Hearing loss is one of the most common chronic health conditions and has important implications for patient quality of life. However, hearing loss is substantially underdetected and undertreated. We present clinical cases to illustrate common situations in which primary care physicians may be called on to identify or to manage hearing loss. With the data reported in the companion scientific review as a guide, we present potential answers to important questions pertaining to hearing loss and suggest ways in which primary care physicians can improve the detection, evaluation, and treatment of hearing loss. The cases focus on screening for chronic hearing loss, evaluation of hearing loss, and treatment of patients with presbycusis.


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See also p 1976 and Patient Page.

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probably multifactorial and include the usual difficulties of adding screening to an acute-care patient visit along with a lack of organizational structure to facilitate screening, such as reminder systems. For screening for hearing loss to become the rule rather than the exception, novel strategies should be explored to make screening a feasible part of routine care. For example, patients could fill out a screening questionnaire in the waiting room. Alternatively, non-physician personnel can easily be trained to use an audioscope to screen for hearing loss while patients wait for the physician.

How Should the Physician Screen for Hearing Loss? Simply asking about hearing loss would be helpful. However, as with patient 1, some patients may be reluctant to admit to hearing loss, or may not yet notice it themselves, even when spouses, family, and friends all notice. Some patients may not report hearing loss in quiet settings, but have difficulty understanding speech in social settings where the ambient noise interferes with auditory acuity.

Most physicians, if they do screen for hearing loss, probably use a version of the whispered voice test (in which several numbers or words are whispered after full exhalation from behind the patient) or a variant (eg, rubbing fingers near the ear or using a tuning fork).\textsuperscript{26-28} These tests are quick, simple, and cheap, but they are somewhat limited by their subjectiveness and the lack of robust methods for standardization.\textsuperscript{25} Two other methods are to use a questionnaire, such as the Hearing Handicap Inventory for the Elderly-Screening version (HHIE-S, see accompanying scientific review for listing of questions),\textsuperscript{7,29-33} or to use a standardized sound production source, such as an audioscope (Audioscope, Welch Allyn Medical Products, Skaneateles Falls, NY).\textsuperscript{7,33,34} Both methods offer excellent test characteristics, as reported in the accompanying scientific review, but they screen different aspects of hearing loss.\textsuperscript{7,25}

Although clinical trial data are lacking to answer the questions of who and when to screen for hearing loss, a number of professional organizations recommend various screening regimens (see accompanying scientific review). We believe that it is reasonable to screen older patients (older than 55 years or 60 years of age) during periodic physical examinations. At present, we recommend using either an audioscope or the HHIE-S questionnaire, but we await data about the effectiveness of combining both methods. Patients with a positive screen result by any method should be referred to an audiologist for confirmatory testing and treatment discussions; patients with negative screen results should continue to receive screening tests during future periodic physical examinations.

What Is the Role of Noise Exposure in Hearing Loss? Although presbycusis can develop in patients without a history of excessive noise exposure, everyday noise exposure can cause hearing loss and may accelerate the process leading to presbycusis.\textsuperscript{25} The Occupational Safety and Health Administration\textsuperscript{26} has developed guidelines for protection from noise in the workplace, with protections required if the average noise level is greater than 85 dB and with shortened durations of exposure mandated as the average noise level increases. Even short blasts of loud noise, usually greater than 120 dB, can profoundly affect hearing. Patient 1 may well have hearing loss from his long-term exposure to loud music as the member of a band, although typical presbycusis can become clinically apparent in the sixth decade, even without excessive noise exposure (Box 1).

Patient 2

A previously healthy woman aged 48 years taking no medications other than calcium and vitamin D supplements wakes up one morning and quickly realizes that she is unable to hear any sound at all in her left ear. She is not dizzy but notes a buzzing sound in the affected ear. She presents to your office 2 days later when her hearing loss persists, hoping that antibiotics will treat her presumed ear infection. She denies otorrhea, otalgia, recent ear injury, or viral infections. Physical examination reveals bilateral, laterally nontender pinnae and mastoid processes, no obstruction of the external auditory canals, and clear tympanic membranes. The findings of the Weber tuning fork examination reveal that the sound lateralizes to the right side. The result of the Rinne examination is normal on the right side, but the patient is unable to hear either air or bone conduction on the left side.

