JAAA 1:23-30 (1990)

Decision Making in Rehabilitative Audiology

Patricia A. McCarthy *
Allen A. Montgomery †
H. Gustav Mueller ‡

Abstract

With the emphasis on quality assurance and patient satisfaction in health care, decision making in rehabilitative audiology is a critical issue. Traditionally, rehabilitative decisions have been based on questionable assessment procedures and unproven treatment methods. In this paper, current strategies for decision making with hearing-impaired adults will be presented. Discussion will focus on nonacoustic factors influencing hearing aid fitting, the decision processes necessary for management of the hearing-impaired adult, and expanded uses of self-assessment inventories of hearing handicap.

Key Words: Decision making, quality assurance, rehabilitation, hearing disorders, hearing aids, self-assessment inventories

One of the axioms of modern decision making is that your decision can be no better than the information used in the decision process. Regardless of whether you are deciding if a blip on a radar screen is an enemy missile or if a patient can benefit from group counseling, the decision can only be correct if the information on which it is based is accurate and appropriate. Nowhere is this more true than in clinical decision making, whether in an educational, medical, or rehabilitative setting.

Decision making in rehabilitative audiology has become a critical issue in the 1980s in large part due to the emphasis on quality assurance in health care. Unfortunately, decision making in the rehabilitation of hearing-impaired adults traditionally has been based on questionable assessment procedures and unproven treatment methods. This paper examines issues involved in decision making with hearing-impaired adults and presents strategies for improved patient management. Discussion will focus on nonacoustic factors influencing hearing aid fitting, the decision processes necessary for management of the hearing-impaired adult, and expanded uses of self-assessment inventories.

*Department of Communication Sciences and Disorders, University of Georgia, Athens, Georgia
†Department of Communicative Disorders, University of South Carolina, Columbia, South Carolina
‡Division of Audiology and Speech — Language Pathology, Letterman Army Medical Center, San Francisco, California
Reprint requests: Patricia A. McCarthy, Department of Communication Sciences and Disorders, 565 Aderhold Hall, Athens, GA 30602

NONACOUSTIC FACTORS IN HEARING AID FITTINGS

Adult aural rehabilitation varies considerably from clinic to clinic in its intended purpose, composition, and duration. Due in large part to the nature of the clinical setting and the philosophy of the audiology provider, current aural rehabilitation programs for new hearing aid users may range from an abbreviated 30 minute hearing aid fitting to a 5-day intensive residency program. Regardless of individual philosophy or work environment, however, most audiologists are in general agreement with the following three goals of aural rehabilitation outlined by Montgomery and Sylvester (1984): (1) to maximize the reception of speech through the auditory and visual channels, (2) to reduce the psychological barriers to communication, and (3) to impart practical information about communication, hearing aids, and related topics.

There is little question that for most patients the accomplishment of the above goals requires a great deal of time—often more time than can be committed by the audiologist or the patient. A component of the first goal, which perhaps requires the least time yet easily could be the most significant event of the entire rehabilitation process, is the fitting of hearing aids.

When fitting hearing aids, the goal of "maximizing speech reception" usually is thought of in the context of obtaining desired gain at selected frequencies throughout the speech spectrum. In this section, however, we will focus on a more rudimentary form of maximizing speech reception—the important and sometimes overlooked task of encouraging hearing aid use.

Motivation To Obtain Hearing Aids

The decision to purchase hearing aids usually is influenced by several factors. While difficulty understanding speech, especially in noisy listening environments, is perhaps the leading reason for seeking amplification, other influences are frequently reported. For example, it is not uncommon for patients to state that they are obtaining hearing aids simply because of encouragement from their spouse. The advice and direction from an audiologist or a physician also can serve as the dominant motivating factor. Does the motivating factor for obtaining hearing aids relate to subsequent use and benefit? Research on this topic is inconclusive (see Brooks [1989] for review), although it is common for audiologists and physicians to defer a recommendation for hearing aid purchase for a patient who is not self-motivated.

