Any pediatric audiologist working with children who have multiple impairments cannot help being struck by the complexity of the assessment, intervention, and management process. It is our good fortune that in this modern time, enhanced technology allows not only for the survival of infants born with severe mental and physical challenges, but also for securing their healthy and productive futures. Certainly, the thoughtful application of hearing technology plays a major role in overcoming some of the obstacles posed by these children’s multiple impairments. In this chapter, specific issues regarding audiologic intervention with children having hearing loss in addition to other significant impairments will be addressed. Three main themes form the basis of this discussion: the magnitude and diversity of this population, current hearing aid fitting practices for children with multiple impairments, and the challenges of family-centered service provision.

**Demographics**

The term *multiple impairments* is used here to describe children with hearing impairment and at least one additional disabling condition. It has been estimated that approximately 25% to 40% of all children with hearing loss in Canada, the United States (U.S.), and Europe will have at least one additional impairment (Davis, Fortnum, and Bamford 1998; Holden-Pitt and Diaz 1998; Karchmer 1985; Karchmer et al. 1981; Mencher 1983). A summary of the additional impairments noted in the Annual Survey of Deaf and Hard-of-Hearing Children and Youth: 1996-97 (Holden-Pitt and Diaz 1998) is depicted in figure 1.

**Etiology**

The etiologies of these additional impairments are as diverse as those for hearing loss alone; that is, heredity, infectious disease (such as cytomegalovirus and herpes), maternal rubella, premature (birth prior to 37th week), and low-birth-weight (<2500 grams) deliveries. Low birth weight (LBW) is a major public health problem in the U.S., comprising approximately 7% of all live births (Ventura et al. 1996) and contributing substantially both to infant mortality and to childhood disability. Commonly accepted definitions of low-birth-weight categories are listed in table 1. Improvements in the understanding of the pathophysiology of newborn conditions and miniaturization of medical equipment that allows for easier physical manipulation of these tiny newborns have lowered the limit of viability to approximately 500 grams birth weight and 23 to 24 weeks gestational age (Allen 1991).

When premature children are carefully followed to school age, the incidence of developmental disabilities is found to be much higher than has been suggested by short-term follow-up studies. Studies in North America and Europe have indicated that approximately one-third...
to one-half of very low-birth-weight (VLBW) and extremely low-birth-weight (ELBW) infants have a variety of neurodevelopmental disorders. The most common of the major disabilities to which LBW infants are susceptible is cerebral palsy (Robertson et al. 1992). Other disorders include learning disability, attention deficit disorder, epilepsy, chronic lung disease, ophthalmologic impairment, mental retardation, and hearing loss (Bergman et al. 1985; Gallo and Lennerstrand 1991; Kraybill, Bose, and D’Ercole 1987; McCormick, Gortmaker, and Sobol 1990; Robertson et al. 1992; Vohr and Coll 1985; Yu et al. 1986).

**Amplification Needs**

Impairments that accompany hearing loss have implications for our amplification decisions for children. That is, hearing aid selection and fitting should be different for the child with multiple impairments than for the otherwise normally developing child with hearing loss. These differences are based on functional needs and physical distinctions. First, the functional needs of children with multiple impairments may be considerably different than those of children with hearing loss alone. Take, for example, the child with significant visual and hearing problems. The goal of education of children with visual and hearing impairment is the development of maximum independence. This child must obtain environmental acoustic information in addition to speech for purposes of developing orientation and mobility skills for reaching that principal goal of independence.

Amplification decisions may significantly impact the orientation and mobility skills of the child with vision and hearing deficits. De l’Aune (1980) suggests at least three ways that these children use auditory cues to assist with orientation and mobility. First, distance estimation (see figure 2a). The intensity of sound emitted from an object is a good indicator of its distance from the listener. The change in loudness is quite pronounced and is accurately portrayed by most hearing aids. It is not clear, however, if compression circuits that attempt to keep loudness levels below a given point could have a detrimental impact on distance estimation. This is of particular concern with hearing aids having high compression ratios. While this characteristic is of great value for relieving the discomfort caused by recruitment, the potential impact on distance estimation for the hearing aid user with significant visual impairment has not been examined.

A second auditory cue described by De l’Aune (1980) as having import for orientation and mobility is the sound shadow effect. In some circumstances, the traveler who is blind may need to know the location of silent objects (for example, a telephone pole). If the object of interest is between the traveler and a sound source, the sound from the source will bend around the object, thus attenuating the high frequencies and providing the observer with a perceptible change in the spectral shape of the sound (see figure 2b).

