear better and more comfortably in complex listening situations, like in the car, social settings, talking on the phone or watching TV. Most of this advanced technology is available in non-rechargeable options as well.
- ▶ Can be more convenient for patients who struggle with vision and/or dexterity when replacing tiny traditional hearing aid batteries.
- ▶ Use either integrated lithium-ion batteries or field changeable silver zinc batteries. These batteries can hold a charge for around 24 hours of use. Batteries require re-charging every night by placing them in a charging station. If you stream a lot of audio, the batteries may not last a full 24-hour day.

*SPECIFIC HEARING AID
MANUFACTURERS OFFER
FEATURES TO APPEAL
TO DIFFERENT CONSUMERS.
IN MOST CASES, THE COST
OF RECHARGEABLES AND
TRADITIONAL HEARING AID
BATTERIES OVER TIME
ARE ABOUT THE SAME.*

Your initial investment when choosing rechargeable will include the charger and the cost of the first rechargeable battery or batteries. The rechargeable battery life will depend on the type of rechargeable battery your hearing aids use.

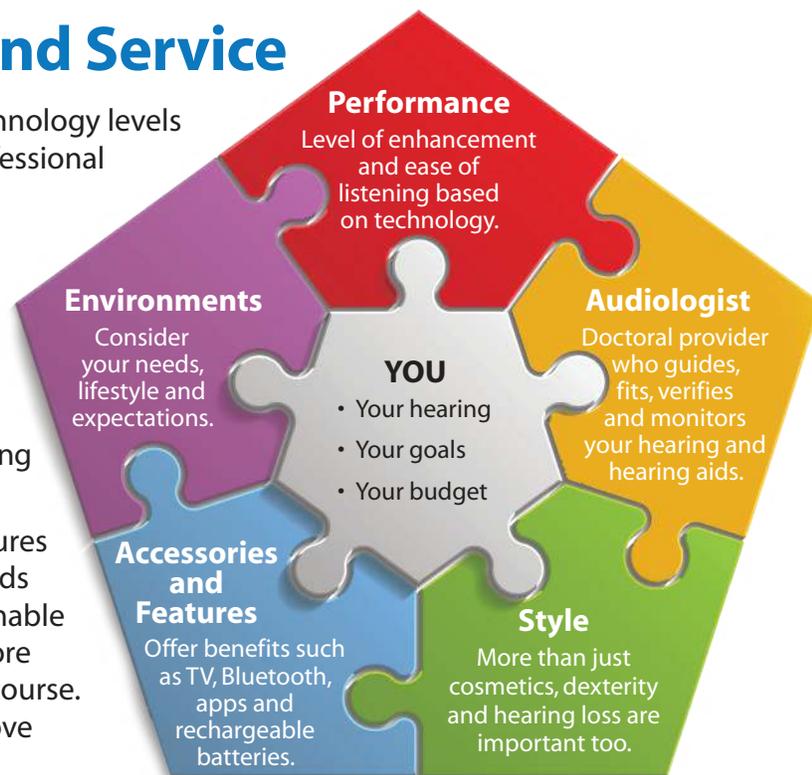
The annual/routine cost of replacement rechargeable batteries is currently about the same as disposable batteries. In some cases, manufacturers will charge a regular out-of-warranty repair cost any time the rechargeable battery needs replacement, which may vary from \$250-350 per repaired device.

The Cost of Technology and Service

Hearing aids come in a wide range of styles and technology levels to fit every budget. Entry-level hearing aids at a professional practice such as Associated Audiologists should run approximately \$675 each. Keep in mind that similar to computer or cell phone technology, today's entry-level hearing aids were considered top-of-the-line five to seven years ago. That means entry-level technology that is well-programmed by a doctoral-level audiologist using real-ear verification can offer you a significant improvement in your hearing and may meet your needs.

Mid-level hearing aids with more sophisticated features typically run \$1,500 to \$1,900 each. These hearing aids can offer faster digital processing and are programmable for the environments where you frequently have more problems hearing, like in restaurants or on the golf course. Other accessories, such as streamers, can help improve talking on the phone or listening to the television.

Premium hearing aids offer the most advanced technology and run approximately \$2,600 to \$2,800 each, or \$5,400 for a pair. These hearing aids may utilize built-in Bluetooth technology to stream phone calls and television programs directly to your hearing aids. Some feature applications that use machine learning or artificial intelligence, and which learn the settings you prefer in specific environments, then automatically switch to those whenever you enter that location. Often, most of these hearing aids have features that are accessible when paired with a smartphone.



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Consider the Level of Service

The audiologist you choose to work with should discuss your budget and goals, as well as provide you with a written estimate of their recommendations. One of the trade-offs between entry-level and premium-level hearing aids, for example, may be the level of service included. Entry-level hearing aids may not include additional adjustments or follow-up appointments. These are paid for as separate office visits when needed, while premium technology may include warranties and follow-up appointments for check-ups, adjustments and monitoring your hearing for the first year.

Health Insurance May Help Cover Costs

If you have health insurance other than Medicare, you may have hearing aid coverage that could help with the costs. Ask if the practice you are seeing will investigate whether or not your particular plan has coverage and will help you understand and coordinate any possible benefits. Associated Audiologists provides this service.

Financing Can Make Hearing Aids More Affordable

And finally, ask about financing options for individuals who qualify. Associated Audiologists offers CareCredit, as well as financing with Wells Fargo, plus we accept all major credit cards as payment. For those who do not have the financial resources to cover the cost of new hearing aids, ask about the possibility of purchasing a refurbished set of hearing aids. Bottom line, hearing aids come in a wide range of prices and styles for every budget and lifestyle.

ABOUT US



Associated Audiologists, Inc., Experts in Breakthrough Technology

Associated Audiologists, Inc., is the region's leader in audiologic care for hearing, tinnitus, and balance disorders. Our doctoral-level audiologists are experts in the latest hearing aid technology, including artificial intelligence. They can recommend technology that meets your individual hearing needs and budget. Plus, they can help you connect to the various options available.

Associated Audiologists is independent and locally owned by Timothy C. Steele, Ph.D., President and CEO. The practice has grown to seven convenient locations to serve you, all staffed by doctoral-level audiologists. Our audiologists have allied health staff privileges at AdventHealth (formerly Shawnee Mission Medical Center), Saint Luke's South Hospital, and Saint Luke's East Hospital.

The Associated Audiologists team features professionals who use advanced diagnostic and verification technology to diagnose and treat hearing loss. The practice offers digital hearing aid products from the world's most respected manufacturers backed by unparalleled service. We also have experts who specialize in diagnosing and managing tinnitus and sound sensitivity, and dizziness and balance disorders.

Each of our associates is a doctoral-level audiologist. As part of their four-year doctoral training, these audiologists spend a final year completing an externship experience supervised by a licensed audiologist. Our audiologists are members of the Academy of Doctors of Audiology (ADA) and hold certificates of clinical competence in audiology from the American Speech-Language-Hearing Association (ASHA). Many of our team members are also adjunct professors at the University of Kansas Medical Center.



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