AUDIOLOGICAL NEEDS AND MANIFESTATIONS OF GERIATRIC NURSING-HOME RESIDENTS

by

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ABSTRACT

The purpose of this study was to provide data on aural communicative handicaps of geriatric nursing home residents and to recommend appropriate follow-up services for individual subjects. Pure-tone air conduction threshold testing, otoscopic inspection, tympanometry, and acoustic reflex testing were administered to 151 geriatric residents (103 females, 48 males) from four nursing homes in three cities. Data are presented by nursing home and by ear. Results of audiological testing revealed a 96% incidence of hearing loss among the subjects. Of the ears tested, there were abnormal otoscopic findings in 47%, aberrant tympanometric findings in 16% (27% of subjects), absent contralateral acoustic reflexes at screening levels in 42% (56% of subjects), and absent ipsilateral acoustic reflexes in 61% (71% of subjects). Seventeen of the subjects reported owning hearing aids. Hearing aid listening checks were performed on all available hearing aids (N=13) of the subjects, and all 13 were found to be malfunctioning. On the basis of the findings, audiological and medical recommendations were made for 96% of the subjects.

Over 5%, or approximately 1.2 million, of the geriatric population live in health care facilities (Hull, 1980a) and, according to projected figures of one survey, 90% of this population are significantly hearing impaired (Chafee, 1967). Several studies have been undertaken in recent years to determine the extent of hearing problems among elderly nursing home residents, for example, Hull and Traynor (1975) and Schow and Nerbonne (1980). Determination of the presense of these hearing impairments was accomplished through audiological pure-tone testing using portable audiometers (Hull and Traynor, 1975; Schow and Nerbonne, 1980), while tuning fork tests and acoustic-immittance measures provided information on the type of hearing impairment (Hull and Traynor, 1975).

Various attempts have been made to provide aural rehabilitative services following the determination of a hearing impairment. Although statistics on what constitutes successful and unsuccessful aural rehabilitation programs appear to be lacking, it has been noted (Harless and Rupp, 1972) that many of these programs for the geriatric population have met with limited success. This limited success has been attributed to such factors as lack of patient motivation, physical and psychological aspects associated with the aging process, prior patient discouragement and/or failure with hearing aid use, transportation difficulties, financial problems, and patient denial of hearing impairment (Harless and Rupp, 1972). In addition, the success of aural rehabilitation programs for the elderly may be limited by, 1) infrequent provision of systematic or comprehensive services (Hull, 1980a), 2) apparent lack of commitment in training programs to prepare professionals to work with the geriatric population (Nerbonne, Schow, and Hutchinson, 1980), and 3) lack of referrals from allied professionals due to their limited awareness of aural rehabilitation services (Ryan, 1980). Despite these problems, successful

programs for the elderly have been reported by a number of authors, including Harless and Rupp (1972) and Hull and Traynor (1975), incorporating such services as hearing aid dispension, speechreading, counseling, and the provision of inservices to nursing home staff and family where appropriate.

The purpose of this study was two-fold: (1) to provide data on the aural-communicative handicap of geriatric residents in four Montana nursing homes; and (2) to recommend appropriate follow-up services to the subjects, based on the data obtained.

METHOD

Subjects

A sample of residents from four nursing homes in three Montana cities participated in the study. The homes, corporately owned and operated, had no specific or restrictive admission policies. The study included all residents who would allow the audiological tests to be administered and those whom the nursing home staffs felt were well enough to participate. A total of 151 residents, representing 53% of the total population (N=285) of the four homes, were tested. The age range of the subjects was 54-95 years old; the average age was 80.6 years. Forty-eight (32%) of the subjects were male, and 103 (68%) were female.

