Trends In Amplification

VOLUME 9, NUMBER 3, 2005

Health-Related Quality of Life and Hearing Aids: A Tutorial

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Health-related quality-of-life (HRQoL) instruments measure the impact of a disorder and treatment on several attributes that are thought to constitute the self-perceived health status of an individual. This tutorial reviews the conceptual framework of HRQoL, including the challenges associated with defining and measuring HRQoL, specifically as it applies to audiologic care. A relatively new instrument, the World Health Organization-Disability Assessment Schedule II, will be discussed as a potentially valuable instrument to measure the impact of hearing loss and hearing aid intervention on self-perceived HRQoL.

Introduction

It could be argued that in the developed world at least, the driving force behind the decisions most individuals make is the achievement of an improved quality of life. Whether it is the college we attend, the career we choose, the partner we seek, the home we purchase, or the schools we send our children to, we are making choices that we believe will improve our lives. For much of the undeveloped world, however, quality of life has a more fundamental meaning and is often associated with such basic needs as freedom from hunger and from political or religious oppression. Regardless of where we live on this planet or our socioeconomic status, our lives are often impacted by injury or disease.

When we describe the influence of health-related events on the quality of our lives, we are referring to health-related quality of life (HRQoL). The measurement of a disease or its treatment on HRQoL has taken on increased importance among health-care researchers and decision makers. Society is recognizing the importance of look-

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The Rehabilitation Research and Development Service, Department of Veterans Affairs supported this work through a Merit Review (C2439) (H. B. A) and a Research Career Development Award (R. M.)

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ing beyond the specific disorder to the impacts that disorder has on the whole person and, by extension, on the community itself.

HRQoL as a concept is relatively new and is especially so within the profession of audiology. This paper presents the issues associated with defining and measuring HRQoL and how it relates to the impact and treatment of hearing loss, with emphasis on adults with acquired losses and treatment through hearing aids.

A word about terminology: In the literature, various terms are used to refer to the concept and measurement of HRQoL. These terms include HRQoL, quality of life, subjective well-being, health state, health status, and quality of well-being. For the purposes of this paper, these terms will be considered interchangeable.

Defining HRQoL

Most of us have an intuitive sense of what constitutes HRQoL. However, to develop appropriate instruments and meaningfully interpret the results of these instruments, it is important that academicians, researchers, and health-care policy experts agree on a definition. According to the World Health Organization (WHO), “health” is a state of compete physical, mental, and social well-being and not just the absence of a disease or infirmity (WHO, 1948).

Quality of life is more problematic in terms of a definition because there is no world body, such as the WHO, to provide guidance. Although there may not be universal agreement as to a definition, there does appear to be some common understanding of the dimensions or domains that constitute the overall concept of quality of life. Spilker (1996), for example, identifies five major domains generally referred to by most researchers in this area. They include:

1. Physical status and functional abilities
2. Psychologic status and well-being
3. Social interactions
4. Economic and/or vocational status and factors
5. Religious and/or spiritual status

The National Institutes of Health (NIH) recognize that the general term *quality of life* encompasses “cultural, psychological, interpersonal, spiritual, financial, political, temporal, and philosophical domains” (NIH, 1993). Although not all of these dimensions may be affected by disease, many influence how an individual may cope with the disease and respond to treatment.

The constellation of domains identified by Spilker and the NIH constitute what some refer to as “quality of well-being” or “subjective well-being”. There is some disagreement about whether subjective well-being and quality of life reference the same construct. Kaplan *et al.* (1989) for example, argues that quality of life should consider physical symptoms only, whereas Croog *et al.* (1986) posit that an individual’s subjective well-being be combined with physical symptoms, emotional state, work performance, and sexual function, among others, to make up that person’s quality of life. To make matters even worse, when we attempt to define *HRQoL*, we combine a universally agreed upon definition (“health”) with one with considerable disagreement (“quality of life”). Croog (1993), for example, proposes a relatively broad definition of HRQoL:

> Health-related quality of life can be viewed as the totality of characteristics of the way of life of an individual or group with particular reference to (1) the areas of physical health, emotional health, cognitive function, social role performance, well-being, and/or life satisfaction and (2) the objective conditions of existence, including living conditions and environmental stressors.