What Is the Appropriate Evaluation for Hearing Loss? Hearing loss may be either sensorineural, involving the inner ear or auditory nerve, or conductive, resulting from blockage of sound from reaching the inner ear, as by impacted cerumen or fluid in the middle ear, or both. The patient’s history may reveal the presence of potential causes of hearing loss, such as pain or drainage, suggesting infection, physical trauma, or barotrauma; previous ear surgery; or associated tinnitus or vertigo; or, as in this patient, an absence of obvious causes.

The physical examination is helpful for distinguishing between conductive and sensorineural hearing loss. The first step is to look in the ear. Examination of the external auditory canal may reveal blockage of the ear canal (eg, blood, cerumen, edema, and/or purulence from external otitis, or foreign bodies) that may cause the sudden onset of hearing loss. Cerumen impaction is found in up to 30% of elderly patients with hearing loss.

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Box 1. Decibel Levels of Common Environmental Noises

<table>
<thead>
<tr>
<th>Noises</th>
<th>Decibel Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jet engine at takeoff</td>
<td>140 dB</td>
</tr>
<tr>
<td>Ambulance siren</td>
<td>120 dB</td>
</tr>
<tr>
<td>Rock concert, jackhammer</td>
<td>110 dB</td>
</tr>
<tr>
<td>Hand drill</td>
<td>100 dB</td>
</tr>
<tr>
<td>Lawnmower</td>
<td>90 dB</td>
</tr>
<tr>
<td>Heavy traffic</td>
<td>80 dB</td>
</tr>
<tr>
<td>Car noise</td>
<td>70 dB</td>
</tr>
<tr>
<td>Normal conversation</td>
<td>60 dB</td>
</tr>
<tr>
<td>Quiet office</td>
<td>50 dB</td>
</tr>
<tr>
<td>Residential area at night</td>
<td>40 dB</td>
</tr>
<tr>
<td>Whisper</td>
<td>30 dB</td>
</tr>
<tr>
<td>Rustling leaves</td>
<td>20 dB</td>
</tr>
</tbody>
</table>

The lowest threshold is 0 dB.

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and it can easily be remedied.\textsuperscript{37} Inspection of the tympanic membrane with pneumatic otoscopy may reveal a perforation or an immobile tympanic membrane, usually associated with fluid in the middle ear.

Testing using a tuning fork also is helpful, preferably using a 512-Hz tuning fork. This frequency lies within the 300 to 3000 Hz range of human speech, and it avoids the possibility of overestimating bone conduction with lower pitches. The finding of the Weber examination is abnormal when the patient reports that tones perceived from a vibrating tuning fork held against the midline skull are louder in one ear. When this lateralization occurs, either an ipsilateral conductive hearing loss on the side the tone is perceived to be louder or a contralateral sensorineural hearing loss is present. In the Rinne test, the vibrating tuning fork is held on the mastoid tip until the patient can no longer perceive the tone. It is moved over the external auditory canal, and patients who hear normally should be able to hear the tone again. When patients are unable to do so, the cause is most likely conductive hearing loss.

The relatively quick onset of hearing loss, the absence of other inciting causes, and the finding of an examination strongly suggestive of a sensorineural hearing loss make the leading differential diagnosis idiopathic sensorineural hearing loss. The patient history is consistent with this disorder, in which patients may quite suddenly, and in the absence of trauma or illness, lose hearing within a few minutes. The hearing loss should be confirmed with formal audiometry. The only treatment is glucocorticoids for which supporting evidence is available from a randomized double-blinded trial.\textsuperscript{38} The glucocorticoid should be administered immediately. A typical course of glucocorticoids will start with 30 to 60 mg of oral prednisone administered once daily and rapidly taper off over 1 to 2 weeks. Sensorineural hearing loss recently was brought to public attention when the radio host and political commentator Rush Limbaugh developed it. With early treatment of cases limited to mild or moderate hearing loss, the prognosis for full recovery of hearing loss is usually good.

