Examining the Effectiveness of Traditional Audiological Assessments for Nursing Home Residents with Dementia-Related Behaviors

Carmen L. Burkhalter*†
Rebecca S. Allen††
Denell C. Skaar*
Jessica Crittenden*
Louis D. Burgio**†

Abstract

Background: It is currently estimated that the resident population of individuals over the age of 65 living in nursing homes will double by 2020. Nearly one-third of all nursing home residents have difficulty seeing or hearing, 46% have some form of dementia, and 30–84% of those with dementia in nursing homes show some form of agitation. Nursing home residents who do not receive appropriate audiological services may experience social isolation, cognitive decline and decreased mobility.

Purpose: To examine the effectiveness of standard audiological testing procedures for nursing home residents and to discuss the purpose of adapting assessment procedures that can lead to more effective audiological assessments for this population.

Research Design: A retrospective chart analyses. A 33-item coding form was used to complete descriptive analysis of original audiological data and demographic data for 307 nursing home residents for a study to examine the effects of auditory stimulation on dementia-related behavior problems exhibited by nursing home residents through audiotape exposure to environmental sounds or soothing voice.

Results: Although 77% (n = 235) of the 307 residents were considered compliant for the testing process and 74% (n = 288) tolerated putting on headphones, audiological assessment using air conduction testing could be completed in both ears on 32% (n = 100) of the residents. In fact, only 5% (n = 16) of the 307 residents were able to complete a full traditional audiometric assessment protocol.

Conclusions: Proper identification of hearing impairment through effective and appropriate audiological assessment is crucial for preserving and enhancing quality-of-life in nursing home residents. This study served as an introduction to the problem of using traditional behavioral testing for hearing assessment of nursing home residents. Much work needs to be done to establish best practices for audiometric assessment in this population.

Key Words: Cognitive decline, diagnostic techniques and procedures, health services for the aged, nursing homes

Abbreviations: AC = pure-tone air conduction; BC = bone conduction; MCL = most comfortable level; MDS = minimum data set; PTA = pure-tone average based on pure tone thresholds at 500, 1000, and 2000 Hz; SR = speech recognition; SRT = speech reception threshold; UCL = uncomfortable level

*Department of Communicative Disorders, University of Alabama; †Center for Mental Health and Aging, University of Alabama; ‡Department of Psychology, University of Alabama; **Institute of Gerontology, University of Michigan School of Social Work

Carmen L. Burkhalter, Ph.D., University of Alabama, Department of Communicative Disorders, College of Arts and Sciences, Box 870226, Tuscaloosa, AL 35487-0226; Phone: 205-348-7007; Fax: 205-348-0560; E-mail: cburkhalter@as.ua.edu

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The United States Administration on Aging identified the group of individuals aged 85 years or older as the fastest growing section of the U.S. population (2004). Current estimates indicate that by the year 2050 there will be more than 19 million individuals who are 85 years or older (United States Administration on Aging, 2009). As a person increases in age, there is a greater chance that he or she will have a disability. In fact, 71.7% of individuals over 80 years of age were estimated to have had a disability in 2002, including sensory disabilities such as hearing, vision, or speaking loss; cognitive disabilities such as dementia and Alzheimer disease; and motor and ambulatory impairments (Stienmetz, 2004). According to the American Association of Retired Persons (AARP, 2007), 39 million Americans are affected by a hearing loss.

It is currently estimated that the resident population of individuals over the age of 65 living in nursing homes will double by 2020. More than half of all residents living in nursing homes are 85 years or older. Nearly one-third of all nursing home residents have difficulty seeing or hearing; 46% have some form of dementia; and 30–84% of those with dementia in nursing homes show some form of agitation (American Geriatric Society, 2005; American Health Care Association, 2005). Agitated behaviors are defined as repetitive verbal, vocal, and motor activities considered inappropriate and outside of social standards (i.e., disruptive vocalizations, such as screaming or repetitive questioning; physical aggression; and psychomotor restlessness) (Cohen-Mansfield and Billig, 1986). Vance et al (2003) concluded that residents with significant hearing impairment and residents demonstrating cognitive decline were more likely to engage in increased agitation.