A more simplified definition of HRQoL is articulated by Revicki (1989), who defines HRQoL as a multidimensional concept that encompasses the physical, emotional, and social components associated with an illness or treatment. Exactly which dimensions constitute this “multidimensional concept” is still a matter of disagreement (O’Connor, 1993). A definition that takes into account *quantity* of life as well as *quality* is described by Patrick (1993): “Health-related quality of life is the value assigned to duration of life as modified by the impairments, functional states, perceptions and social opportunities influenced by disease, injury, treatment or policy.”

Measuring HRQoL

It should come as no surprise, given that lack of universal agreement about what constitutes

HRQoL, the measurement of HRQoL is equally plagued with conflicting issues and inconsistencies. Sadana (2002), for example, reviewed 13 generic health status instruments and catalogued the different health domains incorporated into each. Most instruments include items related to the major health domains of physical, social, and mental health, but they differ in how detailed they are in assigning attributes to these domains. The Sickness Impact Profile (SIP) (Bergner *et al.,* 1981), for example, includes items associated with work, the home, recreational activities, eating, and ambulation as part of the physical domain category, and the Health Utilities Index Mark 3 (HUI3) (Furlong *et al.,* 1998) includes items related to vision, speech, and hearing in that same domain. Depending upon the specific instrument, the mental health domain may include, for example, the attributes of alertness, depression, or self esteem. Table 1 compares the attributes measured by some of the more commonly used generic HRQoL instruments.

Of concern when selecting from among commonly used health status questionnaires is a lack of consistency in terms of the domains and attributes included and in terms of the way they are assessed (Sadana, 2002). Different labels are often used to refer to similar domains, and different questions are used to describe and evaluate similar domains. Some use the same domain label but use different questions to evaluate that domain. Some create a domain to focus on one aspect of performance (*e.g.,* activities related to the home), whereas others incorporate questions to evaluate performance in different environments (*e.g.,* home, work, and school) into a single domain. Finally, different instruments purport to measure different constructs such as functional status, health status, well-being, HRQoL, or quality of life. These differences would seem to reveal the different empiric approaches to defining and assessing health status (Sadana, 2002).

Despite these differences, the most commonly used health status questionnaires have similarities. The questions address general health, physical functioning, and mental health state as well as the performance of activities of daily living such as eating and dressing, and instrumental activities of daily living such as shopping for groceries and managing money. As such, they are useful for monitoring health status within clinical, research, or evaluation settings (Sadana, 2002).

Other issues that affect the measurement of HRQoL include decisions regarding the use of generic vs disease specific instruments and profiles vs utilities. Finally, the question arises as to which of the many available HRQoL instruments have the potential for use as valid, reliable, and responsive measures of hearing aid intervention. Each of these issues is briefly addressed.

Disease-Specific vs Generic Measures

In a consensus statement on HRQoL, the NIH recommended that both disease-specific and generic instruments be used for assessing HRQoL (Patrick, 1993). Health status instruments that focus on a specific illness or intervention are referred to as disease-specific measures. These types of measures tend to be of particular interest to practicing clinicians, as disease-specific instruments are focused on the functional impact of a disorder and are more responsive to interventions designed to manage that disorder (Deyo and Patrick, 1989).

Audiology-specific examples of disease-specific HRQoL instruments include the Abbreviated Profile of Hearing Aid Benefit (APHAB) (Cox and Alexander, 1995) and the Hearing Aid Handicap for the Elderly (HHIE) (Ventry and Weinstein, 1982).

- The APHAB is a 24-item questionnaire composed of situational-specific questions that are classified into one of four categories: (1) ease of communication, which examines the communication effort under favorable conditions; (2) reverberation, which examines communication in reverberant environments such as lecture halls; (3) background noise, which examines communication in high levels of background noise; and (4) aversiveness of sound, which examines the unpleasantness of environmental sounds.
- The HHIE is a 25-item instrument that measures an individual's perceived level of hearing handicap. The HHIE contains 12 items that measure the effect of hearing loss on social/situational functioning and 13 items that measure the emotional impact of the hearing loss.

Both of these instruments have been shown to be responsive to hearing aid intervention (*e.g.,* Chisolm and Abrams, 2001; Humes *et al.,* 1996).

