CE 3 HOURS Continuing Education

By Margaret I. Wallhagen, PhD, APRN,BC, GNP,
Elaine Pettengill, PhD, RN,
and Meredith Whiteside, OD, FAAO

Sensory Impairment in Older Adults: Part 1: Hearing Loss

Hearing impairment is a significant, often debilitating, problem for many older adults, but assessment and intervention by nurses can help.

OVERVIEW: Preserving older adults' sense of hearing and helping them to maintain communication in the face of changes that occur with age are areas of concern for nurses. In addition to reviewing the types of hearing impairment, this article emphasizes assessment strategies and interventions that nurses can use across settings. This is Part 1 of a two-part article on sensory impairment in older adults; in the November 2006 issue, Part 2 will address visual impairment in this population.

She calls it "being sidelined." Greta Hale, an 82-year-old grandmother of five, looks forward to visiting her large family but often feels like an outsider when she does. On holidays, she often sits alone while younger generations buzz about, preparing for meals, telling jokes, and engaging in lively debates. "My hearing is not so good anymore," she explains. Otherwise spry and healthy, Ms. Hale wants to participate but avoids doing so because, she admits, "I don't always understand what people are saying. I think maybe it's just easier for them to pretend I'm not there." She considers this one of the more difficult aspects of aging.

Margaret I. Wallhagen is a professor and Elaine Pettengill is an assistant adjunct professor in the School of Nursing, University of California, San Francisco. Meredith Whiteside is an assistant clinical professor in the School of Optometry, University of California, Berkeley. Wallhagen is also the principal investigator and Pettengill is the project director of a study, the Experience of Hearing Impairment, funded by the National Institute of Nursing Research, National Institutes of Health (grant number RO1 NR008246). Contact author: Margaret I. Wallhagen, meg.wallhagen@nursing.ucsf.edu.

