Status of Hearing Aids in Nursing Homes and Retirement Centers in 2002

Nicole M. Ferguson
Valley ENT Associates, PC

Michael A. Nerbonne
Central Michigan University

The functional status of 114 hearing aids from 8 nursing homes and retirement centers located in mid-Michigan was evaluated via visual/listening inspections and electroacoustic analysis. Overall, 45% of the hearing aids from both facilities failed 1 or more components. The hearing aids from the nursing homes had a much higher problem rate than those from the retirement centers. The results reinforce the continuing need for on-going hearing aid monitoring programs in extended care facilities to promote successful hearing aid use among elderly residents.

Evidence has existed for over two decades documenting the high incidence of hearing loss among elderly persons residing in extended care facilities (Garahan, Waller, Houghton, Tisdale, & Runge, 1992; Hull, 1995; Schow & Nerbonne, 1980). Although the incidence of hearing loss is great and the potential need for audiologic rehabilitation in this focused population is high, a number of major issues have made the implementation of large-scale programs of audiologic rehabilitation for these individuals challenging at best. The typical approach followed by the limited number of audiologists (1.1% of those certified) working in a nursing home setting (American Speech-Language-Hearing Association, 1997) involves carefully selecting those individuals for whom audiologic rehabilitation may be feasible, based not only on audiometric status, but also on their physical,

Nicole M. Ferguson, Valley ENT Associates, PC, Saginaw, Michigan; Michael A. Nerbonne, Department of Communication Disorders, Central Michigan University.

Correspondence concerning this article should be addressed to Michael A. Nerbonne, PhD, Department of Communication Disorders, Central Michigan University, Mt. Pleasant, Michigan 48859. E-mail: nerbo1ma@cmich.edu

cognitive, and psychosocial condition.

Hearing aid use represents a common form of audiologic management used with selected extended care residents. Although the potential benefits which hearing aids can provide for elderly clients are substantial (Mulrow, Tuley, & Aguilar, 1991), successful use depends on numerous factors (Weinstein, 2000). Certainly, three key issues associated with successful hearing aid use are: (a) the extent to which the audiologist is involved in providing essential on-going hearing health care to elderly residents of extended care facilities, (b) the ability of the elderly client to independently use/care for the instruments, and (c) the ability and motivation of staff working in the residential setting to provide on-going assistance with hearing aid use. The extent to which these issues often may not be addressed adequately was dramatically underscored by Thibodeau and Schmitt (1988), who found that 72% of hearing aids in a sample of nursing homes and retirement centers had one or more types of malfunction. Most were simple, easily detected problems (e.g., dead/weak batteries or clogged vent/receiver openings). Thibodeau and Schmitt concluded that consistent hearing aid monitoring programs are essential in order for residents of these facilities to fully benefit from amplification.

In spite of legislative action to expand hearing services provided in nursing homes (Omnibus Budget Reconciliation Act, 1987), legitimate concern still exists regarding the overall functional status of hearing aids used by the elderly residents in extended care facilities. The following study was conducted to obtain a more recent assessment concerning this important issue.

METHOD

Participants

All of the nursing homes (nine) and retirement centers (six) in the mid-Michigan area within a 20-mi radius of Central Michigan University were contacted and invited to participate in the study. Those facilities agreeing included four nursing homes, ranging in size from 45-204 residents, and four retirement centers, with 66-230 residents. All of the facilities were located in towns and cities ranging in population from 2,000-25,000. Approximately 800 individuals lived in the eight facilities at the time of the study. None of the facilities had an audiologist on staff; however, services from these professionals, as well as hearing aid specialists, were available in the immediate community on an as-needed basis.

After consent to participate was obtained by the administration of each nursing home facility, the names of consenting hearing aid users were provided to the investigators. Each of these individuals was invited to participate in the study via written communication and personal contact by the investigators. Retirement center residents were invited to participate through personal contact, newsletters, and announcement postings within the facilities.

Procedures

Each hearing aid was evaluated by means of a comprehensive visual/listening inspection and electroacoustic analysis. All analyses were carried out at each of the participating sites by the first author, a fourth-year AuD student with substantial experience in evaluating hearing aids.

Visual/listening inspection. A visual/listening inspection of each hearing aid was conducted initially. This included examination of the case, controls, battery status (if included), battery contacts, earhook, tubing, vents, and sound bores. Visual abnormalities, such as a cracked case or tubing, corroded battery contacts, inoperative controls, or an obstructed sound bore or vent were noted. Prior to performing a listening check, battery adequacy was checked with a voltmeter. Those that measured at least 1.1 V were classified as good; the remainder were considered weak/dead. The listening check was completed with a stethoscope. Impressions of the general amount of amplification (weak, dead), sound quality/clarity (distortion, static), volume control function, and feedback were recorded.