We recently surveyed 300 males at the time of their hearing aid fitting to determine what factors influenced their decision to obtain hearing aids (Mueller and Bender, 1987). A year after the fitting, these individuals were again surveyed to determine their use of and benefit from the hearing aids. The second survey was returned by 208 subjects, and the distribution of the three major influencing factors for these individuals is shown in Table 1. Communication problems (self-motivation) were reported by 65 percent of the respondents, followed by encouragement from spouse (54 percent) and direction from a medical professional (usually an audiologist) (44 percent). As illustrated in Table 1, several subjects reported a strong influence from more than one factor, while the 28 subjects (13 percent) in Group H did not cite any one of the three top factors.

The discussion of the use and benefit ratings will be limited to three of the groups; the three that reported a strong influence from only one of the three major factors (Groups D, F, and G). As displayed in Figure 1, 72 percent of the subjects in Group D report using their hearing aids more than 60 percent of the average day, a total that is substantially higher than the other two groups (and, in fact, higher than any of the groups listed in Table 1). It cannot be overlooked, however, that 30 to 40 percent of the subjects in Groups F and G (reportedly not self-motivated patients) stated they used their hearing aids over 60 percent per average day.

The distribution of the patients who reported the hearing aids to be "very beneficial" shows Group F falling below Groups D and G (see Fig. 1). The mean group benefit ratings for Groups D and G also were very similar to each other and both ranked near the top of the eight groups shown in Table 1. It is tempting to conclude that audiologists are quite skillful in selecting who will benefit from amplification (Group G), but unfortunately, potential confounding variables make this conclusion tenuous.

Table 1 Distribution for the Three Most Common Reasons for Obtaining Hearing Aids

Group	N	Communication Problems	Encouragement From Spouse	Direction From Professional
A	43	X	X	X
B	39	X	X	
C	25	X		X
D	29	X		
E	11		X	X
F	20		X	
G	13			X
H	28			

Factors marked with "X" represent "strong influence" ratings. Subjects were allowed to list more than one factor as strong influence or no factor as strong influence.

The major point of the presentation of these data is to illustrate that self-motivation is not a prerequisite when evaluating hearing aid candidacy. A firm recommendation for hearing aid purchase by the audiologist may indeed serve to be the sole motivating factor responsible for a successful hearing aid fitting.

Binaural Hearing Aid Fittings

A second area related to the topic of maximizing the reception of speech is the use of binaural hearing aids. While few audiologists

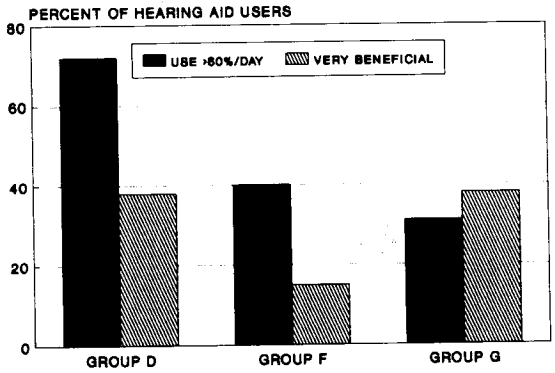

Figure 1 Percentage of respondents reporting greater than 60 percent average hearing aid use per day, and the percentage of respondents rating the hearing aid as "very beneficial" for three selected groups (see Table 1 for group description).

would dispute the advantages offered by binaural amplification, surveys continue to show that the majority of the hearing impaired are fitted monaurally (Cranmer, 1989). The cost of the second hearing aid would seem to be the most probable explanation for this discrepancy between acoustic logic and clinical practice; however, this reasoning may be somewhat shortsighted. For example, in 1986 we surveyed 282 patients with bilateral hearing loss who were being fitted with hearing aids for the first time (Mueller, 1986). The patients were asked if they wished to be fitted with one or two hearing aids. The hearing aids were provided free of charge, therefore cost was not an issue. More than one-half (57 percent) of the patients requested a monaural fitting. We were especially interested in the fact that 49 percent of the patients requesting only one hearing aid stated that the advice from a medical professional influenced this decision.