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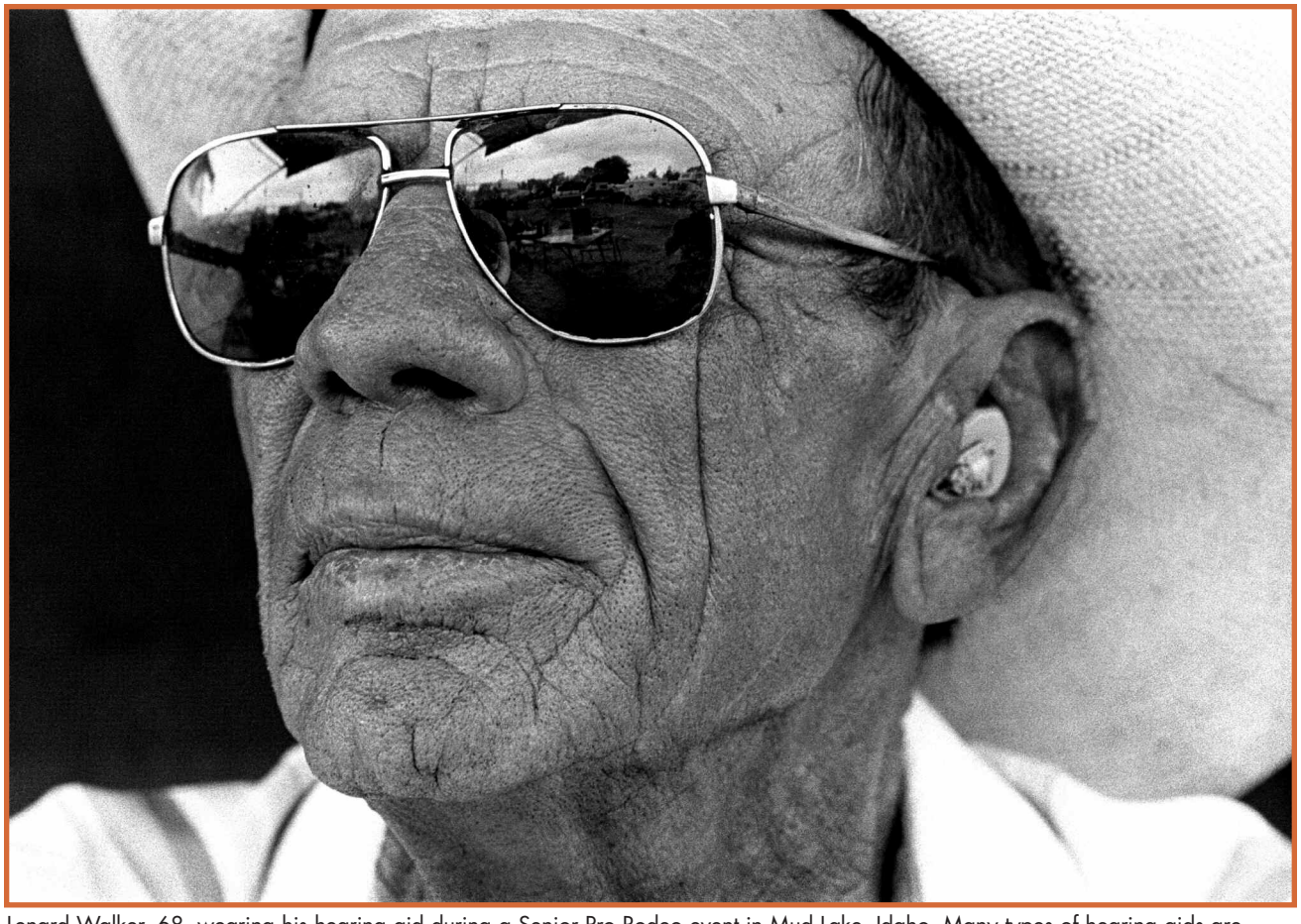
Ms. Hale is not a real patient, but her case typifies a plight faced by many older adults—and witnessed by those who care for them. It may start with a complaint that "people are mumbling." Or perhaps an older adult merely smiles and nods when sad news is delivered; people around him begin to worry—is he in the early stages of cognitive impairment? Because hearing loss occurs gradually, many older adults are unaware of what they're missing. And as the loss becomes increasingly evident, many refuse to acknowledge or treat it, considering the use of assistive devices to be stigmatizing. (Indeed, only about 20% of those who might benefit from a hearing aid actually wear one.[1]) Unfortunately, untreated hearing loss can have many adverse consequences.[2]

Hearing impairment is a significant problem, affecting approximately 30% of those ages 65 and older, more than 50% of those over the age of 75, and more than half of nursing home residents.[1, 3, 4] Hearing loss has been associated with isolation, depression, low self-esteem, and alterations in functional status.[5, 6] Although hearing loss may not always be preventable, many of the negative psychosocial consequences can be prevented or minimized.

THE TYPES OF HEARING IMPAIRMENT

Conductive hearing loss is a reduction in the ability of sound to be transmitted (conducted) to the middle ear. This can involve cerumen (wax) buildup or stiffening of the tiny ossicles in the middle ear (as occurs



Lenard Walker, 68, wearing his hearing aid during a Senior Pro Rodeo event in Mud Lake, Idaho. Many types of hearing aids are available, many of them less visible than older varieties. Photograph taken from *Aging in America: The Years Ahead,* by photographer Ed Kashi and writer Julie Winokur.

Common Symptoms of Hearing Impairment [36-38]

- inability to hear the television or radio at normal volumes
- frequent complaints that others "mumble" or slur their speech when talking
- repeated requests to speak louder
- leaning in closer or cupping the hand over the ear during conversations
- difficulty understanding speech on the telephone
- difficulty with conversation in noisy environments, such as restaurants
- more difficulty hearing the voices of women and children than men
- inappropriate responses or misinterpretations during conversations

in otosclerosis). The accumulation of cerumen is common in older adults, in whom the ceruminous glands decrease in number and the wax they secrete becomes drier and more easily impacted. Conductive hearing loss can also be caused by infections or cholesteatoma (a middle-ear mass).

