A Report on Condition of Hearing Aids in Nursing Homes and Retirement Centers

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The functioning of hearing aids in three nursing homes and three retirement centers was assessed by visual/auditory inspection and electroacoustic evaluation. Despite the relatively large number (944) of residents in these facilities, only 26 persons had amplification and participated. Of the 36 hearing aids evaluated, 72% had some problem which was usually identified through the visual/auditory inspection. The most frequently occurring problems were dead/weak batteries, clogged vents or sound openings, and inoperable volume controls. The overall percentage of malfunctioning aids identified by the visual/auditory inspection was nearly the same for the nursing homes and retirement centers; however, the types of problems were different and were suggestive of characteristics of the residents' hearing aid use. The results indicate the need for hearing aid monitoring programs which are directed by audiology consultants and carried out by staff and/or volunteers.

In 1980, Schow and Nerbonne reported that 82% of the nursing home residents they evaluated had a hearing loss greater than 26 dB HL. Despite the high prevalence of hearing loss in institutionalized persons, there have been limited audiological services offered. Mueller and Peters (1981) surveyed 321 nursing home administrators who reported that approximately one third of their residents experienced hearing problems; however, only 4% reportedly employed audiologists on a full-time or part-time basis. Of those who did not employ an audiologist, 64% indicated no future plans to include audiological services through permanent staff positions or consultant arrangements. When asked why such services were not provided, the majority indicated that they did not need them, rather than that they were unable to obtain services because of budget restraints or lack of availability.

In contrast, Dancer and Drummond (1985) reported that the majority of nursing homes they surveyed were in favor of audiological services. Sixty-six percent were interested in having inservice training regarding the recognition

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of communication problems among elderly persons, and 90% were interested in inservice training regarding effective communication with communicatively-impaired elderly persons. However, only 48% of these nursing homes were providing audiological services to their residents.

The paucity of audiological services in nursing homes was also reported recently by Lubinski and Weinstein (1988). Of 198 homes from which responses were received, 70% did not employ an audiologist; 44% reported offering no audiological evaluations; and 64% reported offering no aural rehabilitation sessions.

No data are available regarding audiological services in retirement centers; however, it is speculated that even fewer services are available because the greater mobility and independence of the residents would allow many to seek outside assistance when needed. Some facilities allow hearing aid dealers to make periodic visits to screen hearing and provide repair services.

The lack of services in these facilities coupled with the high prevalence of hearing loss in the elderly population raises significant concerns about the use and status of amplification in residential facilities for elderly individuals. As part of a needs assessment for establishment of hearing aid maintenance programs in such facilities, the following study was conducted to evaluate the functioning of hearing aids via visual/auditory inspection and electroacoustic analysis in two types of facilities, nursing homes and retirement centers.

METHOD

Subjects

The hearing aids of 26 hearing-impaired residents were evaluated from three intermediate care nursing homes and three retirement centers in Austin, TX. Out of 17 nursing homes contacted, only 3 reported having five or more residents with hearing aids and were also willing to participate in the study. Of five retirement centers contacted, three also agreed to participate. The total number of residents in the three nursing homes was 493, and in the three retirement centers, 451. None of the facilities had an audiologist or speech-language pathologist on staff; however, in the nursing homes services from such professionals were available on a consultant basis and in two of the retirement centers hearing aid dealers visited approximately four times a year. In the nursing homes, names of residents owning hearing aids were secured from an administrative nurse. The hearing aids of all suggested residents were evaluated except for those of four persons who were not contacted because of scheduling difficulties. In the retirement centers, residents were invited to participate through announcements in newsletters or on activity bulletin boards.

Table 1 summarizes the hearing aid types used by the 26 participants. Ten individuals were fit with binaural amplification which resulted in a total of 36 aids. The majority of the nursing home residents (83%) had monaural amplification, whereas the majority of the retirement center residents (57%) used

binaural amplification. Of the 36 aids, 50% were in-the-ear (ITE), 36% were behind-the-ear (BTE), 11% were in-the-canal (ITC) aids, and 3% were eyeglass aids. The residents living in nursing homes used primarily BTEs in contrast to the residents in retirement centers who used primarily ITEs.