In an attempt to systematically evaluate the possible effects of patient motivation and professional counseling on the use of and benefit from binaural hearing aids we divided a series of consecutive patients into four groups (see Table 2) (Mueller and Reeder, 1987). The groups differed as to whether they requested two (Groups 1 and 2) or one (Groups 3 and 4) hearing aid(s), and whether they received pro-binaural (Groups 1 and 3) or you-decide-what's-best (Groups 2 and 4) counseling. All patients were fitted binaurally and their use and benefit ratings were obtained 8 to 12 months after the hearing aid fitting.

Two findings from this study are illustrated in Figure 2. The daily use of two hearing aids clearly was the greatest for Group 1, and the difference in daily binaural use between Groups 1 and 2 could be attributed to the type of counseling employed (the groups were very similar audiometrically and in age). As shown, benefit ratings were similar for all groups (mean benefit ratings ranked the groups in the same order as the very beneficial percentages shown in Figure 2).

The data in Figure 2 suggest that the counseling employed at the time of the hearing aid fitting may have some effect on the use of binaural hearing aids. A second observation is that patients who originally only desired a monaural fitting seem to derive similar benefit from binaural as those patients who entered the fitting process requesting two hearing aids.

Hearing Aid Style

A final area that has a significant effect on the goal of increased hearing aid use is the style of hearing aid that is fitted. The in-the-ear (ITE) style clearly is the most popular, and this model accounts for nearly 80 percent of all hearing aid sales in the U.S. There are several audiologists, however, who continue to favor the behind-the-ear (BTE) style. This seems to be especially true for clinics that refer their patients out for hearing aid purchase rather than dispense directly. There is little question that for some types of fittings, the BTE is clearly superior (e.g., a patient requiring direct audio input or a high gain T-coil). But what about a more routine fitting when the electroacoustic performance of the two instruments is quite similar? We recently randomly separated patients who reported to our clinic for hearing aid fittings into two groups (Calkins and Mueller, 1989). One group was fitted with BTEs, the other group with ITEs. All patients were fitted binaurally using the NAL prescriptive gain as target values. The patients were informed that they were receiving the best hearing aids that were commercially available. Six months after the fitting the patients were surveyed and asked 10 questions about the "other style" of hearing aid (the style they did not receive).

The results to all 10 questions heavily favored the ITE style. While ITE users tended to believe that they had the best hearing aid available, BTE users did not. In fact, many BTE

Table 2 Summary of Selected Patient Characteristics, Types of Counseling Employed, and Requests for Two Hearing Aids

Group	*N*	*Mean Age*	*PTA1 (dB)*	*PTA2 (dB)*	*"Pro-Binaural" Counseling*	*"You-Decide-What's-Best" Counseling*	*Requested Two Aids*
1	21	69	31	46	X		X
2	25	68	32	47		X	X
3	31	69	27	42	X		
4	23	67	26	44		X	

PTA1 = 500, 1000, and 2000 Hz; PTA2 = 1000, 2000, and 4000 Hz

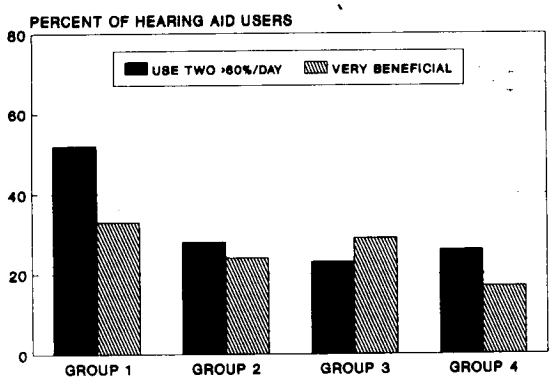

Figure 2 Percentage of respondents reporting to use two hearing aids more than 60 percent per average day, and the percentage of respondents rating the hearing aids as "very beneficial."