Burgio and colleagues (1994) proposed that hearing impairments coupled with dementia produces a state of sensory deprivation causing patients to engage in agitation as a form of self-stimulation. This hypothesis is supported by the need-driven dementia-compromised behavior model (NDB Model; Algase et al, 1996), which posits that agitated behaviors arise from the pursuit of a goal or the expression of a need and are caused by background characteristics and proximal factors surrounding the nursing home resident. Thus, need-driven behaviors include disruptive vocalizations and psychomotor restlessness. Background factors are relatively stable and include cognitive and sensory functioning. Proximal factors are dynamic and include the physical and social environment and the changing needs of the person with dementia.

The purpose of this paper is to examine the effectiveness of standard audiological testing procedures in nursing home residents through retrospective chart review and to discuss the purpose of adapting assessment procedures that can help create more effective audiological assessments for this population. Accurate audiological assessments will facilitate the development of a comprehensive aural rehabilitation counseling program including the selection of appropriate sensory aids to meet the sensory needs of residents with hearing loss and dementia. Successful audiological intervention may thereby reduce depression, aggression, and agitation in response to unmet needs experienced by the resident with dementia or hearing loss (AARP, 2005; Algase et al, 1996; Allen-Burge et al, 1999).

METHODS

The current study utilized data collected by Burgio (1997) for a study examining the effects of auditory stimulation on dementia-related behavior problems exhibited by nursing-home residents through audiotape exposure to environmental sounds or soothing voice. Institutional review board approval for the original study, which was obtained at the University of Alabama and the University of Alabama at Birmingham, included permission for secondary data analyses. The current authors developed a 33-item coding form to analyze the audiological data collected in Burgio’s research.

Overview of the Original Study

The initial research pool for the Burgio (1997) study consisted of 307 nursing home residents from 10 Birmingham, Alabama, nursing homes. Participants from each nursing home were randomly assigned to control or audiotape intervention groups. Each potential participant was rated by nursing home staff on the Behavior Pathology in Alzheimer’s Disease Rating Scale (BEHAVE-AD), a global rating item developed by Riesberg and colleagues (1987), that assesses the resident’s overall behavioral symptoms on a scale of 0 to 3 with 0 being not at all troubling and 3 being severely troubling. In order to meet inclusion criteria into Burgio’s research, residents needed to: (a) be 55 years of age or older; (b) have passed some portion of attempted audiological assessments; (c) engage in a clinically significant amount of agitation as determined by average staff rating of 2 or above on the BEHAVE-AD; (d) be receptive to wearing earphones without resistance; and (e) have a life expectancy of greater than six months. Of the original 307 available subjects, 168 (55%) were selected as participants for the audiotape intervention study based on the above criteria. The 168 selected participants were predominately Caucasian (80.72%), female (81.93%), with an average age of 82.99 years (standard deviation of 8.54 and range of 61 to 101) and a mini-mental state exam.
(MMSE) (Folstein et al, 1975) of 6.36 (standard deviation of 6.59). The MMSE is an 11-item instrument that measures cognitive functioning based on orientation, registration, attention and calculation, recall, and language. Scores can range from 0 to 30, with higher scores indicating better cognitive functioning, and a score of less than 24 indicating significant cognitive deficit.