**When Should the Physician Refer a Patient With Hearing Loss to a Specialist?** Referral to an audiologist is usually necessary in the context of sudden hearing loss for at least 2 reasons. First, it is important to document the hearing loss, as some patients who complain of hearing loss may, in fact, not have measurable loss. Second, the severity of hearing loss may have prognostic value, as patients with worse hearing loss tend to recover less hearing.

Primary care physicians may evaluate and treat many patients with hearing loss (eg, by removing cerumen, treating outer or middle ear infections, or discontinuing ototoxic medications), but other patients may benefit from referral to an audiologist or an otolaryngologist. In general, patients with unilateral or asymmetric hearing loss should receive further evaluation. The following patients should be immediately referred to an otolaryngologist: patients with hearing loss after trauma or with evidence of trauma on examination; patients with perforated tympanic membranes, evidence of severe infection, and persistent drainage; and patients who complain of significant hearing loss if the examination does not reveal an obvious and treatable cause. In the latter patient example, referral would be appropriate to permit detailed examination of the hearing apparatus.

**Patient 3**

A 78-year-old woman whom you have been treating for years comes back to your office for a routine visit. As usual, it is challenging to communicate with her because of her obvious hearing loss. You have inquired in the past about hearing aids and she says she purchased one 10 years ago, but it does not work very well and had cost a lot of money. Her family complains that she’s “deaf as a post” but they also wonder whether her hearing is selective when she doesn’t want to do something. She is able to understand most of what you say in the quiet of the examination room if you slow your speech down. You notice that her family members speak loudly to her after the visit and that they repeat themselves several times before she acknowledges them.

**What Are the Physician’s Therapeutic Options for Patients With Permanent Hearing Loss?** For patients who are developing presbycusis, avoidance of factors that can promote or accelerate presbycusis (eg, excessive noise and ototoxic medications, such as certain antibiotics or high-dose nonsteroidal anti-inflammatory agents) may help preserve hearing function. In patients who have documented presbycusis, the major category of therapy is based on sound amplification. Hearing aid technology has progressed rapidly and a full range of options for patients is available (BOX 2). As described in the accompanying scientific review, hearing aids come in different shapes and sizes, feature a variety of sound processing technologies, and, of course, differ widely in price. Referral to an audiologist is necessary to confirm the need for treatment, to help patients select an amplification device, and to help patients select an amplification device, and to help patients select an amplification device, and to help...
An audiologist may help enhance patient acceptance of hearing aids by seeking agreement from patients that they need a hearing aid, by offering a trial period, by addressing cosmetic issues, and by setting realistic expectations. For example, a small, in-the-canal hearing aid desired by a patient for cosmetic reasons may provide insufficient amplification if the hearing loss is severe.

What Else Can the Physician Do for Patients With Hearing Loss? Despite the technological advances in hearing aids, nonadherence with use of hearing aids remains a problem.3,39-42 Many patients do not wear their hearing aids part or all of the time. This nonadherence may relate to unmet expectations as well as problems with comfort and effectiveness. The primary care physician can play a leading role in improving adherence by inquiring about hearing aid use and by performing basic troubleshooting. If the patient is not using the hearing aid, why not? Does the patient not perceive hearing loss to be as much of a problem as family and friends do, or did the hearing aid not live up to the patient’s expectations? Is the hearing aid uncomfortable? Does the patient know how to use the hearing aid? Is it turned on? When was the battery replaced? The primary care physician can easily check for dead batteries, low volume, or hearing aids set in the off position by cupping a hand over the aid—a normally functioning hearing aid will squeal. Does the patient have trouble inserting the hearing aid (eg, because of arthritis or visual impairment) or regulating it when changing environments (eg, from quiet house to dinner party)? Has excess cerumen accumulated? Are there other medical issues common among older patients that may make hearing aid use difficult, such as dementia?