Equipment and Calibration

Portable audiometers (Maico Model MA-20 and Beltone Model 12-D) were used for pure-tone testing and were calibrated according to current standards [ANSI S3.6-1969(R 1973)] prior to and following testing of the subjects. Listening checks, utilizing persons with known normal thresholds, were administered upon arrival at each nursing home to rule out gross audiometer malfunction. Earphones on these audiometers were telephonic TDH-39 units housed in MX-41/AR cushions. An oto-admittance meter (Grason-Stadler Model 1721) and an "impedance" bridge

(Madsen Model ZS76-I) were used for tympanometric and acoustic reflex testing. These instruments were calibrated in known cavities, and compensations were made for altitude, temperature, and atmospheric pressure.

Procedure

A request was made to each nursing home that testing areas be the quietest available that would accomodate the equipment and personnel. Typical ambient noise levels allowed testing to 10-dB HL as per ANSI S3.1-1977. A brief case history was taken for each subject to obtain information regarding problems with hearing and to identify those with present or prior experience with amplification. Routine listening checks were performed on the hearing aids of those subjects who brought them to the testing area, using a hearing aid stethoscope and battery tester. Otoscopic inspections were performed, and ears were judged to have normal appearance, excess cerumen, occluding cerumen, or other abnormalities. Abnormal appearance was verified by a certified audiologist. Pure-tone air conduction thresholds were obtained in both ears of the subjects at 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz in accordance with specifications promulgated by ANSI S3.21-1978. Acoustic-immittance testing was administered bilaterally to obtain tympanometric peak-pressure. Results were categorized as "normal" ($\pm$ 500 Pa), "mildly positive/negative" (+500 to +1000 Pa; -500 to -2000 Pa), or "abnormal" (outside -2000 to +1000 Pa). Tympanometric shape and amplitude were assessed informally. Contralateral and ipsilateral acoustic reflexes were screened for presence or absence at 1000 Hz at 100-dB HL and 105-dB SPL, respectively. Ipsilateral reflexes were tested on a limited portion (N=34) of the population due to the lack of appropriate equipment at two of the testing sites. Acoustic-immittance testing was not administered to subjects with occluding cerumen, excess ear sensitivity, or significant abnormalities of the external ear.

RESULTS

The results of pure-tone threshold testing by ear and as totals for subjects from the four nursing homes are shown in Table 1. The distribution of auditory sensitivity by nursing home and as totals is shown in Table 2. The thresholds were categorized into 11 types of hearing loss by degree. Independent categorization of each audiogram by at least two of the authors was accomplished to ensure reliability of the results. Excluded from these data were those ears for which no thresholds, or only a limited number of thresholds, were obtained (N=43). Thus, data for both ears are not reported for all subjects such that total ears tested does not equal twice the number of subjects. These excluded ears were those of subjects who did not comprehend the task, or who became upset during the testing such that it had to be discontinued. Of the remaining ears (N=259), 15 (6%) exhibited thresholds considered to be within normal limits (25-dB HL or better). These total results were consistent with the results obtained from each of the four nursing homes and represented a total of six subjects with normal hearing bilaterally. Eleven percent of the ears exhibited mild hearing losses (25-45 dB HL); 10% mild to moderate (high frequency slope before 2000 Hz); 10% mild to severe (sharp high frequency slope before 2000 Hz); and 7% mild to profound (very sharp high frequency slope before 1000 Hz). Relatively flat moderate losses (45-65 dB HL) were demonstrated by 13% of the ears; 15% were moderate to severe (high frequency slope before 1000 Hz); 10% moderate to profound (high frequency slope before 1000 Hz); 7% severe (65-85 dB HL, relatively flat); 5% severe to profound; and 6% profound (over 85-dB HL). The results indicated, therefore, that similar numbers of ears exhibited thresholds in (1) mild and moderate categories (34%), (2) categories of sharply sloping severe and profound high frequency losses (27%), and (3) severe to profound flat loss categories (33%), while only 6% of the ears (4% of the subjects) exhibited normal thresholds.

Insert Table 1 and Table 2 about here

Data obtained from otoscopic inspections are shown in Table 3. One-hundred and sixty (53%) of the 302 ears of all 151 subjects appeared normal. Excess or occluding cerumen was observed in 118 (39%) of the ears, and other abnormalities were observed in 27 (9%) of the ears. These other abnormalities included ear canal abrasion, hemorrhage on the canal wall or tympanic membrane, discharge in the ear canal, epidermal cysts on the concha and antihelix, tympanosclerosis, and retracted tympanic membrane. Thus, 47% of the ears, representing over half of the subjects, exhibited abnormal otoscopic findings.