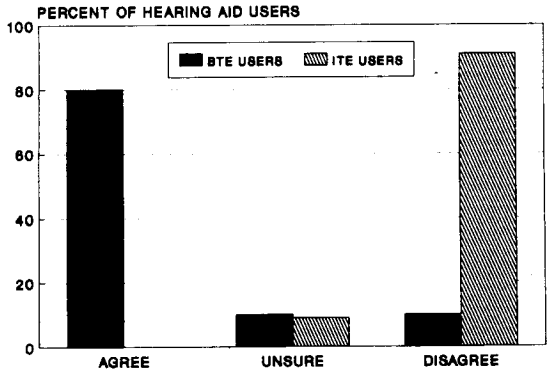

Figure 3 Distribution of responses from BTE (n=52) and ITE (n=43) hearing aid users to the statement "I would use my hearing aids more if I had been fitted with the other style."

users agreed with the statement that the ITE had better electronics and that they would understand speech better with that instrument. Figure 3 illustrates one of the more dramatic differences observed between the opinions of the ITE and BTE users. Note that 80 percent of the BTE users stated that they would use their hearing aids more if they were fitted with the other style. In contrast, not one of the ITE users (n=43) agreed with this statement. These findings suggest that when equal electroacoustic performance can be obtained between the two styles, the rehabilitation process will often be enhanced if the patient is fitted with ITE hearing aids.

In summary, this section has addressed three factors that deserve consideration during the hearing aid selection and fitting process. While increased hearing aid use does not always pave the way to successful aural rehabilitation, overlooking this important component will almost surely make the other goals of the rehabilitation process more difficult.

DECISION MAKING IN PATIENT MANAGEMENT

In this section we discuss some of the decision processes necessary for the management of the adult hearing-impaired client, focusing primarily on the quality of the information available for sensory (speech recognition) evaluation.

Management is typically conducted using one of two or three models of the treatment process. The medical model assumes that one or more specific problems are present and diagnoseable in an individual and that each problem has a specific treatment associated with it. Hearing aid fitting procedures follow the medical model quite closely. The opposite extreme is represented in psychotherapy for middle-class adults with mild neurotic problems, where the form of treatment often depends on the specific therapist rather than on the nature of the problem. The educational model, where goals common to a group are pursued via individualized plans, represents a middle ground. Regardless of which model we operate under, however, the clinical decisions we make based on evaluation of our clients are vital to the management of the client and to our professional conduct in general.

The primary goal in clinical decision making is to determine the best management plan for the client. This requires gathering information on the client's status or level of functioning in several areas, including (1) the remaining sensory capabilities (as involved in recognizing speech) and the ability to benefit from a hearing aid, (2) the personality and behavioral characteristics, as assessed by one of the very useful new inventories, (3) the general intellectual and physical capacity for rehabilitative work, and (4) the social and environmental conditions in the individual's daily routines. An examination of the major texts in adult aural rehabilitation reveals that the primary emphasis is on just such an evaluation. (The emphasis unfortunately is sometimes to the virtual exclusion of treatment techniques. A recent exception to this trend is an excellent book by Erber [1988], which is devoted almost totally to rehabilitation techniques for the adult.)

Having presented a brief view of management decision making, however, we will focus on evaluation of speech recognition ability as one important component of the process and point out some of the weaknesses in the traditional

approach. Later we describe some newer methods that attempt to avoid the difficulties inherent in traditional methods of assessing speech recognition ability.

In a recent review we presented a rather negative picture of speechreading assessment (Montgomery and Demorest, 1988). Traditional film and videotape tests were generally seen as lacking verification of important psychometric properties, as using materials of questionable validity and rationale, as being difficult to score, and as being of low generalizability because of large and unknown differences in the visual intelligibility of the talkers. Many of these weaknesses arise from deriving percent correct scores from lists of simple speech stimuli. The measurement of improvement was singled out as being especially vulnerable psychometrically and difficult to do even if real improvement had occurred in a client or group of clients.