For some patients, there may be relatively simple ways to address problems underlying nonadherence. Minor modifications in the hearing aid shell may substantially improve the fit and resultant comfort. Patients with older hearing aids may benefit from newer fea-

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**Box 3. Partial Listing of US Nonprofit, National Organizations Providing Information and Resources for Hearing Impairment**

**Alexander Graham Bell Association for the Deaf and Hard of Hearing**
Description: Membership organization and resource center on hearing loss and related issues, with emphasis on childhood hearing loss; the Web site provides comprehensive listing of organizations offering financial resources.
Web address: http://www.agbell.org
Contact information: 3417 Volta Pl, NW
Washington, DC 20007
(202) 337-5220

**American Academy of Audiology (AAA)**
Description: Professional organization for audiologists; the Web site provides detailed information about hearing aids and audiology referrals.
Web address: http://www.audiology.org
Contact information: 8300 Greensboro Dr, Suite 750
McLean, VA 22102
(703) 790-8466

**American Academy of Otolaryngology—Head and Neck Surgery**
Description: Professional organization for otolaryngologists; the Web site provides substantial information about hearing loss and treatment.
Web address: http://www.entnet.org
Contact information: One Prince St
Alexandria, VA 22314-3357
(703) 836-4444

**American Speech-Language-Hearing Association (ASHA)**
Description: Professional and credentialing association for audiologists, speech-language pathologists, and speech, language, and hearing scientists.
Web address: http://www.asha.org
Contact information: 10801 Rockville Pike
Rockville, MD 20852
(800) 638-8255

**Deafness Research Foundation (DRF)**
Description: Leading source of private funding for basic and clinical research in hearing science; provides clinical information about a number of causes of hearing loss.
Web address: http://www.drf.org
Contact information: 1050 17th St NW, Suite 701
Washington, DC 20036
(202) 289-5850

**National Organization for Hearing Research Foundation**
Description: Organization funding research into the causes, prevention, and treatment of hearing loss and deafness.
Web address: http://www.nohrfoundation.org
Contact information: 225 Haverford Ave, Suite 1
Narberth, PA 19072
(610) 664-3155

**Self Help for Hard of Hearing People (SHHH)**
Description: Consumer organization for people with hearing loss; provides support groups, discounts for hearing services, and information about hearing aids and assistive listening devices.
Web address: http://www.shhh.org
Contact information: 7910 Woodmont Ave, Suite 1200
Bethesda, MD 20814
(301) 657-2248

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turies, such as directional microphones that improve speech perception and effectiveness. Specific features may appeal to certain patients. One manufacturer (Songbird Hearing Inc, Princeton, NJ) offers disposable hearing aids while another manufacturer (Sonic Innovations Inc, Salt Lake City, Utah) offers a disposable shell that expands to fit the external auditory canal. For patients who may have difficulty regulating volume, a remote control wristwatch for volume control is available (Phonak Inc, Warrenville, Ill). In some cases, simple sound amplification devices (assistive listening devices) are better tolerated.

Some patients and families may benefit from community support groups. Audiologists can educate both the family and patient about the nature of hearing loss and the existence of simple techniques to increase comprehension. For instance, things as simple as speaking low and slow rather than the usual response of raising pitch along with volume when speaking with a person with hearing loss, communicating whenever possible in a quiet environment, and looking directly at the person with hearing loss may all substantially increase comprehension.

**COMMENT**

Although hearing loss is very common and is associated with other distressing problems, such as functional decline, depression, and social isolation, substantial evidence supports that hearing loss is undetected and undertreated in the primary care practice setting. Simple screening tools are available for use in primary care practice and may help physicians identify patients with presbycusis who could benefit from audiological or otolaryngological evaluation and potential hearing augmentation. Moreover, primary care physicians may be the first, and in some cases the only, health professional to assess patients with a number of types of potentially reversible hearing loss. A list of resources, including Internet sites, for patients and physicians to learn more about the evaluation and treatment of hearing loss is contained in Box 3. The appropriate diagnostic and therapeutic decisions, and in some cases referral, for these patients may make the difference in salvaging a patient’s hearing and quality of life.

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