Table 1. A Comparison of the Attributes Measured by Five Common HRQoL Instruments (Adapted from Sadana, 2002)

Health Domain	SIP	SF-36	HUI3	EQ-6D (EuroQoL)	WHO DAS II
General health		√			
Physical health					
Activities/roles		√		√	√
Work	√				
Home	√				
Recreation	√				
Ambulation	√		√		
Eating	√				
Energy/Vitality		√			
Dexterity			√		
Hearing			√		
Mobility/fitness	√	√		√	√
Pain/discomfort		√	√	√	
Self care	√			√	√
Sleep/rest	√				
Speech			√		
Vision			√		
Social health					
Activities/roles		√			
Alertness					
Communication	√				
Interaction	√				√
Support					
Mental health		√			
Activities/roles		√			
Alertness	√				
Anxiety/depression				√	
Cognition			√	√	
Emotional status	√		√		
Outlook					
Self-esteem					
Understand/interact					√
Handicap/participation					√

Although most disease-specific instruments serve an important function for the clinician as a means of validating the benefits of treatment, they suffer from an inability to *compare* the effect of different disorders and interventions on HRQoL. Generic measures, on the other hand, do not focus on any particular disorder or treatment but rather on the self-perceived overall health status of the individual. Examples of generic measures are the SIP, the Medical Outcomes Study (MOS SF-36) (Ware and Sherbourne, 1992), and the EQ-5D (EuroQoL Group 1990).

As cited in O'Connor (1993), Kaplan *et al.* (1989) argue that generic measures can be as responsive as disease-specific measures in some settings. However, in a review of previous hearing aid research that used one of four generic health status questionnaires, Bess (2000) concluded that the SIP, SF-36, Self Evaluation of Life Function (SELF) (Linn and Linn 1984) and Dartmouth COOP Functional Health Assessment Charts (COOP) (Nelson *et al.,* 1996) appear to lack responsiveness to the effects of intervention for adult onset hearing loss.

Profiles and Utility (Preference-Based) Measures

The two primary methods used to assess HRQoL are profiles and utility measures. The generic HRQoL instruments such as SIP, SELF, SF-36, and COOP, reviewed by Bess (2000), are all classified as *profiles*. These are questionnaires similar in format to the APHAB or the HHIE. Health profiles attempt to measure all of the important aspects of HRQoL such as mobility, social interactions, communication, pain, emotional behavior, and activities of daily living. Each domain assessed can be scored separately, and all of the separate scores are typically aggregated to provide summary measures that reflect the overall HRQoL of the respondent or population being studied.

As noted, HRQoL may also be assessed through the use of utility measures. Utilities refer to the *preference* an individual or population expresses for a particular health state (Bennett and Torrance, 1996). A *utility* is a cardinal measure of the strength of preference (O'Connor, 1993) and is typically measured with a scale that ranges from 0.0 (death) to 1.0 (perfect health). Utility measures are emerging as a major psychometric approach to measuring HRQoL because of the potential to compare the effect of disease and interventions on HRQoL across and within disorders.

The techniques currently used to measure health utility are derived from the work of von Neumann and Morgenstern (1944), who described methods of decision making under states of uncertainty. The classic technique to measure health utility is the standard gamble. In this approach, the patient is offered a choice between two alternatives: living with health state "B" with certainty, which is presumably their present health state, or gambling on treatment "A". Treatment "A" can lead to either perfect health or immediate death. The interviewer manipulates the probabilities of perfect health and death in choice "A" until the patient is indifferent between his or her present health state ("B") and choice "A". Obviously, the higher the probability of death the patient is willing to consider, the lower is the health state (or quality of life) inherent in remaining with choice "B". The patient's utility is calculated as 1.0 (perfect health) minus p (the probability of death in condition "A" when the patient is unable to choose between "A" and "B").

Although the standard gamble has traditionally been used for theoretic purposes to elicit utility values associated with serious life-threatening diseases such as cancer and heart disease, this technique may be beneficial for determining the impact of an individual's hearing impairment on self-perceived HRQoL. It might be useful, for example, to apply the standard gamble approach to potential cochlear implant recipients, particularly if candidacy continues to become less stringent. Instead of choosing between perfect health and immediate death, the choice for cochlear implant candidates would be to live with their current hearing or to gamble on the implant, which can lead to either normal hearing or total deafness. If a patient is reluctant to gamble on a small risk of total deafness, the interviewer may assume that the patient perceives HRQoL to be relatively good and not likely to significantly improve with an implant, even if hearing is substantially improved.