It can be argued that unisensory, isolated speechreading assessment and training is a relatively unimportant aspect of the overall aural rehabilitation process. However, almost all the reasons why speechreading is difficult to measure are applicable in general to the assessment of speech understanding in other sensory systems and modes as well. These include impaired audition (traditional speech audiometry), bisensory reception (vision + impaired audition, tactile + impaired audition, vision + cochlear-implant audition), cued speech, and Tadoma method. Thus the clinical decision process involving any form of speech recognition by the client is flawed to some (unknown) extent and accurate measurement of progress is difficult.

In the past some approaches to speech testing have been proposed that are not based on counting correct responses (Speaks et al, 1972; Cox and McDaniel, 1984). In each of these the subject listens to connected discourse in noise and is asked to estimate the percent intelligibility of the speech at a particular signal-to-noise ratio (S/N).

Recently, Hawkins and his colleagues (1988) adapted this technique to measuring the contribution of speechreading to audio-visual speech recognition. A range of S/Ns was employed, which allowed the generation of a performance-intensity (P-I) function. The procedure was simple and seemed to be stable provided that the points on the P-I function were based on means of several repetitions at each S/N. P-I functions were obtained auditorily and also audiovisually using a videotape of a talker producing continuous discourse. The difference between the P-I functions at selected intelligibility levels (50 percent for example) reflects the contribution due to the opportunity for speechreading in the A-V condition. A typical result might be a 4 dB contribution for an average speechreader and 10 dB for a good speechreader. That is, the good speechreader could tolerate 10 dB more noise when viewing *and* hearing the talker and still achieve the same self-estimated percent perceived intelligibility.

The procedure was intended to be representative of real listening situations in that the testing was done in a moderate-sized reverberant room (RT = 0.5 s) with multi-talker babble arising from three loudspeakers (90, 180, and 270 degrees) and the speech from a zero-azimuth loudspeaker over the TV monitor. It provides freedom from some (but not all!) of the psychometric weaknesses associated with percent correct scoring of single words and key words. In addition the unit of measurement is dB S/N, which may be a more tractable and "natural" measure of communication ability (Plomp, 1978). Finally, the testing environment lends itself readily to communication training as well as assessment.

The intelligibility estimation procedure described above is far from being a refined measurement technique. It is presented simply as an example of a nontraditional approach to obtaining useful information about our clients' speech processing capabilities. Many other such methods exist, including De Filippo's tracking procedure (1988) and Bernstein's minimal path length method for scoring sentence material (1989). We look forward to the development of these and other new approaches to providing information for the aural rehabilitation management decision process.

CLINICAL APPLICATIONS OF SELF-ASSESSMENT INVENTORIES

Over 10 years ago, Ross and Giolas (1978) stressed the need to ". . . see beyond the audiogram and realize that our concern with the 'locus of the lesions' also lies in how it manifests itself in a communicative disorder and not just a medical disorder of the auditory pathway." One way that audiologists have developed to "see beyond the audiogram" is in the use of hearing handicap self-assessment inventories. The purpose of these inventories has been to describe the handicapping effects of a hearing loss on the individual and to develop a rehabilitative plan based on this information. Because the audio-

gram offers so little information about the individual's communicative strengths and weaknesses, self-assessment inventories would appear to be an ideal and necessary part of every diagnostic evaluation. However, reality suggests that the audiologists routinely utilizing self-assessment inventories are in the minority.

So why have audiologists not embraced these tools as a necessary part of the diagnostic battery? A number of reasons seem plausible. First, audiologists may find the number of inventories available to be overwhelming. As such, the process of experimenting with the various inventories may be too large a task to undertake. Second, in looking for the ideal inventory to use at his or her facility, the audiologist may be frustrated to find there is no one perfect inventory for his or her clinical population. Third, many audiologists consider themselves primarily involved in diagnosis. Consequently, they may not recognize that a handicap assessment inventory can augment the diagnosis and aid in developing a rehabilitative plan. As such, an assessment inventory can be much more of a diagnostic tool than rehabilitative. Finally, some audiologists may feel they do not know what to do with the information obtained from these inventories. This stems from an inability to translate this information into a rehabilitation plan.