<table>
<thead>
<tr>
<th>Category</th>
<th>Birth-weight (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Birth Weight (LBW)</td>
<td>&lt;2500</td>
</tr>
<tr>
<td>Very Low Birth Weight (VLBW)</td>
<td>&lt;1500</td>
</tr>
<tr>
<td>Extremely Low Birth Weight (ELBW)</td>
<td>&lt;1000</td>
</tr>
<tr>
<td>Incredibly Low Birth Weight (ILBW)</td>
<td>&lt;800</td>
</tr>
</tbody>
</table>

**Figures 2a, b, c.** This individual with hearing and vision deficits utilizes low-frequency acoustic cues from traffic noise for estimating distance from cars (a), the sound shadow effect for locating the presence of the telephone pole (b), and ambient environmental sound reflected from the wall surface for maintaining orientation along the sidewalk (c).
A third auditory cue for the traveler with visual impairment is the ambient environmental acoustic effect. Also referred to as “facial vision” in children who are blind and adults, this effect depends upon reflected sound to enable a traveler to avoid large obstacles before making contact. In industrial societies, there exists a considerable amount of broadband background noise. This background noise results in resonances set up between the listener and reflecting surfaces, such as walls, thereby enabling the traveler to use the sound to trail along a wall or detect corners by the absence of reflected sound (see figure 2c). Relevant information is often contained in the low-frequency components of this background noise (De l’Aune 1980).

Frequencies providing relevant information to the traveler with visual impairment are often not in the range of emphasis characteristic of most hearing aids. For example, spectral analyses of traffic sounds revealed the greatest absolute intensity to be in the lower frequencies (Wiener and Lawson 1997). Therefore, a hearing aid that emphasizes only frequencies above 1000 Hz may fail to provide some useful information for interpretation of traffic sounds, a very important function for individuals with visual impairments. These low frequencies, which are important for the traveler who is visually impaired, are typically not amplified as much as the higher frequencies because they are the major carriers of noise. Enhancing these lower frequencies generally makes communication more difficult. Because most hearing aid users are concerned primarily with understanding speech, hearing aids are designed with this specific function in mind.

Despite the enormous advances in hearing aid technology to date, this small but very important segment of the population with which we work (i.e., those with dual sensory impairments) may not be maximizing their aided potential with our traditional hearing aid fittings. In a review of several leading texts aimed at the education of persons who had hearing or visual impairments, it was surprising to find that little, if any, information on amplification was included. In fact, one well-regarded researcher of issues relating to deafness and blindness stated, “If it is at all possible for the blind client to get by without a hearing aid he or she should do so. If the hearing problem is sufficient to warrant an aid, check into the possibility of using the aid simply for speech and removing it for mobility tasks” (De l’Aune 1980, p. 23). Although this statement was made more than two decades ago, these concerns have not yet been dispelled. Further studies on the effects of aided hearing on orientation and mobility skills of those with visual impairment are certainly needed.

Until such studies are conducted, how might we accommodate the multiple auditory needs of a child with vision and hearing deficits? It is reasonable to assume that during travel, a child would want to select a predominantly low- or broad-frequency response. During verbal instruction in orientation and mobility training, that child would want to eliminate the low-frequency noise and maximize reception of speech cues. A classroom setting would certainly dictate the need for maximizing speech perception ability. The flexibility afforded by programmable multimemory hearing aids and those that offer omni- and directional microphones could allow this child to select the preferred amplification for specific listening needs and environments.

The child with vision and hearing deficits is just one example of how the functional needs of individual children must be considered when recommending amplification. Children with significant mental retardation or physical impairments that would preclude their ability to adjust their hearing aid volume may benefit from automatic volume controls. Other physical characteristics of hearing aids should also be considered. Children with multiple impairments are frequently involved in activities that may make the use of the most commonly recommended hearing aid style for children, the behind-the-ear (BTE) aid, problematic. It is highly likely that a BTE could result in excessive feedback as a result of positioning for physical therapy activities, the use of head and neck braces, and general postural concerns with children having poor head control (see figures 3a and b). Body-style hearing aids, while not commonly used in today’s high-tech market, may be appropriate options for some of these children.