Sensorineural hearing loss is hearing loss resulting from damage to any part of the inner ear or the neural pathways to the brain. It can result from genetic causes or from systemic disease, ototoxic substances, or prolonged exposure to loud noise.[7] It can also be caused by medications, including antibiotics, chemotherapy, nonsteroidal antiinflammatory drugs, diuretics, and antimalarial drugs.[8, 9] Patients with sensorineural hearing loss find it difficult to filter background noise.

Presbycusis is a form of sensorineural hearing loss associated with aging. According to Bagai, it "is the most common cause of hearing loss in the United States and is typically gradual, bilateral, and characterized by high-frequency hearing loss."[7] An inability to distinguish high-frequency tones makes comprehending speech difficult. Many consonants, such as *t, p,* and *s,* are high-frequency sounds, while the vowels are low-frequency sounds. Consonants convey most of the information needed to make words distinct and comprehensive. As a result, louder speech will not necessarily help because the high-frequency consonants remain inaudible. (Hence, some older adults with presbycusis say that they can hear but not understand what is being said.)

Mixed hearing loss is a combination of conductive and sensorineural impairment.

Central hearing loss can occur when auditory processing is compromised at the level of the brain. While the ear function may remain normal (unless a concurrent conductive or sensorineural loss is present), the person with central hearing loss may lose the ability to interpret language. Accurate diagnosis and treatment require advanced assessment and intervention strategies and should therefore be handled by an expert in this area.

WHAT IS HEARING IMPAIRMENT?

There is no universal definition of hearing impairment, as both the cause of the loss and its degree can differ from person to person. However, the degree of loss a person has depends on how loud a sound, measured in decibels, a person can hear. Hearing loss can be categorized according to how soft a sound a person can hear[10]:

- normal hearing (a person can hear sounds of 25 dB or lower)
- mild hearing loss (the softest sounds a person can hear are 26 to 40 dB)
- moderate hearing loss (the softest sounds a person can hear are 41 to 55 dB)
- moderately severe hearing loss (the softest sounds a person can hear are 56 to 70 dB)
- severe hearing loss (the softest sounds a person can hear are 71 to 90 dB)
- profound hearing loss (the softest sounds a person can hear are higher than 90 dB)

ASSESSMENT

Studies have suggested that assessment for hearing impairment isn't routinely performed in older adults, even those in nursing homes.[11, 12] The first step of any assessment is to check for cerumen occlusion, which would need to be dealt with.

Observation. Does the patient cup her hand behind her ear? Does she tilt her head or lean toward you when listening? Does she keep the volume very high on the television or radio? Does she complain of ringing, roaring, or buzzing in her ears? Does she misinterpret questions or comments or not respond at all? Does she look lost? Any of these signs should prompt further assessment and evaluation.

The patient's own report. Ask the patient whether she has difficulty hearing in specific situations—such as in a noisy room, a restaurant, at a lecture, on the telephone, or during normal conversations. Researchers have found that simple questions such as "Do you have a hearing problem now?" or "Do you feel you have a hearing loss?" are as sensitive (71% to 93%) and specific (56% to 71%) in detecting mild to moderate hearing impairment as audiometric testing.[13, 14]