Collection of Audiological Data for the Original Study

As part of the selection process for the initial research study, audiological assessments were attempted by a certified licensed audiologist for all 307 nursing home residents. The specific audiometric tests attempted included pulsed pure-tone air (AC) and unmasked bone conduction (BC) for 500, 1000, 2000, and 4000 Hz; speech recognition threshold (SRT); speech recognition (SR) score using phonetically balanced words; uncomfortable listening level of speech (UCL); and most comfortable listening level of speech (MCL). The MCL and UCL were determined monaurally under earphones using continuous discourse. The level started at 40 dB above the SRT. In situations where a clear SRT was not determined, the audiologist began an MCL determination at 60 dB. Once the MCL was obtained, a modified SR score was determined using the MCL. Due to the research nature of the data collection process, the audiologist was given ample time to complete the procedures but was asked not to deviate from the standard conditioning process necessary to elicit audiometric thresholds in a healthy, cognitively functioning adult population. The instrument used for the assessments was a Beltone 114 audiometer calibrated to ANSI standards. Due to the often inambulatory nature of the residents in the nursing home, it was decided that all assessments would occur in the resident’s room with other extraneous environmental noises removed, including television, radio, roommates, and so on. The room doors were closed. Sound level meter data were not assessed in each room, but nursing station and hallway assessment did not reveal ambient noise levels to have exceeded 70 dBA as measured by a calibrated Quest Q-300 noise dosimeter.

The audiologist conducted a biologic calibration and an everyday listening check prior to assessment and determined the equipment to be in good working order as well as the ambient noise levels to be acceptable. Results from the attempted assessments were provided in narrative form by the audiologist conducting the assessments. The written reports detailed behavioral observations, objective test results, impressions, and recommendation for or against inclusion in the study.

Development of 33-Item Coding Form

In order to retrospectively analyze the available audiological assessment results across the original 307 residents, the current authors developed an analysis form consisting of 33 questions designed to obtain critical information from the narrative reports, behavioral observations, assessment results, and general impressions provided by the testing audiologist for each resident (Appendix 1). In order to develop the analysis form, one author (C.B.) and a research assistant served as raters for the forms. They independently reviewed the records of 10 randomly selected residents and developed a list of items designed to document the audiological and behavioral data reported in the records. Then the raters (C.B. and the graduate assistant) compared these independently developed items and combined them to form the final 33 items on the form. Items included the participant’s level of compliance, level of distractibility, level of alertness, receptiveness to behavioral conditioning, and previous case history information. The two raters then used the form to analyze the data across patient files and code results to describe residents’ reaction to the audiological testing process and the efficacy of testing procedures.

RESULTS

Reliability of the 33-Item Coding Form

In order to determine reliability between expert raters, each rater completed an analysis form for 10 residents (one from each of the 10 nursing homes). Comparison of the raters coding for these 10 residents on the 33-item forms indicated inter-rater agreement of 100% with no variance between rater responses.

Descriptive Analysis of Findings from the 33-Item Coding Form

In addition to audiometric findings, the authors categorized resident behaviors reported by the audiologist that may have affected the assessment process. Items included the participant’s level of compliance with the process of attempting to condition for audiological testing, level of distractibility, level of alertness, receptiveness to behavioral conditioning, and previous case history information. Of the 307 residents, 84% (n = 259) were considered alert, 76% (n = 235) were considered compliant, and 74% (n = 228) tolerated putting on headphones. Of the patients who were considered compliant, 86% (203) tolerated putting on headphones.

A review of the demographic data in patient medical charts indicated that 23% (n = 72) of the residents had
a primary or concurrent diagnosis of dementia or Alzheimer’s disease. An additional 4% (n = 11) of the residents were diagnosed with mental retardation, senility, major depression, altered mental status, or psychosis. Moreover, the average MMSE (Folstein et al., 1975) score of 6.36 (standard deviation of 6.59) indicates severe cognitive deficits among residents. An additional 28% (n = 85) of the residents exhibited clinically significant agitation during the study, although they did not have a primary or secondary diagnosis of dementia or cognitive related disorders listed in their medical charts. In total 54% (n = 168) of the original 307 residents demonstrated dementia or dementia-characterized behaviors, which contributed to the overall ineffectiveness of the audiological assessments. However, only 4% (n = 13) were judged to have unusual behavior that interfered with any form of audiological testing. These behaviors were characterized as aggressiveness, erratic or strange behavior, bad reaction to questioning, combativeness, complete disorientation, echolalia, excessive talking, falling asleep, hostility, paranoia, removal of headphones, crying, and unresponsiveness to any stimuli.