An additional consideration for children with cognitive impairments is the impact of listening in the presence of background noise. Although poor listening environments are of concern for all children with hearing loss, there is some evidence to suggest that background noise may be of greater consequence to those with reduced cognitive resources. Rabbitt (1966) examined the effect of background noise on a memory recognition task. He concluded that while background noise did not decrease task performance, noise did contribute to reduced task efficiency. Similarly, Downs and Crum (1978) proposed that even when speech signals are intelligible, background noise contributes to increased processing demands during auditory learning. It was suggested that the increased effort required to attend to auditory stimuli in background noise may produce deleterious effects on learning. Such findings imply that efforts to improve signal-to-noise ratios in learning environments are particularly important for children with cognitive impairments. Personal or sound
field FM systems are recommended options for this population.

In addition to differences in the selection of hearing aid types and physical characteristics, the actual fitting process may be different for children with multiple impairments than that for the otherwise normally developing child. As discussed in detail by McCracken and Bamford (1995), despite the ease and efficiency of real-ear-to-coupler difference (RECD) measures, some children with multiple impairments may strongly resist such measures by means of excess movement and tactile defensiveness. As such, average RECD values might be used, thus ignoring individual variability. The ear canal volumes in children with craniofacial abnormalities will often be unusually small for their chronological age and will differ considerably from age-average RECDs. The age-average RECD, therefore, may greatly underestimate the actual RECD (McCracken and Bamford 1995).

Figure 4 illustrates just such an example. Significant variability can be seen between the ears of these two 3-year-old children. The effect of using an age-average RECD with the child on the right might be to select hearing aids that provide greater real ear levels than needed. Therefore, despite the sometimes difficult struggle to measure the RECD, such efforts may be especially important with this population.

Survey Results

In an effort to document hearing aid selection, fitting, and verification practices for children with multiple impairments, a survey was developed and mailed to 6,000 audiologists across the U.S. Currently, there are approximately 12,000 audiologists certified by the American Speech-Hearing-Language Association in the U.S. Therefore, an attempt was made to survey about 50% of practicing audiologists. The survey return rate was 27%, or 1,599 surveys. The respondents completed the survey anonymously. To ensure that the respondents were actively involved in the fitting of amplification in children between the ages of birth and 12 years, only those who typically fit three or more hearing aids on children in a six-month period were asked to complete the survey. All respondents (those who fit children and those who did not), however, were asked to provide demographic information. Four hundred twenty-five, or 27%, of the responding audiologists indicated that they qualified to complete the entire questionnaire. For purposes of brevity, only portions of the survey results are presented here. A more detailed analysis of the survey findings can be found elsewhere (Tharpe, Fino-Szumski, and Bess in preparation).

A wide and evenly dispersed response distribution from across the U.S. was obtained. The respondents...
appear to accurately reflect the profile of the targeted audiologists. That is, the majority of the respondents had master’s degrees (84%) and worked full-time (79%) performing clinical duties an average of 95% of their time. Additionally, the primary work site of the respondents was a private practice setting (64%).

The survey instrument consisted of 31 multiple-part questions designed to extract information on the educational training and professional experience of the respondents. In addition to children with hearing loss and no other impairments, respondents were asked to reveal hearing aid selection, fitting, and verification practices for children who had hearing loss and vision impairments, mental retardation, physical impairments, and autism spectrum disorders. Table 2 lists the descriptors of these impairments provided to the respondents for purposes of answering the survey questions.

Inquiry into the educational background of the respondents revealed that 82% of the respondents had taken a class in pediatric audiology in graduate school; however, only about 32% received at least one full lecture on these impairments. Further, approximately 18% had taken a course in pediatric amplification in graduate school. The respondents were also asked if they received any type of instruction on hearing aid fitting practices for children with the four types of additional impairments covered in this survey. Only 19% of the respondents had received such training. Training was primarily received through practicum experience obtained in graduate school or at conferences and workshops.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing Loss</td>
<td>sensorineural and at least moderate to severe in degree bilaterally</td>
</tr>
<tr>
<td>No Other Disabilities</td>
<td>no other disabilities except speech-language disorder</td>
</tr>
<tr>
<td>Vision Impairment</td>
<td>low vision (i.e., between 20/60 and 20/200 binocular); may wear glasses but also in need of additional assistance</td>
</tr>
<tr>
<td>Mental Retardation</td>
<td>moderate mental retardation (i.e., 50-60 IQ); will develop some language and learn to read in adolescence</td>
</tr>
<tr>
<td>Physical Impairment</td>
<td>cerebral palsy resulting in limited head control, requiring wheelchair use with head support and minimal fine motor function</td>
</tr>
<tr>
<td>Autism Spectrum Disorders</td>
<td>autism with stereotypical symptoms including tactile sensitivities, receptive and expressive language disorder, marked social impairment, and other behavioral concerns</td>
</tr>
</tbody>
</table>

Table 2. Description of impairment categories provided to survey respondents.