FIGURE 1. AGE-RELATED CHANGES TO THE EAR

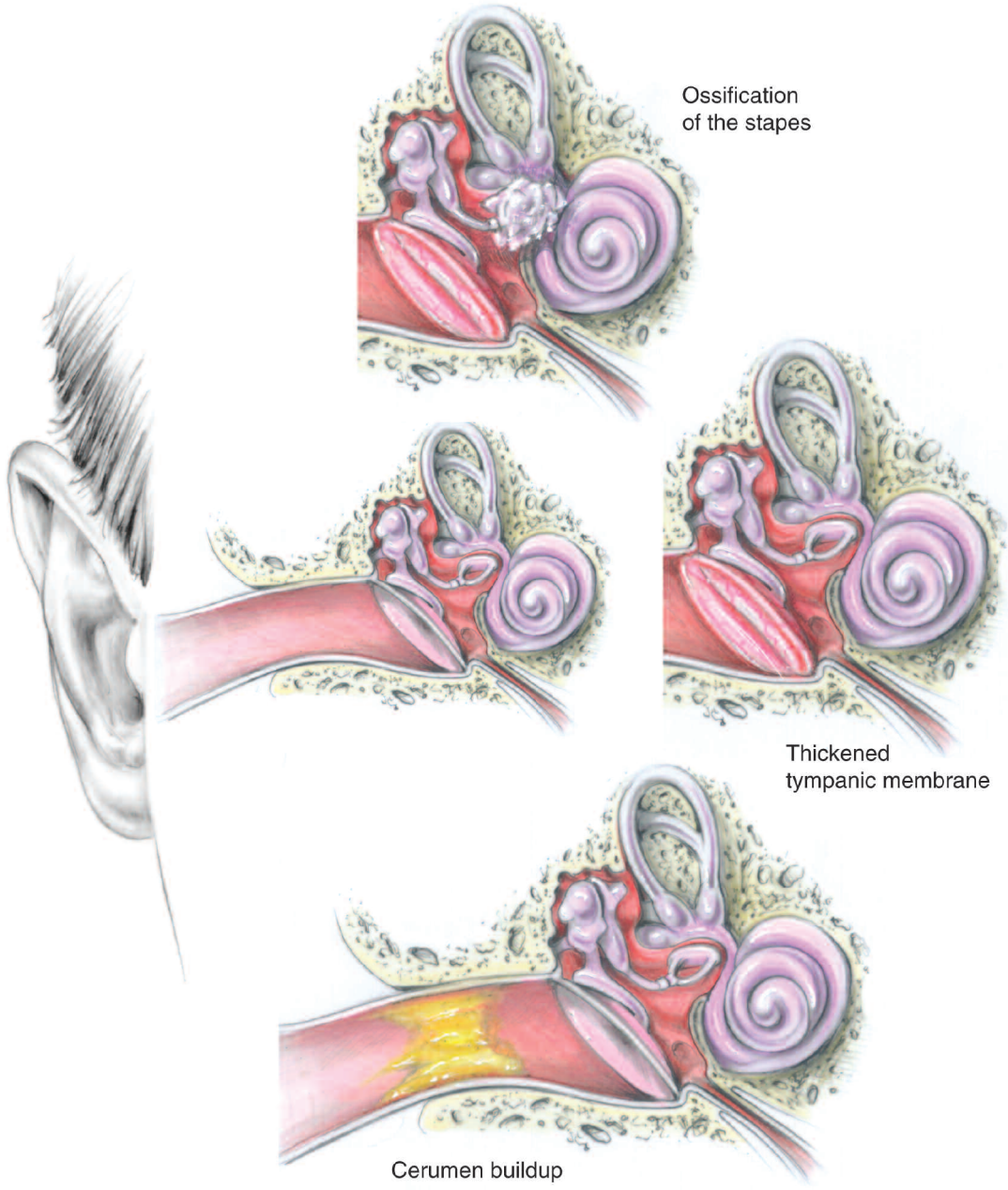


Illustration by Jennifer Smith

With aging the ear undergoes changes that decrease a person's hearing acuity. Cerumenosis occurs secondary to a loss of cilia in the ear canal and production of cerumen that is drier, leading to impaction. The tympanic membrane thickens and is less flexible, so the vibration necessary to transmit sound waves to the middle ear is deficient. The stapes may become stiff with abnormal bone growth, as occurs in otosclerosis, limiting the conduction of sound waves to the cochlea.

Pure-tone audiometry is considered the gold standard of hearing assessment; it's used to assess a person's ability to hear "pure tones" of various loudness, measured in decibels, across a range of frequencies, measured in hertz. Assessments are usually made at 250 Hz (low frequency), 500 Hz, 1,000 Hz, 2,000 Hz, 3,000 Hz, 4,000 Hz, and 6,000 Hz (high frequency). The results are recorded on an audiogram. Used under controlled conditions (for example, in a sound-proof booth), it's the most reliable method of screening for hearing loss and essential in definitive diagnosis.[13]

The hand-held audioscope, a portable and simpler version of the audiometer, also assesses pure-tone hearing—usually at 500 Hz, 1,000 Hz, 2,000 Hz, and 4,000 Hz. When used in a quiet environment, the audioscope is easy to use, reliable, and valid.[15, 16]

Screening during physical examination hasn't been well studied or standardized. But even with its limitations, it's easy to do and gives information that can be used in planning interventions and making referrals for pure-tone audiometry.