The authors also rated the residents’ communication characteristics based on informal remarks by the audiologist in the narrative reports and determined that of the 307 residents, 64% (n = 199) exhibited intelligible speech, 60% (n = 186) produced spontaneous speech, and 52% (n = 162) produced speech appropriate for the topic at hand. Some overlap exists between these groups; however, due to the difficulty of objectifying behavioral observations in a complex and very diverse group of patients, the communication characteristics of intelligibility were considered separate from whether a patient’s communication was appropriate. For example, if the audiologist asked a patient about the family photos and the patient very intelligibly talked about mashed potatoes from lunch, their communication was considered intelligible but not appropriate.

Some residents tolerated conditioning of some procedures and not others, or one ear and not the other. It was found that 38% (n = 117) of the 307 residents tested could not be conditioned for administration of any of the behavioral assessment procedures. However, of the total 307 participants, binaural AC testing was successfully completed in 32% (n = 100) of the residents and monaural testing in an additional 4% (n = 12). Therefore, 112 patients were able to produce AC results. Unmasked BC testing was successful in 11% (n = 34) of the residents. Binaural SRT using spondee words was successful in 21% (n = 66) of the residents, and monaural SRT was completed in an additional 4% (n = 11). Modified binaural SR testing using W-22 words was completed in 46% (n = 141) of the residents, and monaural testing was completed in 5% (n = 15) of the residents. To put these data in perspective, only 45% (n = 100) of the 235 residents who were considered compliant for the testing process were able to be conditioned to complete AC testing. This means that less than one-third of the total 307 residents could be conditioned to complete AC testing. The data analyses revealed the most notable finding that only 5% (n = 16) residents out of the 307 were able to complete all test procedures in both ears.

No data was produced from 38% (n = 117) of the residents of what could be considered a traditional audiological protocol of AC, BC, SRT, SR, and MCL. The remaining 190 residents had some combination of the assessment protocol yield audiological results. Recognizing that any difficult-to-test population may fatigue through an entire protocol, analysis was completed for the data by ear and different procedure combinations (Fig. 1). When analyzing these data, the authors found that beyond the 16 residents who were able to complete all test procedures in both ears, no additional residents completed all procedures in only one ear. If the residents were capable of performing all procedures in one ear, they completed them in both ears.

Of the residents who were able to complete some assessments (n = 190), the specific procedural breakdown included the following: 52% (n = 100) of the residents completed AC in both ears, 18% (n = 34) completed unmasked BC testing, and 35% (n = 66) completed SRT in both ears. Of the 100 residents completing binaural AC testing, 18% had a primary or concurrent diagnosis of dementia or Alzheimer’s; 82% were characterized as produced appropriate speech; 99% tolerated headphones; 98% were compliant for the testing process; and only 8% were characterized as easily distracted. Obviously dementia is not the only variable that keeps a nursing home resident from completing audiological assessment.

Speech recognition was reported in both ears in 75% (n = 141) of the residents. It must be noted, however, that because of the low number of residents able to complete the SRT, the audiologist often chose to perform a modified SR based on the MCL level. This accounts for the higher number of residents with SR scores. Astoundingly, an AC, BC, and SRT combination alone could only be completed in both ears for 10% (n = 19) of the residents. It appears from the data that AC and some type of most comfortable speech testing yielded the most frequent and reliable results.