![Figure 5](image-url) Response to the statement, “On average, how old are children...when you fit their initial amplification?”
Figure 5 depicts the ages at which children with a variety of impairments were reported as being fitted with amplification. When asked, “On average, how old are children...when you fit their initial amplification?” the majority of respondents reported that they fitted most children, with the exception of those with vision impairments, at 13 months of age and older. Approximately 50% of respondents revealed that they fit children with vision impairments earlier than children with any other impairment or children with hearing loss only. In contrast, respondents indicated that children with autism are fitted later than children with any other additional impairment. Similarly, Arehart and colleagues (1998) reported on their survey results of universal newborn hearing screening programs in 16 states. Those screening sites also reported that the majority of infants screened are fitted with hearing aids at 12 months of age or later.

The results of the question, “As compared to children with hearing loss alone, how do you think that a child with hearing loss and the following disabilities will benefit from amplification?” are displayed in figure 6. Fifty-seven percent of respondents felt that children with vision impairments would receive more benefit from amplification than children with any other impairment or children with hearing loss only. It is interesting to reflect on these perceptions of audiologists, given the vastly different perceptions by some researchers in the area of dual sensory impairments reported earlier. Recall that they considered amplification for those with dual sensory impairments as a hindrance to orientation and mobility and an intervention to be avoided whenever possible. It is also noteworthy that about half of the respondents did not know how children with autism would benefit from amplification as compared to those with hearing loss alone. This finding is consistent with the dearth of information on children with autism present in the audiologic literature.

### Hearing Aid Type and Style

Earlier in this chapter, the need for special consideration of hearing aid type and style for those with various impairments was discussed. Contrary to the conclusions drawn from that discussion, when asked to select the type of primary amplification you typically fit for children with the various impairments, most respondents selected nonprogrammable hearing aids as the amplification type...
of choice. As can be seen in figure 7, with responses averaged across age, this preference was maintained regardless of whether the child had an impairment in addition to hearing loss. This preference was also true across the age range; however, recommendations for FM/BTE combinations systematically increased with age.

Respondents were asked to “select the hearing aid style that you typically fit” for children with the various impairments. Their choices included body, behind-the-ear, and in-the-ear style aids. Figure 8 reveals that respondents choose behind-the-ear hearing aids for all children approximately 90% of the time, regardless of additional impairments. There was a slight increase in the choice of in-the-ear hearing aids for children in the 6- to 12-year range for children with and without additional impairments.

One might have expected a higher number of body aids for those with physical impairments. Recall that the definition of physical impairment that the respondents were asked to use in answering this question indicated children with head braces that might reasonably be expected to interfere with a behind-the-ear-type hearing aid (see table 2).

When asked about the microphone type typically selected, respondents reported selecting omnidirectional microphones more frequently than directional microphones for all of the impairment categories (approximately 50% to 75%) regardless of the children’s ages. However, the respondents indicated an increase in recommendations for directional microphones for children over approximately 2 years of age. A considerable number of respondents indicated that they did not know what type of microphone they ordered (approximately 10%). As stated previously, the definition of visually impaired provided to the respondents included children in need of some orientation and mobility training. For purposes of travel and development of independence, an omnidirectional microphone may be a preferred option. There were no differences, however, in microphone recommendations based on specific additional impairments.

**Selection and Verification**

Several years ago, Hedley-Williams and colleagues reported findings from a pediatric amplification survey at the International Symposium on Amplification for Children with Auditory Deficits (Hedley-Williams, Tharpe, and Bess 1996). They reported that the majority of respondents to their survey used a personal fitting strategy, based on the respondents’ experience, when selecting hearing aid specifications for children. Less than 10% used the desired sensation level (DSL) approach (Seewald 1992) for the majority of their hearing aid fittings, the one prescriptive approach specifically designed for use with young children.