> THE RINNE TUNING-FORK TEST DETERMINES WHETHER THE PATIENT HEARS BETTER BY BONE OR AIR CONDUCTION.

The whispered-voice test involves standing 2 ft. behind the patient, covering and rubbing the untested ear (rubbing will ensure the masking of sound) and whispering three random letters and numbers. The examiner inhales and exhales, then whispers without breath in the lungs. The patient then repeats the three letters and numbers. An incorrect response requires the test to be repeated, using different letters and numbers. In a systematic review, the whispered-voice test was deemed "simple and accurate."[17]

The Hearing Handicap Inventory for the Elderly (HHIE) is a 10-item, self-administered questionnaire designed to assess the social and emotional effects of hearing impairment.[13, 18] The HHIE was found to have good sensitivity and specificity for moderate (80% and 76%, respectively) and marked (100% and 70%, respectively) hearing loss; for mild hearing loss, it had a sensitivity of 58% and specificity of 85%.[14] The HHIE may be especially useful in assessing a person's readiness to use a hearing aid or other assistive device.

The Rinne and Weber tuning-fork tests. Although these are often regarded as quick screening assessments for hearing loss, they may be better considered methods of distinguishing conductive problems from sensorineural problems and thus more useful after an assessment of acuity has been performed.[19]

The tuning-fork tests are performed using either a 256-Hz or 512-Hz tuning fork.

The Rinne tuning-fork test determines whether the patient hears better by bone or air conduction. Commonly performed before the Weber test, it involves placing a vibrating tuning fork against the patient's mastoid process (behind the ear). Sound is conducted by bone to the cochlea, which "translates sound into nerve impulses to be sent to the brain."[20] When the patient no longer hears the sound, the U of the tuning fork is quickly moved to the opening of the external ear canal, and the patient is asked whether he can hear the tone. Sound heard at this level is being conducted by air to the tympanic membrane. Both patients with normal hearing and those with sensorineural hearing loss will hear sound for a longer period through air conduction. If the person can better hear sound conducted by bone than by air (or at least as well), a conductive hearing loss may be present.

The Weber tuning-fork test is most helpful in assessing unilateral hearing loss. The Weber test is performed by placing a vibrating tuning fork on top of the patient's head or against his forehead and asking him where he hears the sound. In patients with normal hearing or in those with bilateral, symmetrical losses, no lateralization will occur; the patient will hear the sound equally in both ears. However, if the tone is stronger in one ear, conductive impairment may be present, a sensorineural impairment may exist in the opposite ear, or both conditions may be present.[7]

INTERVENTIONS

When a patient has hearing impairment, a combination of adaptive techniques, environmental modifications, and assistive devices (including hearing aids) is necessary to ensure effective communication.

Adaptive techniques. When speaking with a patient who has a hearing impairment it's important

- to face him directly and make sure you have his attention.
- to speak at a normal volume while clearly enunciating (but without using exaggerated lip movements).
- not to cover your mouth with your hand.
- to rephrase sentences instead of repeating them.
- to make sure that hearing aids are in place and that batteries are charged.
- to make sure that glasses are worn when needed.

TABLE 1. COMMON STYLES OF HEARING AIDS [1, 4, 31, 34, 35]