For these reasons and others, self-assessment inventories are underutilized in audiology. The purpose of this discussion is to present some uses of hearing handicap inventories that might enhance their clinical utility. Three applications for use of self-assessments inventories will be presented including use in counseling, in measuring hearing aid benefit, and in quality assurance programs. (The purpose of this section is not to recommend one scale or to review the unique aspects of each scale. Refer to Giolas [1983] and Weinstein [1984] for comprehensive reviews of available inventories.)

Counseling

The primary goal of counseling hearing-impaired adults is to emphasize the development of options in dealing with communication problems. However, any discussion of "options" must be realistic in terms of the person's total life situation. As such, inclusion of family members in counseling as well as the entire rehabilitation process is both logical and widely advocated.

The literature provides examples of at least three hearing handicap scales that can be used to provide a basis for counseling. Newman and Weinstein (1986) utilized the Hearing Handicap Inventory for the Elderly (HHIE) and a modification of the HHIE for spouses to evaluate differences in perception of hearing handicap in elderly married couples. They found the emotional and social effects of hearing loss as perceived by hearing-impaired men were generally underrated by the spouses. McCarthy and Alpiner (1983) similarly found an overall low level of agreement between subjects and family members on the psychological, social, and vocational sections of the M-A scale. Schow and Nerbonne (1977) developed the Nursing Home Hearing Handicap Index to obtain input from hearing-impaired nursing home residents and staff. They also observed a discrepancy in ratings. Staff members' rating of hearing handicap correlated much better with pure-tone average than did residents' self-perceptions of hearing handicap.

Each of these studies suggest that the people surrounding the hearing-impaired adult may have very different perceptions of the handicapping effects of the hearing loss. Whether these disparities in perception are due to a lack of information or a lack of insight into the nature of the problem, they can impede the rehabilitation process. As such, assessing the attitudes and perceptions of a family member can improve the chances for successful auditory rehabilitation. Use of an inventory that allows assessment of the family remains the ideal tool for obtaining this important information.

Hearing Aid Benefit

Since one purpose of hearing aid fitting is to reduce the perceived handicap resulting from the hearing loss, self-assessment inventories can be useful instruments for measuring hearing aid benefit. Two approaches to this end have emerged in the literature.

The first approach involves the use of already existing inventories to measure hearing aid benefit through pre- and post-HAE administrations. Dempsey (1986) used the Hearing Performance Inventory (Giolas et al, 1979) to investigate reduction in hearing handicap as a result of amplification. After 6 weeks, hearing aid wearers demonstrated a significant decrease in hearing handicap for the Understanding Speech and Intensity subsections of the HPI. Similar results using the HPI were obtained by Demorest and Walden (1985) after only 1 week of hearing aid experience. Tannahill (1979) found significant improvement in scores on the Hearing Handicap Scale (High et al, 1964) following

4 weeks of hearing aid use. Newman and Weinstein (1988) found a significant reduction in the emotional and social effects of hearing loss using the HHIE after 1 year of hearing aid use. Interestingly, the reduction of handicap for spouses in this study was less than for the hearing aid wearer. Finally, Malinoff and Weinstein (in press) report a significant reduction in handicap as measured by the HHIE after only 3 weeks of hearing aid use.

A second approach to assessing benefit derived from amplification has involved development of new questionnaires. Walden et al (1984) designed the Hearing Aid Performance Inventory, which is a 64-item questionnaire assessing benefit from amplification in a variety of situations. Hearing aid users respond: Very Helpful, Helpful, Very Little Help, or Hinders Performance. Lazenby et al (1986) have described a series of questionnaires used at the Bill Wilkerson Clinic with one specifically designed to assess hearing aid benefit in elderly patients. Patients in their study reported success with hearing aids in both quiet and noisy conditions and the majority indicated that the hearing aids were worth their financial investment.

Regardless of the inventory used, self-assessment tools appear to be a promising method of measuring hearing aid success. Because hearing aid fitting is the cornerstone of aural rehabilitation, it is important that success with amplification be measured and documented. At present, self-assessment tools appear to be the ideal format for obtaining this information.