As demonstrated in figure 9a, when asked, “select the method you are most likely to utilize in selecting gain/frequency specifications for children with hearing loss and no additional handicapping conditions,” approximately 50% of respondents to the current survey select gain/frequency specifications by using the DSL approach, followed in frequency by about 25% to 30% who use a personal fitting strategy. Similarly, when asked the same question for children with hearing loss and other impairments, respondents again indicated that they use the DSL about 50% of the time (see figure 9b). These findings were consistent across all of the impairment and age categories.

Additionally, 60% to 80% (1996) of respondents to the Hedley-Williams et al. survey, reported always using aided behavioral measures to verify hearing aid fittings while only about 15% to 40% always used probe micro-
phone measures. The current survey asked respondents to “rank the...methods you typically use to verify your gain/frequency specifications.” Figure 10a illustrates that approximately one-half of the respondents use some type of probe microphone measure (i.e., traditional probe microphone or RECD measures) to verify their gain/frequency specifications with otherwise normally developing children with hearing loss. The other half utilizes some type of behavioral measure (i.e., aided pure-tone thresholds, aided speech reception or awareness thresholds, or aided word recognition). Note that the use of probe microphone measures gradually increases as the age of the child increases. As seen in figure 10b, this trend is maintained for children with hearing loss and additional impairments.

Numerous investigators have clearly articulated the limitations of using sound field aided thresholds or aided speech measures to select or verify hearing aid fittings or to make comparisons across aids (Hawkins et al. 1987; Humes and Kirn 1990; Macrae 1982; Mueller and Grimes 1983; Seewald et al. 1996; Shore, Bilger, and Hirsh 1960; Walden et al. 1983). The most obvious limitation of these measures with young and multiply involved children is that a reliable behavioral response is required. Given the varying levels of responsiveness that are expected from children with multiple impairments, particularly mental retardation and autism, such measures are not recommended.

Output limiting has long been a concern of those involved in fitting young children with amplification. The limitations of utilizing 2cc coupler measures when fitting the small ears of infants and young children have been well documented by many (Bratt 1980; Feigin et al. 1989; Kruger 1987; Kruger and Ruben 1987). Survey respondents were asked to “select the method you typically use to select output limiting characteristics” for children with the various impairments. No clear method for selecting output limiting characteristics emerged from this survey. Respondents most often answered that they utilize 2cc coupler levels using average (age-appropriate) RECDs

Figure 9. Response to the statement “select the method you are most likely to utilize in selecting gain/frequency specifications” for children with the various impairments. Recommendations as a function of age for otherwise normally developing children with hearing loss (a) and for children with hearing loss and additional impairments (b).

Figure 10. Response to the statement “rank the...methods you typically use to verify your gain/frequency specifications for children with the various impairments.” Recommendations as a function of age for otherwise normally developing children with hearing loss (a)
predicted from prescriptive formulae and measured RECDs to select output limiting characteristics. Figure 11a depicts these preferences for children with hearing loss and no other impairments. Figure 11b illustrates these preferences as a function of age for children with hearing loss and additional impairments. A preference was observed for using 2cc coupler levels using average RECDs for the younger age groups but, no differences were noted for the type of impairment. Approximately 5% of respondents reported that they do not know what method they use to select output limiting characteristics.

Further, survey respondents were asked to “rank the...methods you typically use to verify your output limiting specifications” for children with the various impairments. Their choices included a variety of behavioral and probe microphone measures. As illustrated in figure 12a, our respondents most often utilize objective measures (i.e., RECD or traditional real ear) for children with hearing loss and no additional impairments. This trend was also true for children with hearing loss and additional impairments (see figure 12b). Note that for all children with hearing loss (i.e., those with and without additional impairments), as age increases, the use of traditional probe microphone measures also increases.

Unfortunately, approximately 30% of respondents reported using behavioral measures such as aided sound field thresholds, aided speech awareness thresholds, and aided speech reception thresholds to verify output limiting—methods that cannot provide information about output limiting characteristics.

The results of this questionnaire are encouraging. However, while there appears to be a considerable increase in the use of probe microphone measures and prescriptive formulae for selecting, fitting, and verifying amplification in young children over the past several years, the need for improvement continues. Participants at this conference have clearly articulated the tremendous gains in technology that our field has experienced. Our task now is to apply these technologies in our prac-
cies thoughtfully considering the individual functional needs of all the children we serve.