An alternative approach to the standard gamble is time trade-off. In this technique, the patients is offered a choice between living a normal life span in his or her present health state or a shortened life span in perfect health. The interviewer reduces the number of years spent in perfect health until the patient is indifferent between the shorter period of perfect health and the longer period in the less desirable state. An individual who is willing to "trade-off" years of life for a shorter life in perfect health (or perfect hearing) is revealing a great deal about his or her perceived quality of life as imposed by the disorder.

A third technique of measuring utility is known as the "feeling thermometer" or visual analog scale and has the advantage of simplicity. This approach merely requires the patient to rate their perceived health state on a scale marked with 0 at one end representing death or some least desirable state (*e.g.,* deafness) and 100 at the other end representing perfect health or a most desirable state (*e.g.,* perfect hearing).

The primary use of utilities in audiology has been in the examination of the cost-effectiveness of cochlear implants (Summerfield *et al.,* 1997; Wyatt *et al.,* 1996; Francis *et al.,* 2002; Wyatt *et al.,* 1995; Summerfield *et al.,* 1995; O'Neill *et al.,* 2000; Cheng *et al.,* 2000; Cheng and Niparko, 1999; Palmer *et al.,* 1999; Harris *et al.,* 1995; Evans *et al.,* 1995). A cost-effectiveness analysis that is designed to measure the costs associated with improved HRQoL as determined by a utility measure is called a cost-utility analysis, the result of which is expressed as the cost per quality-adjusted life-years (QALY) gained. In many of the cochlear implant studies, the cost per QALY for the implant was compared against those of other medical devices and interventions. For example, Evans *et al.* (1995) calculated a cost per QALY of $15,590 for the cochlear implant compared with previously published costs per QALY for coronary angioplasty ($11,490), implantable defibrillator ($29,220), and knee replacement ($49,700). Arguably, it was data such as these that convinced third-party payers to include cochlear implantation as a covered benefit.

The application of utility measures in adults receiving hearing aids is in its infancy:

- Piccirillo *et al.* (1997) reported on the use of the U-Titer (Sumner *et al.,* 1991), an automated utility assessment software application, to determine the benefit of amplification by using time trade-off utility scores before and after treatment. Eighty-four percent of 33 patients who participated in the study reported that their hearing was "much improved" after treatment and their average difference in utilities was 0.13, which was statistically significant ($p < .03$) and clinically impressive (>10% change).
- Abrams *et al.* (2002), also using the U-Titer, demonstrated post-hearing aid improvements in mean utility scores among 54 participants as well as a positive correlation between the visual analog scale and time trade-off and the International Outcome Inventory for Hearing Aids (Cox and Alexander 2002), a disease-specific measure of hearing aid benefit.

It has been argued that the classic techniques for measuring utility are sometimes problematic because the standard gamble and time trade-off are susceptible to the effects of cognitive biases in patients and the visual analog scale is not a true preference-based measure (Hanita, 2000). An alternative approach is to ask individuals to use verbal descriptions of various health states to rate their level of functioning, with each descriptor associated with a different utility value.

For example, in the HUI3, a person is asked to select one of six descriptors that best represent his or her hearing (Table 2). Each descriptor (1 to 6) is associated with a different utility value, such that 1 = 1.0, 2 = .95, 3 = .89, 4 = .80, 5 =. 74, and 6 = .61. In the HUI3, utilities are measured for the multiple domains of vision, hearing, speech, dexterity, ambulation, emotion, cognition, and pain, and a summary measure is calculated to provide an overall utility value.

Although the HUI3 and the EQ-5D (formally the EuroQoL) were developed to directly relate descriptors to utility values, another approach has been to develop mathematical corrections to apply to profile data such as that obtained through the SF-36, so that the scores can be converted to measures of utility (Brazier, 1998). Some recent work in audiology has explored the use of profile-derived utilities.

For example, Abrams *et al.* (2002) used a modification of the SF-36 for the veteran population (SF-36V) (Kazis *et al.,* 1999) to conduct a cost-utility of audiologic intervention. As with the SF-36, the SF-36V measures eight general health concepts in two major domains: mental and physical functioning. A mental component summary scale score (MCS) is calculated through the responses provided in the health concept areas of vitality, social functioning, role limitations due to emotional problems, and mental health. Responses provided for the health concepts of physical functioning, role limitations due to physical health problems, bodily pain,