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

Hearing Aid Type	Nursing Homes		Retirement Centers	
	Number	%	Number	%
Behind-the-ear	8	57	5	23
In-the-ear	5	36	13	59
In-the-canal	0	0	4	18
Eyeglass	1	7	0	0

Procedure and Equipment

Function of the 36 hearing aids was assessed via (a) visual/auditory inspection and (b) electroacoustic evaluation. The assessments were conducted in each facility over a two-month period. In the nursing homes the aids were usually tested in the resident's room and in the retirement centers the tests were offered at convenient times in common activity areas.

Visual/auditory inspection. Each of the hearing aids was visually inspected for physical problems. The components inspected included the case, controls, battery contacts, earhook, tubing, vents, and sound bores. Any broken, loose, nonfunctioning, or corroded items were noted. The earhook, earmold, and tubing were checked for flexibility, cracks, or obstructions. Prior to the auditory check, the battery voltage of each hearing aid was assessed. The auditory check consisted of listening to the hearing aid at user setting with a stethoscope. Problems were noted in three categories: (a) quality — static, intermittency, and/or distortion; (b) power — weak signal or no amplification at all; and (c) volume control — nonlinear amplification or dead spots. In addition, a feedback check was performed by occluding the sound opening and turning the volume full on.

Electroacoustic evaluation. If possible, any malfunctioning identified in the first two inspections was corrected before the electroacoustic evaluation was performed. The electroacoustic analysis was conducted with a portable Fonix hearing aid test box (Model F30). All measurements were made in accordance with S3.22 standards for the specification of hearing aid characteristics by the American National Standards Institute (ANSI, 1982).

Criteria for malfunctioning aids. A hearing aid was classified as malfunctioning if any problem was identified during the visual or auditory inspections.

On the basis of electroacoustic performance, an aid was considered malfunctioning if it had full-on-gain of 15 dB or less, an aberrant frequency response in which gain was present in the low or high frequencies only, or harmonic distortion greater than 5%. In addition, the performance of 12 of 13 BTE aids was compared to manufacturers' specifications to determine if function was within ANSI specified tolerance values. (Specifications for one BTE aid were not available.)

RESULTS

Visual/Auditory Inspection

Of the 36 hearing aids, 61% (22) were classified as malfunctioning by visual/auditory inspection. Of the 14 hearing aids in the nursing homes, 64% (9) were malfunctioning in one or more aspects compared to 59% (13 of 22 aids) in the retirement centers. Of the 22 malfunctioning aids in both the nursing homes and the retirement centers, 27% (6) of the aids had two or more problems. With regard to type of hearing aid, 59% (13) of the malfunctioning aids were ITEs, 32% (7) were BTEs, and 9% (2) were ITCs.

The types of problems identified according to facility type are reported in Table 2. The most frequently occurring problem in the nursing home was a dead or weak battery followed by a clogged vent or sound opening. In the retirement centers, malfunctioning controls were the leading problem followed by a dead or weak battery. Volume controls were either stuck or broken off.

Table 2

Type of Hearing Aid Malfunction Identified by Visual/Auditory Inspection

Type of Problem	% of Aids in Nursing Homes	% of Aids in Retirement Centers	% of All Aids
Visual check			
case	0	23	14
controls	0	31	18
battery contacts	0	8	5
earhook	11	0	5
tubing	22	0	9
vent/sound opening	33	15	23
Auditory check			
quality	22	15	18
power	0	8	5
volume control	22	15	18
feedback	11	0	5
Battery			
dead/weak	44	23	32

Electroacoustic Evaluation

Three aids could not be evaluated electroacoustically because they produced no measurable output. Of the remaining 33 hearing aids, 9% (3) had 15 dB or less gain, 9% (3) had aberrant frequency responses, and 21% (8) had more than 5% distortion at one or more frequency. Four of the malfunctioning hearing aids were in the nursing homes; 10 were in the retirement centers. Of the 14 hearing aids classified as malfunctioning according to electroacoustic evaluations, 71% (10) had also failed the visual/auditory checks. Thus, the electroacoustic check revealed four hearing aids as malfunctioning that were not identified in the visual/auditory checks. The average and range of electroacoustic performance according to hearing aid type are included in Table 3.