Insert Table 3 about here

Table 4 contains data obtained from tympanometry. One-hundred and twenty-seven ears were not tested due to the inability to obtain a seal, patient discomfort or rejection, or because assessment was contraindicated by otoscopic findings. Of the 175 ears tested, 148 (85%) exhibited normal peak-pressure points. Normal peak-pressure points were present bilaterally in 73% of the subjects. Fifteen (9%) of the ears were mildly positive or negative with regard to peak-pressure (+500 to +1000 Pa; -500 to -2000 Pa), and 12 (7%) were classified as abnormal (outside -2000 to +1000 Pa).

Insert Table 4 about here

Contralateral acoustic reflexes at 1000 Hz at 100-dB HL were present in 67 ears, representing 58% of the ears tested (N=116), and bilaterally in 44% (N=27)

of the subjects. These data are shown in Table 5. Ipsilateral acoustic reflexes at 1000 Hz at 105-dB SPL were present in 23 ears, or 39% of the ears tested (N=59), and were present bilaterally in 29% (N=10) of the subjects. Table 6 contains these results.

Insert Table 5 and Table 6 about here

Seventeen of the subjects reported owning hearing aids at the time of the assessment. Fifteen had monaural fittings, two binaural. Of these 17, six subjects did not bring their aids to the testing site, noting that they seldom or never wore their aids; some were not even sure where their aids were. Three subjects actually wore their hearing aids to the testing site. An additional eight subjects did not wear their aids but brought them along for assessment. All 13 hearing aids available for assessment were malfunctioning for one or more reasons, including the following: corroded battery contacts, broken battery compartment, plugged earmold, weak or dead batteries, incorrect battery size, corroded or malfunctioning gain control, and plugged microphone opening.

DISCUSSION

One purpose of this study was to determine the degree of hearing impairment in an uncontrolled sample of 151 geriatric residents from four nursing homes, representing 53% of the total population of those homes. Data obtained from pure-tone audiometric testing indicated that only 6% of the ears had thresholds considered to be within normal limits. The remaining ears exhibited thresholds that were fairly equally divided among those in, (1) mild and moderate groups; (2) groups characterized by sharply sloping severe and profound high frequency losses; and (3) severe to profound, relatively flat losses. Therefore, 94% of the ears tested, representing 96% of the subjects, were found to be significantly

impaired (losses greater than 25-dB HL). This percentage was similar to those reported by Miller and Ort (1965), 97%; Hull (1980b), 92%; and Schow and Nerbonne (1980), 82%.

Schow and Nerbonne (1980) suggested that the variability of percentages of hearing loss incidence among studies could be affected by the types of nursing homes involved, ages of the subjects, definitions of hearing loss, classifications used to describe the degree of hearing loss, and methods used to assess hearing sensitivity. Within their study it was noted that the presence of collapsed ear canals may increase the percentage of hearing loss incidence. The use of circumaural earphone cushions, rather than the conventional supra-aural cushions, were advocated to circumvent this problem; a lower percentage of hearing loss was found when circumaural cushions were used. A companion study undertaken by Schow and Goldbaum (1980) further substantiated these findings. To compensate for the threshold differences between circumaural cushions and the conventional supra-aural cushions, Schow and Goldbaum (1980) adjusted their audiometer output levels using correction factors obtained by Chaiklin and McClellan (1971). However, their results must be viewed with caution since the accuracy of these calibration techniques cannot be ascertained in the absence of ANSI standards for the calibration of earphones with circumaural cushions and the nonexistence of an appropriate standard acoustic coupler.

