Amplification: The Treatment of Choice for Presbycusis

Doron Milstein, PhD, Hofstra University, Long Island, NY, USA.

Barbara E. Weinstein, PhD, Graduate School and University Center, CUNY, New York, NY, USA.

Hearing loss diminishes quality of life. The elderly rely on auditory input to maintain social contact and awareness of their environment, such that hearing loss in this age group can lead to isolation and withdrawal from the community. Most elderly individuals do not take advantage of available audiological services nor do they use hearing aids (HAs), the treatment of choice for their hearing loss. Modern HAs utilise digital technology and computer software to improve speech intelligibility. Current research reveals that HAs are effective in minimising the negative consequences of hearing loss in the daily functioning of the elderly. The availability of sophisticated technology allows for more efficient HA fitting, and allows the audiologist to spend more time counseling.

Key words: presbycusis, hearing aid technologies, rehabilitation, assistive listening devices.

Demographics

The fastest growing segment in the U.S. population is, and will continue to be, the elderly. In the U.S., hearing impairment increases with age, such that its prevalence ranges from 25% among persons 70–74 years to more than 50% among persons 85 years of age and older.1 Similarly, hearing impairment increases with age among Canadians, as does prevalence. Patterson noted that at least 25% of Canadians older than 65 years reported hearing problems, with audiologically detectable hearing loss present in more than one-third of all people in that age group.2 Prevalence of hearing loss is even greater among the elderly living in institutions. Despite the high prevalence of hearing loss, older adults represent a small proportion (i.e., 30%) of the caseload of U.S. audiologists.3 Furthermore, estimates of hearing aid (HA) use range from 10–23%.4 Although hearing loss is a disorder amenable to early intervention, the elderly tend to wait about 10 years before seeking assistance.

Hearing Loss Characteristics

Hearing loss results from degenerative changes in the inner ear, the auditory nerve and structures within the central auditory nervous system. The changes with age, which are variable, have corresponding effects on pure-tone hearing sensitivity and speech understanding (see article, page 40). Older adults suffer significant hearing loss in both the low and high frequencies, but the loss is generally greater in the high frequencies (which, consequently, negatively affects speech understanding). The hearing loss associated with aging, presbycusis, is gradual in onset, bilateral, symmetrical and sensorineural. It tends to be mild to moderate in degree, with speech understanding difficulties most pronounced in noisy situations.4 Sensorineural hearing loss can arise from a variety of medical conditions, including vascular and metabolic diseases and otoxicity. Moscicki, et al. noted that age, sex, family history, Meniere’s disease and noise exposure are significant risk factors for hearing loss, but age is by far the most critical risk factor.5

Consequences

Weinstein suggested that persistent difficulties in understanding may present initially as feelings of frustration and discouragement.1,6 Hearing difficulties can severely limit engagement in activities and strain family relations. For example, difficulty understanding one’s spouse or caregiver can interfere with ongoing relations. Difficulty interacting with family and friends can lead to reduced involvement in leisure time activities and socialisation. Interference with solitary activities, such as problems hearing television or radio, can jeopardise psychological well-being, while problems using the telephone may compromise security.

Undetected hearing loss also can affect medical management. Hearing loss can prevent a physician from obtaining a valid medical, psychiatric and social history, which increases the potential for a misdiagnosis. Misunderstandings with respect to important medication instructions can interfere with medical treatment. Hearing loss also might be misinterpreted as a cognitive, affective or personality disorder. As such, it could interfere with therapeutic interventions across all disciplines (e.g., social work) and could exacerbate medical conditions such as Alzheimer disease or depression.4

A recent study by the National Council on the Aging (NCOA) revealed that untreated hearing loss has serious emotional and social consequences.7 This survey of 2,300 hearing-impaired adults 50 years and older revealed that individuals with untreated hearing loss were more likely to report depression, anxiety and paranoia and less likely to participate in organised social activities than individuals who wear HAs. They also concluded that HAs help to reduce the negative consequences of hearing loss.

Efficacy of Hearing Aids

Amplification is the treatment of choice for presbycusis. Kochkin and Roin stated that since modern hearing instruments improve speech intelligibility, they should also improve the social, emotional, psychological and physical functioning of individuals with hearing loss.8 Indeed, the NCOA study revealed that hearing instruments were clearly associated with impressive improvements in these areas for people with hearing loss. Specifically,
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Questions from the Hearing Handicap Inventory for the Elderly-Screening Version (HHIE-S)