Quality Assurance

Everyone involved in health care is aware of the current emphasis on developing ways to measure the quality of health-care services. In the 1980s, there has been a shift toward innovative and more meaningful quality assessments. As such, hearing assessment inventories may be effective tools for measuring quality of treatment. A discussion of use of these scales in quality assurance programs follows.

Traditionally, quality assurance reviews have consisted of retrospective chart audits. The purpose of these audits is to identify patterns of patient treatment so improvements can be made for future patients (Cornett and Chabon, 1988). Recently, concurrent and prospective reviews have been utilized to measure quality of treatment.

Concurrent reviews are conducted during patient treatment and are often used to determine the need for continued stays in treatment or the appropriateness of treatment as it occurs (Cornett and Chabon, 1988). Self-assessment inventories by their nature are concurrent tools. As such, the data from a self-assessment inventory can provide an ongoing assessment of treatment efficacy and data for making discharge decisions.

Prospective reviews use established admission criteria to determine need for admission to treatment (Arnold and Leonard, 1987). In order to use self-assessment inventories for a prospective quality review, criteria for admission to the rehabilitation process would have to be established. One method for establishing these criteria would be the use of data from previously administered assessment inventories. Upon establishment of these criteria, a patient would be referred for treatment only if the measured handicap met established criteria for hearing handicaps. Clearly, there are other variables to be considered, but this represents a novel approach to establishing admission as well as dismissal criteria.

Assessment of patient outcome is another major focus in quality assessment programs. Donabedian (1969) defines outcome as "the final evidence of whether care has been good, bad or indifferent." The patient record has been the traditional source for measuring whether patient care has been positive. However, Cornett and Chabon (1988) report that surveys, questionnaires, interviews, and direct observations are being used currently as alternative measures of patient outcome. Therefore, hearing handicap inventories represent potentially effective outcome measurement tools. By routinely administering assessment inventories on a prerehabilitation and postrehabilitation basis, data can be collected regarding the patient's adjustment to his or her hearing impairment. Clearly, a reduction in measured hearing handicap would suggest a positive patient outcome as a result of treatment. By administering these inventories on a routine basis, quality assurance can be part of a clinical service program rather than an additional, time-consuming, administrative nuisance.

These ideas for utilizing self-assessment inventories in quality assurance programs are only representative of myriad possibilities. As quality assurance demands increase through JCAHO and other credentialing bodies, self-assessment inventories may become increasingly valuable tools.

SUMMARY

In summary, three aspects of the aural rehabilitation process were examined in the context of clinical decision making. First, factors beyond electroacoustic characteristics and hearing loss that influence hearing aid fitting decisions were presented. Second, the problems inherent in assessing speech recognition ability for clinical decision making were examined. Finally, hearing handicap inventories were presented as tools that can potentially provide valuable information for rehabilitative decision making.

The importance of decision making in rehabilitation of the hearing-impaired adult can not be overemphasized. This paper has attempted to highlight problems in the decision process as well as present strategies for more effective decision making.

Acknowledgment. Presented at the first annual convention of the American Academy of Audiology, Kiawah Island SC, April 22, 1989

REFERENCES

Arnold W, Leonard M. (1987). HMOs and PPOs: an operational guide. *Top Health Care Financ* 13:19-31.

Bernstein LE. (1989). Speechreading sentences I: development of a sequence comparitor. *J Acoust Soc Am* 85(Suppl)1:s59.

Brooks D. (1989). Attitude factors and hearing aid orientation. In: Brooks D, ed. *Adult aural rehabilitation.* London: Champman and Hall, 68-84.

Calkins A, Mueller H. (1989). BTE vs ITE: do experienced users want to change style? *ASHA* 30:193 (Abstract).

Cornett B, Chabon S. (1988). *The clinical practice of speech-language pathology.* Columbus, Ohio: Merrill Publishing, 171-196.