Within the present study, a variable which may have influenced the results was the relatively low percentage of residents (53%) tested from the total population of the four nursing homes. This percentage was lower than the 73% reported by Schow and Nerbonne (1980) and Gaitz and Warshaw (1964) in their studies of nursing home residents. The total percentage tested in the present study appeared to be influenced strongly by the low percentage tested at one of

the nursing homes ("B"). This might be attributable to the fact that, in this study, the responsibility of bringing patients to the testing sites was given to the nursing home staffs. Since there appeared to be a lack of enthusiasm and cooperation at nursing home "B," a greater number of nonambulatory and difficult-to-test residents were seen at the other three nursing homes. Had more residents been seen at nursing home "B," the percentage of hearing impairments might have been greater.

The second purpose of this study was to recommend appropriate follow-up services for the subjects based on their individual test results. Recommendations were not made for subjects who passed the pure-tone audiometric assessment, acoustic-immittance testing, and otoscopic inspection. Audiological referrals were made, however, for subjects who demonstrated a hearing loss (greater than 25-dB HL) in at least one ear so that the need for amplification and/or other rehabilitative services could be determined. Since only six subjects passed the audiological testing, recommendations for audiological evaluation were made for 96% of the subjects. Medical referrals were made where otoscopic inspection revealed excess cerumen, occluding cerumen, and/or other abnormalities of the pinna, external auditory meatus, or tympanic membrane. Medical referrals were also made where acoustic-immittance results indicated abnormal tympanometric configurations. Fifty-eight percent of the subjects were medically referred. Evaluation/re-evaluation of acoustic-immittance was recommended when, (1) tympanometric measures were mildly aberrant but not severe enough to be viewed as abnormal; (2) absent acoustic reflexes were inconsistent with the degree of hearing impairment; or (3) acoustic-immittance measures could not be obtained at the time of the testing.

In addition, recommendations were made for the correction of malfunctioning hearing aids. It was of interest to note that only 17 of the subjects reported owning hearing aids, despite the fact that over half of the subjects received Medicaid benefits which allowed for payment for hearing aids. Of these 17 subjects, only three actually wore their aids at the time of the assessment. Perhaps this was related to the fact that 11 of the 17 subjects had cerumenous ears. Furthermore, all hearing aids assessed were found to be malfunctioning for various reasons. These findings indicate the importance of proper aural rehabilitation services (of which hearing aid maintenance is an integral part) if successful fitting and use of hearing aids is to be maintained in the nursing home environment.

The aural rehabilitation programs outlined by Hull and Traynor (1975) and Hull (1980a) merit consideration in serving geriatric patients, including the subjects of this study. By providing such services as patient counseling, hearing aid fitting with extensive hearing aid orientation, communication rehabilitation, and routine inservice training to families of the patients and nursing home personnel, a greater percentage of the geriatric nursing home population will likely have their rehabilitative needs met than has been the case in the past. Despite the variables that may have affected the results of the present study, the authors concluded that the data obtained further substantiate the need to improve audiological services for the geriatric nursing home population.

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TABLE 1. Distribution of total ears tested (N=259*), by ear and as totals, showing degree of hearing loss in dB HL /ANSI-1969(R 1973)/ for 151 subjects from four nursing homes.

Pure-tone thresholds (air conduction)	Right Ear	Left Ear	TOTAL
Normal (0-25 dB HL)	8(6%)	7(5%)	15(6%)
Mild (25-45 dB HL)	14(11%)	14(11%)	28(11%)
Mild to moderate (high frequency sloping before 2 KHz)	14(11%)	13(10%)	27(10%)
Mild to severe (sharp high frequency sloping before 2 KHz)	11(9%)	15(11%)	26(10%)
Mild to profound (very sharp high frequency sloping before 1 KHz)	6(5%)	11(8%)	17(7%)
Moderate (45-65 dB HL)	19(15%)	14(11%)	33(13%)
Moderate to severe (high frequency sloping before 1 KHz)	16(13%)	23(17%)	39(15%)
Moderate to profound (high frequency sloping before 1 KHz)	14(11%)	12(9%)	26(10%)
Severe (65-85 dB HL)	11(9%)	7(5%)	18(7%)
Severe to profound	7(6%)	7(5%)	14(5%)
Profound (over 85-dB HL)	7(6%)	9(7%)	16(6%)
TOTAL	127	132	259

*Does not equal twice the number of subjects as complete data available on only one ear of some subjects.