Electroacoustic analysis. Hearing aids were analyzed electroacoustically unless the visual/listening inspection indicated an aid was not functioning at all or if internal feedback was detected. Seven programmable hearing aids could not be analyzed electroacoustically, due to connection and software limitations that prevented making necessary full-on adjustments. When possible, if any problem identified in the visual/listening inspection could be corrected, such as a dead battery or obstructed sound bore, that was done so that an electroacoustic analysis could be carried out. The analysis was completed with an Audioscan RM 500 system in accordance with the American National Standards Institute's (ANSI) S 3.22 standards (ANSI, 1987).

Criteria for failure. Any significant problem identified with a given hearing aid during the visual/listening evaluation resulted in its being failed. For the electroacoustic analysis, an aid failed if it had a high-frequency-average (HFA) Full-On Gain of less than 20 dB, if harmonic distortion exceeded 10%, or if it had an abnormal frequency response (gain only in the extreme low or high frequencies). Since manufacturer specifications are readily available for behind-the-ear (BTE) hearing aids, each BTE's electroacoustic results also were compared to manufacturers' specifications in a separate analysis to determine if performance was within ANSI-specified tolerance values.

RESULTS

A total of 114 hearing aids used by 79 individuals (30 nursing home and 49 retirement center residents) were analyzed in the study. The age of the aids ranged from 1 to 17 years, with 71% being 1-5 years old and 51% being 1-3 years old. Most (78%) were not programmable or digital instruments. Age and circuitry

Table 1
Hearing Aids Evaluated for Residents
of Four Nursing Homes and Four Retirement Centers

Hearing aid style	Nursing homes		Retirement centers	
	No.	%	No.	%
BTE	10	25	18	24
ITE	27	68	39	53
ITC	3	8	17	23
Total	40		74	

Note. BTE = behind-the-ear. ITE = in-the-ear. ITC = in-the-canal.

type were generally the same across facility types. Table 1 summarizes the hearing aid styles included. A majority of residents of both facility types used in-the-ear (ITE) hearing aids, more so within the nursing home setting than in retirement centers. In-the-canal (ITC) hearing aid use was more common among retirement center residents compared to those in nursing homes. No completely-in-the-canal hearing aids were noted in either facility type. Binaural hearing aid use also was more common in the retirement centers (53%) than in the nursing homes (33%).

Visual/Listening Inspection

Table 2 presents the results of the visual/listening inspections, including battery status, for the hearing aids analyzed. Overall, a failure rate of 35% was noted. Hearing aids from the nursing homes had a higher percentage of problems (50%) than the hearing aids from the retirement centers (27%; note that the Table 2 tallies include individual hearing aids more than once, depending on the number of failed components). The rate of weak or dead batteries found was high (14%) and more common for aids in nursing homes; however, this failure rate was considerably lower than was found by Thibodeau and Schmitt (1988). During the visual inspection, casing/battery door problems, bad battery contacts, and receiver port obstructions were the most common problems noted for the hearing aids from nursing homes. For the instruments from the retirement centers, the most frequently noted problems during the visual inspection were tubing abnormalities and receiver port obstructions. During the listening inspection, the most frequent problems in hearing aids from the nursing homes were faint/no sound output and internal feedback. Few problems were detected during listening checks with hearing aids from the retirement centers.

Electroacoustic Analysis

Electroacoustic analysis was completed at full-on settings with a total of 98 of the 114 hearing aids, and Table 3 presents a summary of the results. Overall, 28%

Table 2

Types of Hearing Aid Problem Identified in Visual/Listening Inspection

Type of problem	% of aids in nursing homes	% of aids in retirement centers	% of all aids
Battery ($n = 105$)	24	9	14
Visual inspection ($n = 114$)			
Case/battery door	8	0	3
Battery contacts	8	0	3
Microphone	0	1	1
Receiver	10	5	7
Tubing	5	8	7
Earmold	3	0	1
Earhook	0	0	0
Venting	0	0	0
Overall	30	17	22
Listening inspection ($n = 114$)			
No/faint sound	5	1	2
Noise/static/dist	3	1	2
Intermittent	3	0	1
Internal feedback	8	0	2
Volume control	3	0	2
Overall	15	4	8

Note. A given hearing aid could be included in more than one category.