Style	Hearing Loss	Advantages	Disadvantages
Behind the ear	Mild to severe	Can accommodate a range of circuitry options, battery changing is easier, provides better sound localization, can change ear mold without affecting hearing aid, produces less feedback	Is perceived to be more visible, is harder to use with headphones, can fall off from behind the ear when active
In the ear	Mild to moderate	Is perceived to be less visible, more secure fit, more adjustments possible than smaller aids	Feedback may be a problem, manual dexterity is required
In the ear canal	Mild to moderately severe	Is less visible, uses the outer ear to catch and amplify sound, less amplification is needed because of closer proximity to eardrum	Feedback may be a problem, manual dexterity is required, is somewhat limited in power, can be damaged by ear wax or ear drainage
Completely in the ear canal	Mild to moderate	Is virtually invisible, uses the outer ear to catch and amplify sound, is easier to use with headphones and telephones, less amplification needed because of closer proximity to eardrum, picks up less wind noise	Manual dexterity is required for care and insertion because of small size, wax may influence function, occlusion effect (voice sounds like in a tunnel), can be uncomfortable, is less powerful, can be damaged by ear wax or ear drainage, is expensive

Identifying hospitalized patients who have a hearing impairment to others (for example, with a bracelet, a bed tag, or a flag on the chart) and posting communication strategies (with the patient's consent) may ease frustration and minimize miscommunication. Remind patients to listen actively. However, many people with hearing impairment find it tiring to keep paying attention, so provide adequate time. Training in word recognition has also been shown to result in some improvements in older adults with hearing impairment.[21]

Environmental modifications include strategies to enhance comprehension and minimize background noise. For example, in a restaurant, it may be helpful for the person with hearing impairment who is not using directional hearing aids to sit with his back to the wall, so sound doesn't come from all sides. He should not sit at the end of a table or away from the center of conversation. There should be enough light to allow faces to be clearly seen because visual cues are helpful.[22]

It's difficult to eliminate background noise in clinical settings. In a study of long-term care settings in Scotland, Tolson and McIntosh found that "levels of background noise were shown to be unacceptable in 77% of the observations."[23] Staff conversations, the use of radios and televisions, open doors, and "the careless and noisy use of equipment and movement of furniture by staff" were the most common sources of disruptive sound. However, the researchers found it "impracticable" to reduce the noise level below approximately 60dB (about the level of normal conversation)—doing so required a great deal of effort on the part of the nursing staff and the education of all staff and visitors. Resident-to-resident conversation was facilitated through the provision of additional lighting and rearrangement of furniture. Sommer and Sommer also recommend talking to patients with hearing impairment in private rooms whenever possible.[24]

Assistive devices include hearing aids and other devices and services.

Hearing aids have changed significantly over the last decade, and many can now be programmed to closely address specific needs. Hearing aids consist of,

Tips for Nurses by Health Care Setting

Hospital

Label the patient's chart so all hospital personnel are aware of her hearing loss. Ask the patient what communication methods work best for her. Face the patient and get her attention before speaking. Verify that information regarding any treatments or procedures has been clearly understood, and provide written materials as indicated. If you must wear a mask, talk about what will be happening before putting the mask on.

Nursing home

Check that hearing aids are in place and batteries are functioning. Label hearing aid storage containers with the patient's name and room number. Ask family members to bring in user guides for the patient's hearing aids, if available, for nursing staff reference. Use pocket talkers with patients who have hearing impairment but do not or cannot use hearing aids. When speaking with older adults, minimize background sounds as much as possible. Consider environmental modifications that minimize echoes.

Ambulatory care

Discuss with facility receptionists strategies to communicate clearly with older adults who have hearing impairment. These include facing people who come for appointments, speaking clearly without shouting, not turning away to face a computer while speaking or setting appointments, and going over to the person to get his attention if necessary. Recognize that background noise is often a significant problem that affects hearing.

Home care

Carry a pocket talker. Discuss with older adults and their family members strategies to promote hearing in various situations. These include turning down televisions and radios and minimizing other sources of background noise, facing each other when speaking, not trying to converse while turned away or from another room, and speaking clearly without shouting. To enhance hearing a television or radio, consider assistive listening devices such as headphones or (for television) closed captioning. When eating out, choose restaurants that are relatively quiet and seating arrangements that permit those with hearing impairments to see all faces clearly.

at minimum, a microphone that receives sound and transforms it into an electrical signal; an amplifier that increases the loudness of the signal; and a speaker that receives the signal, converts it back into sound waves, and transmits it to the ear. A good fit is essential, so molds of the patient's ears are made.