Results of pure-tone testing were reported as a pure-tone average (PTA), which was calculated using hearing thresholds for 500, 1000, and 2000 Hz (see Table 1). Using PTA, the authors categorized the residents based on degree of hearing loss: normal (25 dB HL or below), mild (26 to 40 dB HL), mild to moderate (41 to 55 dB HL), moderate (56 to 70 dB HL), severe (71 to 90 dB HL), and profound (91 or above dB
Analyzing the PTA in the right ear for the 109 residents who had data for the right ear, 25% (n = 27) had normal hearing, 37% (n = 40) had mild hearing loss, 40% (n = 44) had mild to moderate loss, 7% (n = 8) had moderate loss, 3% (n = 3) had severe loss, and 1% (n = 1) had profound loss. Analyzing the PTA in the left ear for the 103 residents who had data for the left ear, 24% (n = 25) had normal hearing, 35% (n = 36) had mild loss, 25% (n = 26) had mild to moderate loss, 14% (n = 14) had moderate loss, 2% (n = 2) had severe hearing loss, and none had a profound loss.

DISCUSSION

Nursing home residents who do not receive appropriate audiological services may experience social isolation, cognitive decline, and decreased mobility (Desai et al, 2001) resulting in increased behavioral agitation due to unmet needs (Algase et al, 1996; Vance et al, 2003). Aural rehabilitative counseling and the use of hearing aids and assistive listening devices can reduce the adverse effects of hearing loss. Research from Japan has indicated that proper audiological interventions, such as aural rehabilitation and hearing aid fitting for residents with hearing impairment, leads to an increased feeling of happiness and adaptation to nursing home living (Tsuruoka et al, 2001). Audiological interventions improve communication between residents and staff and help to build positive relationships within the nursing home setting. Improved communication between staff and residents and among residents has a positive impact on residents’ quality of life (Allen-Burge et al, 2001; Burgio et al, 2001). Corrected hearing impairment also results in improvements in mood, social interactions, and performance on daily living tasks (Appollonio et al, 1996). It is clear that improvement in the techniques and procedures used to adequately identify those who need services and provide counseling and intervention is necessary in order to achieve these end results (Tsuruoka et al, 2001).

Only 76% of noninstitutionalized individuals aged 70–74 with hearing impairments have seen a hearing health-care professional about their problems, and far fewer individuals who live in nursing homes receive the audiological assessments and interventions they require (Desai et al, 2001). For example, Voeks et al (1990) conducted a study in a Wisconsin Veterans Home and found that only 16% of the 198 patients in the study were identified as having a hearing loss by a nurse or physician in spite of the fact that 54% had moderate to profound losses at high frequencies and 24% had moderate to profound losses throughout all frequencies. A similar study conducted at Starr Farm Nursing Center in Vermont indicated that at least 77% of residents had a mild hearing loss, and 51% of residents had a moderate to severe hearing loss (Garahan et al, 1992). However, nurses’ assessments...
Hearing thresholds are separated into traditional diagnostic categories and reported by percentage.

Table 1. Pure-Tone Averages Using 500, 1000, and 2000 Hz Are Reported by Ear

<table>
<thead>
<tr>
<th>Degree of Hearing Loss</th>
<th>Right Ear (n = 109)</th>
<th>Left Ear (n = 103)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Mild</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>Mild to Moderate</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Moderate</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Profound</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Hearing thresholds are separated into traditional diagnostic categories and reported by percentage.

coupled with medical records failed to identify 48% of those individuals. Patient self-assessments and audiometric data from trained professionals were proven to be better guides for providing appropriate intervention.

Problems in the identification and intervention of disorders in nursing home patients in the 1980s were not limited to the practice of audiology. In an attempt to improve the overall quality of care in nursing homes, the U.S. Congress issued the Omnibus Budget Reconciliation Act of 1987 (OBRA-87), which sets forth standards for nursing home care in order to qualify for Medicare and Medicaid reimbursement. This act mandated that a uniform instrument be developed to periodically assess nursing home residents across all domains in order to identify those needing further evaluation and intervention. OBRA-87 included the decree that all nursing home residents be provided access to comprehensive audiological services in order to maintain and promote a high level of quality of life.