<table>
<thead>
<tr>
<th>Question</th>
<th>Modified from Weinstein, 2000 and Ventry and Weinstein, 1983.</th>
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<tr>
<td>Does a hearing problem cause you to feel frustrated when talking to members of your family?</td>
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<td>Does a hearing problem cause you difficulty when visiting friends, relatives or neighbours?</td>
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<tr>
<td>Does a hearing problem cause you difficulty when listening to TV or radio?</td>
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<tr>
<td>Do you feel that any difficulty with your hearing limits or hampers your personal or social life?</td>
<td></td>
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<tr>
<td>Does a hearing problem cause you to feel embarrassed when meeting new people?</td>
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<td>Do you have difficulty hearing when someone whispers?</td>
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Hearing Aids by Systems/Technologies

HA technologies include:
1. conventional/analogue HA;
2. digitally programmable analog HA (uses conventional/analogue technology to process the sound, but digital technology to modify the characteristics of the analog circuit, utilising computer software); and
3. fully digital HA (uses digital technology to process the sound).

Programmable HAs rely on computer software to adjust the electroacoustic features of the HA to the patient's needs. The audiologist can compare different programs, thereby enabling selection of the circuitry most appropriate for the patient's hearing loss, and better fine-tuning of the response. Programmable HAs allow for use of remote control to enable the patient to alternate between programs or to adjust the volume control. They require less mechanical parts than conventional HAs, resulting in fewer breakdowns and repairs and, consequently, lower costs.10

Fully digital HAs have the advantages of programmable HAs, but manipulation of sound can be performed even more efficiently. Digital HAs can minimise or prevent feedback noise, can process sound so that speech signal will be enhanced/amplified more so than environmental noise, and can provide a more natural signal, speech or voice quality. Furthermore, digital technology requires less power and circuit size, allowing the HA to be made smaller.10

Advances in HA technologies, especially the movement away from analog technology, can better address the needs of the elderly. For example, directional microphones suppress background noise and focus on and amplify speech coming from the front. Compression/non-linear circuitry prevents loud sounds from being uncomfortable or too loud, entering the HA output/intensity into the patient's tolerable dynamic range and, consequently, minimising or eliminating the need for using volume control. Furthermore, removal cords or notches ease manipulation, a cerumen guard minimises cerumen obstruction, and a high volume control knob can ease adjustment if needed. Finally, feedback and occlusion controls, as well as telephone compatibility, are available. Thus, the advent of high-end HAs should serve as an inducement for the elderly to attempt their use.

Disposable Hearing Aids

It is interesting to address the use of disposable HAs (conventional or digital), whereby the HA is manufactured as a standard package and can be disposed after a certain time period; thus, it is a modular rather than custom HA and is not based on an individual patient's earmold impression or HA prescription. If the disposable HA's features fit the patient's audiogram configuration and hearing loss needs, advantages would include the ability to be fitted by the audiologist immediately post-audiological evaluation/medical clearance (no need to obtain earmold impression or order the HA), lower cost and no need for batteries and volume control. However, possible disadvantages include the inability to make adjustments and to fine-tune to the patient's needs, and the HA may not fit the patient properly, causing feedback problems. Thus, although disposable HAs might increase the first-hand experience of rehabilitation/amplification among hearing-impaired patients, an unsuccessful experience due to their possible limitations might reinforce outdated beliefs regarding the limited efficiency of HAs in general.10

Assistive listening devices are an
adjunct to HAs or can be used in lieu of HAs. These devices are commercially available, inexpensive and ideal for select listening conditions. They help to better understand television and speech in large rooms, such as in movies, churches or synagogues. Telephone amplifiers are very useful for persons having difficulty understanding speech over the telephone. Alerting devices, such as vibrating alarm clocks and flashing lights to alert individuals to a fire, are invaluable. Persons with hearing impairment have at their disposal a variety of devices that can help overcome their communication and interpersonal difficulties.

HAs may be rejected if the patient is unprepared and not thoroughly counseled regarding their use. Utilising computer software with both programmable and digital HAs allows for a faster and more efficient fitting. The audiologist can spend more time listening to the patient’s hearing needs, difficulties and expectations, and counseling them regarding the latter. Counseling should address issues ranging from HA manipulation and maintenance to realistic expectations and motivation, thereby allowing for successful rehabilitation and improved quality of life.

Conclusion

Despite the high prevalence of hearing loss and its negative consequences, most elderly individuals do not receive audiological services, nor do they use HAs. Physicians are in the ideal position to help audiologists reach elderly people with hearing impairment. Simple screening techniques with an audioscope, which combines an audiometer with an otoscope, can be a practical tool for physicians.11 Furthermore, administration of a brief questionnaire, such as the Hearing Handicap Inventory (Table),4 can help identify older adults who are experiencing activity limitations and participation restrictions due to hearing loss. Given the beneficial effects of available technology, referral to an audiologist can help improve quality of life of older persons with hearing impairment.

References