The primary purpose of a hearing aid is to amplify sounds across a range of frequencies. It does not correct hearing deficits. This may be frustrating to those who expect otherwise and don't allow time to adapt; indeed, because hearing loss usually occurs slowly, the brain becomes unaccustomed to hearing sounds—it can take three months or more to get used to the device and to hearing again.[25] For this reason, new users may prefer lower levels of amplification.[26]

Hearing aids are usually not covered by health insurance or Medicare, although some plans cover a portion of the cost. They range in price from a few hundred dollars per unit to several thousand, depending on the technology.[27] Further, batteries (which can be purchased in bulk) are changed every one to two weeks, adding significantly to overall costs.

Whistling, usually a result of feedback, is a frequent complaint of hearing aid wearers. The device takes sound in through a microphone, amplifies it, and directs it through a speaker toward the tympanic membrane. Whistling can occur when sound leaving the speaker gets fed back into the microphone, which can occur when the hearing aid is not properly fitted into the ear canal. It can also occur if an object (such as a hand, head, or clothing) gets close to the outside of the ear, reflecting sound back into the microphone. Turning the volume too high can also cause whistling. One positive aspect of whistling is that it usually indicates the hearing aid is working. (Indeed, a commonly used technique to test hearing aid batteries involves placing one's hands close to a hearing aid that is turned on. If it doesn't whistle, the batteries may need replacing.)

Cochlear implants can be helpful for older adults who have severe hearing impairment due to progressive hearing loss. Unlike hearing aids, which amplify sound, cochlear implants circumvent the damaged section of the inner ear and instead send signals from an external microphone to a surgically implanted electrode that transmits them directly to the auditory nerve. A study by Francis and colleagues found that six months after cochlear implantation, adults between the ages of 50 and 80 years of age had significant improvements in speech perception.[28] The authors stated these improvements were "predictive of gains in health related quality of life and associated emotional benefits." However, it's important to note that in addition to the risks presented by the surgical procedure, magnetic resonance

imaging (MRI) is not recommended in people with cochlear implants. According to the Food and Drug Administration, "even being close" to an MRI unit "will be dangerous because it may dislodge the implant or demagnetize its internal magnet."[29] For more information, go to www.fda.gov/cdrh/cochlear.

Other assistive listening devices and services can be grouped into three general categories: those that improve face-to-face communication and increase the enjoyment of activities such as listening to the radio or watching television; those that improve telephone communication; and those that enhance awareness and recognition of environmental sounds and situations.[30]

One of the most clinically useful devices is the stereo-amplified listener, better known as the "pocket talker." The pocket talker is a small unit (the size of a Sony Walkman) that amplifies sound and sends it to the user's ears through earphones, ear clips, or headphones. Pocket talkers are very effective for close, one-on-one conversations and often come with extension cords that permit additional distance.

Other devices include telephone amplifiers, telecommunication devices for the deaf, closed-caption decoders for television, visual alarm systems for such things as the door bell or smoke alarm, and vibrating alarm clocks.[30, 31] Many hearing aids come equipped with a telecoil that facilitates use of the phone. In addition, many classrooms, theaters, concert halls, places of worship, and other public settings have available systems that can facilitate hearing. These include personal FM systems, infrared transmission systems, and inductive loop systems. (For more information on assistive communication devices, go to www.entcolumbia.org/acd.htm.)

Recent reports estimate that 31 million Americans have hearing loss and that 80% of the cases occur among the elderly.[32, 33] Nurses will inevitably encounter older adults with hearing impairment in any setting in which they work. Understanding the challenges associated with hearing impairment and being able to offer solutions will help older adults minimize or even avoid problems. ▼

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GENERAL PURPOSE: To provide registered professional nurses with information on the types of hearing impairment that affect older adults, including assessment strategies and interventions that nurses can use across various settings.

LEARNING OBJECTIVES: After reading this article and taking the test on the next page, you will be able to

- recognize the various types of hearing loss.
- outline the diagnostic tests used to identify and classify hearing loss.
- plan the appropriate interventions for older adults who are hearing impaired.

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