Of the 12 aids which were compared with manufacturer's specifications, 58% (7) were not within specifications. Problems included low full-on-gain

Table 3

Mean and Range of Electroacoustic Results by Type of Hearing Aid

	Hearing Aid Type		
Measurement[a]	In-the-Ear n = 16	Behind-the-Ear n = 13	In-the-Canal n = 4
SSPL 90 in dB SPL	113 (102-130)	126 (118-135)	96 (89-103)
HFA SSPL 90 in dB SPL	108 (96-120)	119 (105-127)	93 (85-101)
HFA FOG in dB	28 (12-41)	45 (33-56)	15 (5-26)
RTG in dB	27 (12-60)	40 (28-71)	12 (5-24)
Distortion in %			
500 Hz	1.4 (0-12)	2.7 (0-13)	0 (0)
800 Hz	3.6 (0-20)	1.1 (0-6)	3.3 (0-11)
1600 Hz	2.1 (0-20)	3.2 (0-35)	2.0 (0-6)

[a]SSPL = Saturation Sound Pressure Level. HFA = High Frequency Average. FOG = Full on Gain. RTG = Reference Test Gain.

(4), high distortion (3), and inappropriate frequency responses (2). Of the 7 malfunctioning BTE hearing aids, 5 also failed the auditory/visual check. In other words, all but two of these hearing aids were identified during the visual/auditory checks.

SUMMARY AND CONCLUSIONS

The evaluation of 36 hearing aids used by persons in nursing homes and retirement centers revealed that 72% (26) had some problem which interfered with adequate functioning. The majority of problems were detectable by relatively simple visual/auditory checks and were usually easily correctable. The most frequently occurring problems were dead/weak batteries, clogged vents or sound openings, and inoperable volume controls. With respect to type of aid, the BTEs in this sample were more durable than the ITEs.

Although nearly the same overall percentage of hearing aids in the nursing homes and retirement centers were malfunctioning according to visual/auditory checks, the types of problems encountered most frequently suggest differences between the residents. The problems with clogged openings and battery strength were not as frequent in the retirement centers which suggests that those residents were monitoring those aspects. The increased problems with controls in the retirement centers may be reflective of some of the difficulties of operating the small controls. Possible reasons for the lack of these problems with controls in the nursing homes was the greater use of BTEs with easier controls to manipulate and/or the greater likelihood that the hearing aids were handled by the nursing staff. The overall percentage of aids identified as malfunctioning according to the electroacoustic evaluation was considerably higher in the retirement centers than in the nursing homes. This is partly a result of the higher percentage of ITEs and ITCs in the retirement centers which often had limited gain.

These results suggest that consistent hearing aid monitoring programs are needed in both nursing homes and retirement centers in order for the residents to fully benefit from amplification. It also appears that the majority of problems could be identified through visual/auditory checks. These monitoring programs could be done by properly trained staff supervised by an audiology consultant. At a minimum, it is recommended that staff or trained volunteers routinely check battery strength and patency of vent/sound openings. Such programs could be initiated with minimal expense. In addition to the cost of training the staff and volunteers, basic tools must be purchased to perform the hearing aid checks such as stethoscopes, wax picks, and battery testers. Thereafter, the cost of maintaining such a program would include the necessary forms to document the assessments and the audiology consultant who would resolve questions regarding function and make arrangements for the necessary repairs.

This study provides continued evidence regarding the lack of audiological services in residential facilities for elderly persons. Surprisingly few residents who used amplification were identified. Only 4% of the 493 nursing home residents were reported as using amplification; only 5% of the 451 retirement center residents participated in the hearing aid checks. These small percentages are in stark contrast to the high prevalence of hearing loss known to exist in this

population (Franks & Beckmann, 1985; Schow & Nerbonne, 1980). According to Schow and Nerbonne, 48% of the nursing home residents they evaluated had hearing levels greater than 40 dB HL. Therefore, it may be estimated that in these nursing homes alone, 236 persons were potential candidates for some type of amplification, yet only 18 persons were identified as hearing aid users. It is conceivable that the establishment of hearing aid monitoring programs in nursing homes and retirement centers may serve, not only to decrease the number of malfunctioning hearing aids, but also heighten the awareness of amplification benefits and provide some motivation for others to seek audiological assistance.

ACKNOWLEDGEMENTS

The authors express appreciation to Frye Electronics for loaning the portable hearing aid test equipment and to the staff of the six facilities who assisted in contacting the residents.

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