In response to these mandates, the Health Care Financing Administration developed the Resident Assessment Instrument, an interdisciplinary assessment tool, which consists of a minimum data set (MDS) and resident assessment protocols. The MDS consists of a core set of items screening for a variety of healthcare disciplines including audiology. Section C of the MDS is entitled “Communication/Hearing Patterns” and contains specific questions related to hearing ability and amplification. Although these items are to be completed by “an appropriate health professional,” there is no designation of qualifications that the professional must hold because the tool serves the purpose of “screening.” Instead, the MDS must be signed by a registered nurse upon completion (Lubinski and Frattali, 1993; Achterberg, et al, 1999).

It is clear that Section C of the MDS represents within the nursing home regulatory structure the importance of screening all nursing home residents in an effort to identify those requiring more comprehensive audiological diagnostic testing. What has yet to be addressed clearly is how the professional audiologist obtains an audiological assessment that will effectively determine which residents are normal and which need medical intervention, aural rehabilitation, counseling, hearing aids, or other assistive devices. Measuring the hearing ability of nursing home residents is often a difficult task because of factors such as limited cooperation, response to conditioning, cognitive abilities, the fragile health of residents, limited equipment, and the lack of staff, including audiologists. From the data presented in this retrospective chart analysis, it is clear that the participant’s ability to be behaviorally conditioned for audiological testing had the most significant impact on the effectiveness of the assessment measures. Having only 5% (n = 16) of 307 residents be able to be conditioned in both ears for a full audiological assessment protocol indicates that the profession of audiology must elevate the importance of the audiological assessment protocol in this special population.

Audiological assessment procedures must be modified in order to identify nursing home residents who are suffering from hearing impairment (AARP, 2007). The American Academy of Audiology (Academy) recognizes the challenges associated with providing hearing screenings within nursing facilities and states that screenings should “use tools appropriate for the particular setting, and should employ professionals who are well trained to perform the screen” (1991). In addition, the Academy’s (2000) clinical practice statement for the assessment of adults notes that assessment procedures may vary based on patient needs. The American Speech-Language-Hearing Association’s (ASHA) guideline for audiology service delivery in nursing homes clearly states that “alternative test environments and protocols are the rule rather than the exception when providing audiology services in nursing homes” (1997). These guidelines state that the resident’s functional and cognitive ability should be accounted for in selecting the assessment components of the procedure.

In addition, ASHA (1997) acknowledges that nursing home residents will present with a variety of social, psychological, and physical functioning levels making a standard approach to assessment difficult to develop. The position of the organization is that no standard protocol can be prescribed for this population (ASHA, 1997). What the ASHA (1997) guidelines offer instead is a protocol that is “representative of an appropriate evaluation protocol” that includes otoscopy, 250–6000 Hz air and bone conduction, speech recognition or detection thresholds, suprathreshold word recognition testing, MCL and UCL, and functional communication assessment scale. It must be pointed out that the original audiological evaluation of all 307 nursing home residents did utilize this protocol. However, the audiological assessment procedures employed in this study, although conducted by a licensed and certified...
audiologist, were inappropriate for the population regardless of the diagnosis of dementia. Remember that only 18% of the 100 residents who were able to complete binaural AC testing had a primary or concurrent diagnosis of dementia or Alzheimer’s.

The authors would argue that the current professional guidelines related to audiological assessment in the nursing home population do not adequately address the necessity of changing protocols when a patient exhibits cognitive impairment, distractibility, noncompliance, or other interfering behaviors. This nursing home resident population is a very difficult-to-test population, and clinical audiologists need guidance in the assessment process. This is evidenced by the 38% of the 307 residents who were unable to be conditioned for any procedures that could give data about hearing thresholds. Furthermore, of the 112 patients that were able to produce AC results, only 34 were able to follow through with BC results. This suggests a variable unrelated to the ability to condition (such as fatigue) interfering with the assessment protocol. Additionally the success of the speech MCL and the SR suggests the potential in using speech assessment in the test protocol. Regardless, it is clear that 16 out of the 307 completing AC, BC, SRT, SR, and MCL cannot be considered a successful protocol.