Table 2. Utility Values for Various Health States for the Attribute of Hearing*

Level	Description	Utility Value
1	Able to hear what is said in a group conversation with at least three other people, without a hearing aid	1.0
2	Able to hear what is said in a conversation with one other person in a quiet room without a hearing aid, but requires a hearing aid to hear what is said in a group conversation with at least three other people.	.95
3	Able to hear what is said in a conversation with one other person in a quiet room with a hearing aid, and able to hear what is said in a group conversation with at least three other people, with a hearing aid.	.89
4	Able to hear what is said in a conversation with one other person in a quiet room, without a hearing aid, but unable to hear what is said in a group conversation with at least three other people even with a hearing aid.	.80
5	Able to hear what is said in a conversation with one other person in a quiet room with a hearing aid, but unable to hear what is said in a group conversation with at least three other people even with a hearing aid.	.74
6	Unable to hear at all.	.61

*Adapted from the Multi-Attribute Health Status Classification System: Health Utilities Index Mark 3 (HUI3) (http://www.fhs.mcmaster.ca/hug/).

and general health perceptions are used in the calculation of a physical component summary scale score.

In the Abrams (2002) study, MCS scores were used to compare two treatment approaches: (1) hearing aid use alone (HA), and (2) hearing aid use in conjunction with short-term group audiologic rehabilitation (HA+AR) after fitting. The results of the cost-utility analysis revealed that HA treatment cost $60.00 per QALY gained, whereas HA+AR cost only $31.91 per QALY gained, making HA+AR the more cost-effective treatment. As pointed out in this study, however, no statistical difference was observed between the MCS change scores for the HA alone condition and HA+AR, so it is not entirely clear whether MCS would be a useful measure to study the HRQoL impact of hearing aids alone.

More recently, Barton *et al.* (2005) compared the QOL among 915 patients referred for complaints of hearing loss by using three different utility measures: the EQ5D, the HUI3, and the SF-6D (derived from the SF-36) The mean utility scores were 0.79, 0.56, and 0.77, respectively, all significantly different from one another and highlighting the fact that the utility scores are dependent on the measures used.

Which Measure Should Be Used?

If audiologists are to measure generic HRQoL, either directly through a profile or in terms of preference-based utilities, which instrument should be used to assess the effects of hearing aid intervention? Joore *et al.* (2003) were able to demonstrate a positive relationship between hearing aid intervention and improvements on the social functioning dimension of the SF-36 but failed to find a similar relationship using the EuroQoL. On the other hand, Stark and Hickson (2004) found that the mean general health subscale scores of the SF-36 actually *decreased* significantly after fitting. The authors suggest that the deterioration in their perceived HRQoL may have been the result of the participants' awareness of the full extent of their impairment only after the hearing aid fitting.

Recall that in a comprehensive review of research to date, Bess (2000) found that generic health status instruments used in previous hearing aid investigations (*i.e.,* SELF, SF-36, and COOP) appeared to lack sensitivity to hearing aid intervention. Indeed, in a review of 13 health status questionnaires, Sadana (2002) identified that only the SIP and the HUI3 contain questions related to communication and/or hearing, respectively.

Bess (2000) observed that the SIP might have the potential to demonstrate a generic HRQoL benefit associated with hearing aid intervention. However, the only study that has demonstrated responsiveness to audiologic treatment with the SIP (Crandell, 1998) only included subjects whose preintervention score indicated a severe level of functional impairment.

Although the HUI3 has been used effectively in measuring HRQoL improvements among cochlear implant recipients (*e.g.,* Wyatt *et al.,* 1996; Cheng *et al.,* 2000; Francis *et al.,* 2002), the responsiveness of the HUI3 to hearing aid intervention among adults has not yet been evaluated. The absence of hearing-related questions on most commonly used health status questionnaires has made it difficult for clinicians and researchers to demonstrate the effect of treatment for adult-onset hearing impairment on generic HRQoL and, by extension, to convince health-care policy makers that what we do as audiologists makes a significant impact on an individual's or a community's quality of life. Indeed, as Bess (2000) pointed out, there was and still is a critical need "…to develop a multidimensional functional health status measure, which includes items that load on the consequences of hearing impairment."