Cox R, McDaniel M. (1984). Intelligibility rating of continuous discourse: application to hearing aid selection. *J Acoust Soc Am* 76:758-766.

Cranmer K. (1989). Hearing instrument dispensing-1989. *Hear Instruments* 40:6-15.

De Filippo CL. (1988). Tracking for speechreading training. *Volta Rev* 90:215-240.

Demorest M, Walden B. (1985). Psychometric principles in the selection, interpretation, and evaluation of communication self-assessment inventories. *J Speech Hear Disord* 49:226-240.

Dempsey JJ. (1986). The hearing performance inventory as a tool in fitting hearing aids. *J Acad Rehab Aud* 19:116-125.

Donabedian A. (1969). A guide to medical care administration II: medical care appraisal-quality and utilization. Washington, DC: *Am Pub Health Assoc* 2.

Erber NP. (1988). *Communication therapy for hearing-impaired adults.* Abbotsford, Australia: Clavis Publishing.

Giolas T. (1983). The self-assessment approach in audiology: state of the art. *Audiology* 8:157-171.

Giolas T, Owens E, Lambs H, Schubert E. (1979). Hearing performance inventory. *J Speech Hear Disord* 44:169-195.

Hawkins DB, Montgomery AA, Mueller HG, Sedge RK. (1988). Assessment of speech intelligibility by hearing-impaired listeners. In: Berglund B, Berglund U, Karlsson J, Lindvall T, eds. *Noise as a public noise source.* Vol. 2. Stockholm: Swedish Council for Building Research, 241-246.

High WS, Fairbanks G, Glorig A. (1964). Scale of self-assessment of hearing handicap. *J Speech Hear Disord* 29:215-230.

Lazenby B, Logan S, Alhstrom J, Bess F. (1986) Self-assessment questionnaire for the elderly: hearing aid dispensary use. *Hear J* 39:18-21.

Malinoff R, Weinstein B. Measurement of hearing aid benefit in the elderly. *Ear Hear* (in press).

McCarthy P, Alpiner J. (1983). An assessment scale of hearing handicap for use in family counseling. *J Acad Rehab Aud* 16:256-270.

Montgomery AA, Demorest ME. (1988). Issues and developments in the evaluation of speechreading. *Volta Rev* 90:193-214.

Montgomery A, Sylvester S. (1984). Streamlining the aural rehabilitation process. *Hear Instruments* 35:46-48.

Mueller H. (1986). Binaural amplification: attitudinal factors. *Hear J* 39:7-10.

Mueller H, Bender D. (1987). Reasons for obtaining hearing aids: do they relate to subsequent benefit? *Corti's Organ* (Abstract):11.

Mueller H, Reeder P. (1987). Success with binaural amplification: two important contributing factors. *ASHA* 29:161 (Abstract).

Newman C, Weinstein B. (1986). Judgements of perceived hearing handicap by hearing impaired elderly men and their spouses. *J Acad Rehab Aud* 19:109-115.

Newman C, Weinstein B. (1988). The hearing handicap inventory for the elderly as a measure of hearing aid benefit. *Ear Hear* 9:81-85.

Plomp R. (1978). Auditory handicap of hearing impairment and the limited benefit of hearing aids. *J Acoust Soc Am* 63:533-549.

Ross M, Giolas T. (1978). *Auditory management of hearing-impaired children.* Baltimore: University Park Press, 33.

Schow R, Nerbonne M. (1977). Assessment of hearing handicap by nursing home residents and staff. *J Acad Rehab Aud* 10:2-12.

Speaks C, Parker B, Harris B, Kuhl P. (1972). Intelligibility of connected discourse. *J Speech Hear Res* 15:590-602.

Tannahill C. (1979). The hearing handicap scale as a measure of hearing aid benefit. *J Speech Hear Disord* 44:91-99.

Walden B, Demorest M, Hepler E. (1984). Self-report approach to assessing benefit derived from amplification. *J Speech Hear Res* 27:49-56.

Weinstein B. (1984). A review of hearing handicap scales. *Audiology* 9:91-109.