Additionally, more guidance would help standardize the process ensuring better quality of hearing health care, including rehabilitation across all nursing homes. This is evidenced by the fact that of the patients that were able to provide data to establish a PTA (Table 1), less than 4% had a severe or profound hearing impairment. This demonstrates that if properly counseled and with proper management of hearing impairment, 109 (36%) of 307 would have a better than average chance of improving the quality of their life because the hearing impairment is treatable. This is of paramount significance if one subscribes to the belief that the geriatric population has wisdom and knowledge to share and communicate.

Using a standard audiological assessment and intervention protocol with an independent geriatric patient with a hearing impairment is difficult at best; adding the concomitant variables of dementia, dementia-related behaviors, or mobility problems only serves to exacerbate the diagnostic difficulty. In theory, every audiologist should be prepared to modify assessment procedures of any patient not conditionable for a standard audiological evaluation protocol. This does not address the special expertise of the audiologist needed in the nursing home setting. For example, since fatigue of the patient is an issue, is it necessary to complete pure-tone testing at all frequencies? Can the assessment frequency range be modified? Can bone conduction testing be substituted by tympanometry? Can it ever be appropriate to substitute a typical word recognition monosyllabic words list with easier material such as monosyllabic digits? With this population, could electrophysiology and electroacoustic procedures be more appropriate than even cognitively developmental behavioral techniques such as seen used in young children?

Guidelines for the audiological assessment of children from birth to five years of age can be used as an example of how the profession of audiology can address service needs of special populations by recommending adaption to standard assessment protocols. Specialized diagnostic guidelines help protect special populations. The nursing home resident is no exception. The development of the ASHA (2004) guidelines for the audiological assessment of children birth to five (outlined below) was based on federal law much like the development of the MDS for use in screening nursing home residents was based on OBRA-87. In fact, the Individuals with Disabilities Education Act of 1997 emphasizes that appropriate audiologic assessment by qualified professionals is essential in the provision of audiologic services for children ages birth to five even though this population is often difficult to test due to behavioral, physiologic, and/or cognitive/developmental needs and limitations.

The ASHA (2004) guidelines outline audioligc assessment procedures that may be effective in testing the difficult-to-test child, including serial evaluations, adequate case history, and behavioral assessment techniques that establish various types of simple motor responses in the presence of an auditory stimulus such as visual reinforcement audiometry (VRA) and conditioned play audiometry. In VRA children respond to the auditory signal with a head turn, which is then reinforced by an appealing visual display. In conditioned play audiometry, the child is taught to respond to the auditory signal by engaging in a simple play activity each time it is detected (ASHA, 2004).

While traditional pediatric assessment procedures may not be totally appropriate for testing the geriatric population with or without cognitive and behavioral disorders, the comparison between the two populations is relevant due to the fact that the profession of audiology has clearly recognized the need for specialized training with the pediatric, difficult-to-test population. The authors envision elevating the importance of the needs of the difficult-to-test nursing home resident in the same manner. The authors also envision the development of age-appropriate, population-appropriate, modified versions of pediatric procedures to assist audiologists in conditioning nursing home residents who are difficult to test.

Although it may be difficult to develop a standard protocol appropriate for every nursing home patient who displays dementia or dementia-related behaviors, modifications of general procedures already estab-
lished by AAA and ASHA for other difficult-to-test populations could be applied to establish more effective audiological assessment procedures for nursing home residents. When developing these modified assessments, the practicality of the specialized nature of audiometric equipment along with the limitations of the nursing home environment must be considered. It will be useful to collaborate with our colleagues in the field of geriatrics and mental health who are working to identify activities that are appropriate for behavioral intervention for this population (Meeks et al, 2007; Meeks et al, 2008). Additionally, as rapidly as new technology is being developed, researchers should not be encumbered by the lack of technical solutions but, rather, begin to dream about technology solutions that have not been invented yet.