TABLE 2. Categorized pure-tone threshold results by nursing home and as totals according to degree of hearing loss in dB HL /ANSI-1969(R 1973)/ for ears tested (N=259*) of 151 subjects from four nursing homes.

Pure-tone thresholds (air conduction)	Nursing Homes A	B	C	D	TOTAL
Normal (0-25 dB HL)	5(5%)	3(6%)	2(6%)	5(6%)	15(6%)
Mild (25-45 dB HL)	9(9%)	5(10%)	3(9%)	11(14%)	28(11%)
Mild to moderate (high frequency sloping before 2 KHz)	7(7%)	6(13%)	3(9%)	11(14%)	27(10%)
Mild to severe (sharp high frequency sloping before 2 KHz)	5(5%)	8(17%)	2(6%)	11(14%)	26(10%)
Mild to profound (very sharp high frequency sloping before 1 KHz)	10(10%)	2(4%)	1(3%)	4(5%)	17(7%)
Moderate (45-65 dB HL)	11(11%)	5(10%)	6(18%)	11(14%)	33(13%)
Moderate to severe (high frequency sloping before 1 KHz)	19(19%)	5(10%)	7(21%)	8(10%)	39(15%)
Moderate to profound (high frequency sloping before 1 KHz)	11(11%)	7(15%)	3(9%)	5(6%)	26(10%)
Severe (65-85 dB HL)	7(7%)	5(10%)	1(3%)	5(6%)	18(7%)
Severe to profound	5(5%)	2(4%)	4(12%)	3(4%)	14(5%)
Profound (over 85 dB HL)	10(10%)	0(0%)	2(6%)	4(5%)	16(6%)
TOTAL	99	48	34	78	259

*Does not equal twice the number of subjects as complete data available on only one ear of some subjects.

TABLE 3. Otoscopic inspection results for ears (N=302) of 151 subjects from four nursing homes.

Otoscopic inspection results	Nursing Homes A	B	C	D	TOTAL
Normal	70	30	19	41	160(53%)
Excess cerumen	17	11	18	23	69(23%)
Occluding cerumen	18	13	5	13	49(16%)
Other abnormality	5	1	4	17	27(9%)
TOTAL	110	55*	46	94*	305*

*Does not equal number of ears as some ears exhibited cerumen concomitant with other abnormalities.

TABLE 4. Tympanometry results for ears (N=175*) of 92 subjects from four nursing homes.

Tympanometric peak-pressure point	Nursing Homes A	B	C	D	TOTAL
Normal	44	31	17	56	148(85%)
Mildly positive/negative (+500 to +1000 Pa; -500 to -2000 Pa)	2	5	1	7	15(9%)
Abnormal (outside -2000 to +1000 Pa)	5	2	1	4	12(7%)
TOTAL	51	38	19	67	175

*Does not equal twice the number of subjects as data available on only one ear of some subjects.

TABLE 5. Contralateral acoustic reflex results for ears (N=116*) of 62 subjects by ear and as totals.

Contralateral acoustic reflex at 1000 Hz, 100-dB HL re: ANSI-1969(R1973)	Right Ear	Left Ear	TOTAL
Present	34(56%)	33(60%)	67(58%)
Absent	27(44%)	22(40%)	49(42%)
TOTAL	61	55	116

*Does not equal twice the number of subjects as data available on only one ear of some subjects.

TABLE 6. Ipsilateral acoustic reflex results for ears (N=59*) of 34 subjects by ear and as totals.

Ipsilateral acoustic reflex at 1000 Hz, 105-dB SPL re: ANSI-1969(R1973)	Right Ear	Left Ear	TOTAL
Present	12(41%)	11(37%)	23(39%)
Absent	17(59%)	19(63%)	36(61%)
TOTAL	29	30	59

*Does not equal twice the number of subjects as data available on only one ear of some subjects.