The World Health Organization's Disability Assessment Schedule II

Recently, a new generic profile-type questionnaire was developed that appears to address the need for a multidimensional instrument that includes items loading on the consequences of hearing impairment. This is the WHO-DAS II (World Health Organization, 1999). It was designed to address the effects of impairment as conceptualized in the WHO's International Classification of Functioning, Disability, and Health model (ICF) (WHO, 2001). The ICF is a major revision and update of the International Classification of Impairments, Disabilities and Handicaps (ICIDH) (WHO, 1980) and is a biopsychosocial model of functioning and disability that provides a framework for intervention and treatment evaluation research in all areas of rehabilitation, including audiology rehabilitation (Beck, 2000; Gagne, 2000; Wilkerson, 2000). The ICF systematically organizes and codifies the consequences of an individual's health condition (*i.e.,* a disease or a disorder such as sensorineural hearing loss) into three dimensions: body structures and function, activity, and participation.

Body structures are the anatomic parts of the body and include the external (s240) (WHO-ICF, 2001) middle (s250) (WHO-ICF, 2001) and inner (s260) (WHO-ICF, 2001) parts of the ear. Body functions are the physiologic and psychologic functions of body systems and include abilities such as sound detection (b2300) (WHO-ICF, 2001) and sound localization (b2301) (WHO-ICF, 2001). A person who has an anatomic deviation, such as occurs in otosclerosis, exhibits an *impairment* in body structure. An individual who has a deviation in function, as occurs when cochlear damage results in elevated auditory thresholds, has an *impairment* in body function.

Activity and participation cover the full range of life areas: learning and applying knowledge, general tasks and demands, communication, mobility, self-care, domestic life, interpersonal interactions and relationships; major life areas such as employment, education, and economic life; and community, social, and civic life. Activity is defined as a person's ability to perform or execute an action or task in a uniform environment; or more simply, what a person "can do."

Participation is what a person "does do" in his or her everyday environment. For example, "can" a person with sensorineural hearing loss, who has difficulty with sound detection, "communicate with—receive—spoken messages" (d310) (WHO-ICF, 2001) or engage effectively in a "conversation" (d350) (WHO-ICF, 2001)? Even if a person can do these activities, he or she may not participate in communication and conversational activities for a variety of reasons, such as the effort involved, embarrassment from potentially misunderstanding a message, or the lack of readily available communication partners. Indeed, the three dimensions of health status interact with each other and with both environmental and personal contextual factors, to determine *disablements*—the specific activity limitations or participation restrictions that impact on the daily functioning of an individual.

The WHO-ICF model implies that to characterize truly the effects of a health condition on an individual, and the effectiveness of interventions for the health condition, all dimensions of the WHO-ICF must be considered. The WHO-DAS II has the potential to allow for consideration of all ICF dimensions.

The WHO-DAS II consists of 36-items organized into six domains: communication (*i.e.,* understanding and communicating with the world), mobility (*i.e.,* moving and getting around), self-care (*i.e.,* attending to one's hygiene, dressing, eating and staying alone), interpersonal (*i.e.,* getting along with people), life activities (*i.e.,* domestic responsibilities, leisure, and work), and participation in society (*i.e.,* joining in community activities). The WHO-DAS II assesses difficulties with functioning and disability in each of these domains over the past 30 days.

Because the WHO-DAS II is a generic measure, it can be used within and across disorders to determine the impact of a specific disorder relative to other disorders, the relative effectiveness of the interventions, and the relative costs associated with managing each disorder. In these respects, the WHO-DAS II holds promise for measuring the generic health impact of hearing loss and allowing comparisons between those findings and those obtained for other disorders. It could also be argued that the WHO-DAS II is an effective measure of self-perceived HRQoL as it assesses the physical, psychologic, and social functioning associated with an illness or with the treatments associated with that disorder (Revicki, 1989).

Conclusion

The pressures on providers to demonstrate the effectiveness of their treatments has yielded a proliferation of health care outcome measures. Audiologists have a variety of disease-specific instruments at their disposal that have been useful in evaluating and documenting the results of hearing aid intervention. As a discipline, audiology needs to move beyond these established instruments and demonstrate that what we do has a positive impact on overall HRQoL, not just the activities and participation of an individual.

As discussed above, the WHO-DAS II has potential for being a generic HRQoL for audiology. As Bess (2000) pointed out, the determination of an instrument's usefulness as a generic measure ". . . could only be met by conducting a large-scale, multisite/multidisciplinary investigation with several quality of life measures—measures that include items certain to be influenced by hearing impairment.". In 2000, we began such an investigation of the WHO-DAS II in a large-scale study at four separate VA Medical Centers. The papers that follow represent the results of that investigation.

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