As the field of audiology seeks to serve a growing number of patients in nursing homes, it is critical and timely to identify the best assessment and remediation procedures for this population. This study served as an introduction to the problem of using traditional behavioral testing for hearing assessment. Additional studies need to be conducted on the reliability and validity of modified behavioral testing much like we use with normal and difficult-to-test children, as well as the feasibility of the role and use of objective electrophysiology testing. Additionally, researchers must begin to work on practical, reliable methods of intervention for older adults diagnosed with hearing impairment independent of behaviors that could be classified as difficult to manage. Finally, the authors see it as imperative that the profession of audiology, through the Academy and ASHA, develops more evidence-based, discipline-specific policies and procedures in order to foster greater confidence in the diagnosis and management of nursing home residents (ASHA, 2004) as well as to improve the quality of audiological care provided by promoting standardized practice across audiologists (Academy, 2006).

REFERENCES


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**Appendix 1. Thirty-Three Item Coding Form**

Last name: ____________ First two letters of first name: ____________

Date of birth: _______

1. Was testing aborted based on case history?
   - Yes
   - No
   - Unsure

2. Was the patient compliant during testing?
   - Yes
   - No
   - Unsure

3. Could the patient be conditioned for any type of behavioral testing?
   - Yes
   - No
   - Unsure

4. Was the patient’s speech intelligible to the tester?
   - Yes
   - No
   - Unsure

5. Was the patient’s speech appropriate for the topic at hand?
   - Yes
   - No
   - Unsure

6. Was the patient easily distractible?
   - Yes
   - No
   - Unsure

7. Did the patient produce spontaneous speech?
   - Yes
   - No
   - Unsure

8. Was the patient reported to use spontaneous speech?
   - Yes
   - No
   - Unsure

9. Was the patient
   - Alert
   - Semi-alert
   - Not alert

   Reaction changes to the following stimuli:

10. Auditory:
    - Calming
    - Agitating
    - No noted difference

11. Tactile
    - Calming
    - Agitating
    - No noted difference

12. Visual
    - Calming
    - Agitating
    - No noted difference

13. Did the patient exhibit any unusual behavior that interfered with testing?
    - No
    - Yes
    - If yes, explain: ________________________________

14. Did the patient tolerate headphones?
    - Yes
    - No
    - Unsure

Please give information for the following tests (items 15–21):

15. Pure-tone air conduction:
    - Attempted
    - Successful one ear
    - Successful both ears
    - No data
    Right ear: _____ db
    Left ear: _____ db
16. Sound localization

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

17. Bone conduction

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

18. Speech reception threshold

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

19. Speech recognition

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

20. Most comfortable level

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

21. Uncomfortable level

- Attempted
- Successful one ear
- Successful both ears
- No data

Right ear: _____ db
Left ear: _____ db

22. On the items marked “no data” on the previous question, why was there no data?

- Patient could not be conditioned
- Patient was uncooperative
- Patient refused
- Audiology decided
- Poor environmental testing conditions
- Other: _______________________________________

23. Hearing level in right ear

- Normal
- Mild
- Moderate
- Severe
- Profound
- Could not be determined

24. Hearing level in right ear

- Normal
- Mild
- Moderate
- Severe
- Profound
- Could not be determined

25. Was speech discrimination consistent with hearing loss?

- Yes
- No
- Unsure

26. The volume setting of the audiotape was recommended to be __

27. Was there enough data to make a recommendation on inclusion in the study?

- Yes
- No

28. Was the patient recommended to be included in the study?

- Yes
- No

29. The inclusion impression is based on:

- Audiometric testing
- Behavioral observation report of audiologist
- Audiotape fitting attempt
- Responses at MCL
- Behavioral report of staff/family/other

30. Was there audiological contraindication for inclusion in the right ear?

- Yes
- No

31. Was there audiological contraindication for inclusion in the left ear?

- Yes
- No

32. Was there behavioral contraindication for inclusion in the study?

- Yes
- No

33. Rated candidacy in the study:

- Excellent
- Good
- Fair/Adequate
- Guarded
- Poor