Table 3

Summary of Electroacoustic Abnormalities Found for All Hearing Aid Types by Facility Type ($N = 98$)

Type of problem	Aids in nursing homes %	Aids in retirement centers %	All aids %
HFA FOG	3	9	7
Distortion			
500 Hz	16	12	13
800 Hz	31	6	14
1600 Hz	6	6	6
Frequency response	0	3	2
Overall	34	24	28

Note. HFA FOG = high-frequency-average full-on gain.

failed on one or more of the three parameters evaluated (gain, distortion, frequency response). The failure rate for aids in the nursing homes (34%) was higher than for those from the retirement centers (24%). Excessive distortion was the most common abnormality noted with instruments from each type of residence.

In a separate analysis, 26 of the BTEs also were compared electroacoustically with manufacturers' performance specifications. This led to an overall failure rate when using this additional analysis of 65% (50% of nursing home aids, 72% of retirement center aids). This compares to a lower overall failure rate for these same 26 BTEs of 42% (50% of nursing home aids, 39% of retirement center aids) when using the three-parameter electroacoustic analysis reported earlier.

Combined Results

When the results from the visual/listening inspection (battery included) and the three-parameter electroacoustic analysis were combined (see Table 4), it was determined that 45% of the 114 hearing aids had at least one abnormality. For the hearing aids from the nursing homes, 58% had one or more problems, compared to 37% for the hearing aids from the retirement centers. The overall failure rate was 62% for BTEs, 35% for ITEs, and 50% for ITCs. It should be noted that while the 100% failure rate found for ITCs in nursing homes was excessively high, this was based on a total of only three hearing aids.

It was also determined that, with the 98 hearing aids from the nursing homes and retirement centers on which both visual/listening and electroacoustic analyses were completed, 51% passed both evaluations. Another 14% passed the visual/listening inspections, but failed the electroacoustic analysis. The results also indicated that 21% failed the visual/listening inspections and passed the electroacoustic analysis. Most of those occurred because the battery was dead, then replaced, or because the hearing aid failed the visual inspection due to tubing or

Table 4

Percentage of Hearing Aids With a Problem Detected by Visual/Listening and/or Electroacoustic Analyses ($N = 114$)

Hearing aid style	Nursing homes	Retirement centers	Total
BTE ($n = 28$)	70	58	62
ITE ($n = 66$)	48	26	35
ITC ($n = 20$)	100	41	50
Overall	58	37	45

Note. BTE = behind-the-ear. ITE = in-the-ear. ITC = in-the-canal

earmold factors that did not adversely affect electroacoustic results. Finally, 14% failed both the visual/listening and electroacoustic evaluations.

DISCUSSION

Although it may not be surprising to some, the fact that 45% of the hearing aids used in four nursing homes and four retirement centers had one or more problems certainly is worthy of concern. This is especially true for the hearing aids from nursing homes, where the percentage with problems was even worse (58%) than in retirement centers (37%). This higher rate may be attributed, in part, to differences between residents of retirement centers compared to those in nursing homes as to how well they can independently care for and manage their hearing aids. As unacceptably high as the overall failure rate is, it is encouraging to note that it is much lower than the 72% rate reported by Thibodeau and Schmitt (1988). This may be due, in part, to factors such as increased audiologic and staff support for hearing aid use/care and possible improvements in hearing aid reliability over the past two decades.

In contrast to Thibodeau and Schmitt's (1988) findings, in the present study the ITE style of hearing aid was found to have the lowest overall problem rate (35%). The higher rate of problems associated with BTEs mostly can be attributed to the large number of hearing aids (six) that failed only because of tubing issues (hardened/discolored, occluded, torn, loosened).

Battery and cerumen-related problems were the most frequently encountered abnormalities during the visual/listening inspection. These, as well as some of the other defects identified, usually can be remedied relatively easily through ongoing monitoring and support programs from in-house staff and/or audiologic personnel. The overall failure rate for the visual and listening inspections of the present study (35%) was substantially lower than was reported by Thibodeau and Schmitt (61%; 1988). They found 32% of all aids had dead/weak batteries, while the corresponding rate was 14% for the present investigation. The most common problem detected during the electroacoustic analysis was the presence of excessive amounts of distortion, which was also the case in the Thibodeau and Schmitt study.

In summary, the results of the study indicate an unacceptably high rate of problems still exists for the hearing aids of residents living in extended care facilities, particularly nursing home residents. Many of the problems found required a minimum of technical expertise and equipment to correct, and could easily have been handled by in-house staff. Hearing aid monitoring programs can minimize the extent to which these problems occur, making their existence essential for successful hearing aid use in nursing homes and retirement center facilities. While the results of the present study suggest improvement relative to the status as of 1988 (Thibodeau & Schmitt, 1988), much remains to be done to reduce the rate

of problems to more acceptable levels among hearing aids used by elderly individuals in these facilities.

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