Family-Centered Service Provision

Beyond the technical hurdles of fitting amplification on infants and young children with multiple impairments lies one of our most difficult challenges: providing truly family-centered service. Although we attempt to provide family-centered services to all of our patients, our efforts take on particular significance with this population. Why? Because there are frequently more unknowns with this population, thus, adding to the stress and confusion already present in most of these families. How do we address questions such as “What benefits should I expect for my child if we get these hearing aids?” from the mother of a child with severe cognitive delays and hearing loss? Should we recommend audiological services to a parent who is already doing her best just to have her child’s basic health needs met? As we make recommendations for the child with special needs, should we take into account the impact of these recommendations on the family as a whole?

It is useful at this point to look at long-term illness from a social sciences perspective. In Western culture, one approach to working with children having long-term disabilities is rehabilitation aimed at enabling children to live a life as close to normal as possible, or normalization (Wolfensberger 1972). We, as audiologists trained to enhance communication for our patients, also strive for normalization. That is, we aim for improving hearing ability and communication skills to a level as close to normal as possible. Although this appears to be a noble endeavor, it should be recognized that not all families share this philosophy. In fact, in at least one examination of Chinese culture, “looking after” and fostering the “happiness and contentment” of children with chronic illnesses took precedence over normalization (Anderson 1986, p. 1280). When health care recommendations contributed to discomfort of children, those recommendations were rejected.

Deviations from this typical Western concept of normalization also occur within our own culture. Parents of severely involved children may choose not to authorize interventions at all. This is particularly true when it is reasonably believed that a child’s condition is such that his or her capacity for even minimal benefit cannot be attained, or that the costs to other persons, especially the rest of the family, are excessive. For example, while many of our families will strive to normalize their children as much as possible, another family may decide that making their child wear a hearing aid that is vehemently resisted is too disturbing to the family peace. Parents may feel that maintaining a calm atmosphere in the home is preferable to any benefit that the hearing aid might bring to the child. The well-being of the entire family is under consideration, not just the needs of the child in question.

Such decisions are difficult to make on the part of the parents and sometimes difficult to accept on the part of the clinician. Anderson, in her 1986 article on ethnicity and illness experience, states it best, “The family who fails to comply with recommendations engenders feelings of frustration and impotence in the clinician hence the family becomes labeled as ‘difficult’ or ‘non-compliant’ “ (p. 1281). We, in striving to assist the families with whom we work, may feel that we have somehow failed them if they reject our recommendations for intervention. However, attempts to override reasonable parental decisions in these matters are unjustified. Society has traditionally allowed the family considerable independence.
and authority in relation to the management of its children. This authority includes judgments regarding medical care, and in this sense the family’s decisions should be respected (Shelp 1986).

It is not always easy to gain an accurate understanding of the goals of a family. Before revealing this information, families must know that they will be supported in their decisions, even if that decision means going against professional judgment. The Family Needs Survey, as adapted for families of children who are deaf or hard of hearing (Johnson, Benson, and Seaton 1997), is one tool that may provide considerable insight into family needs and expectations (see Appendix 1). It consists of 40 questions that can be completed quickly by caregivers. Another option is to consider different ways of eliciting information from parents, such as the following questions:

- What are the most important results that you hope to receive from this evaluation or hearing aid fitting?
- What are the chief problems your child’s hearing loss has caused for you?
- What do you fear most about your child’s hearing loss?

The answers to these questions may help audiologists and the families with whom they work come to an understanding of what they ultimately want from audiologists, for their children, and for their family as a whole.

Families must be provided with sufficient information and explanations regarding possible consequences of available options in order to make well-informed decisions. The audiologist’s ability to assist families, however, is most difficult when prognoses are not easy to determine. For children with severe cognitive or behavioral involvement, no guidelines are available to predict the effectiveness of amplification. Effectiveness of intervention for these children must be determined by how the intervention meets the needs of the family.

While we now have sufficient tools to determine the appropriateness of the gain, frequency, and output characteristics of hearing aids for children, we do not have a wealth of tools to assess benefit from amplification, particularly for children who are severely and multiply involved. Most audiologic tests traditionally used to assess auditory speech perception skills in the pediatric population are inappropriate for very young children or those with developmental delays. Progress with many of these children will be excruciatingly slow and may require long-term monitoring before benefit can be determined. There are some parent and teacher questionnaires, however, that may assist us in documenting this progress.

These include the Infant-Toddler: Meaningful Auditory Integration Scale (Zimmerman-Phillips, Osberger, and Robbins 1997) and the Listening Development Profile (Johnson, Benson, and Seaton 1997, pp. 416-417). Putting the results of these or similar tools together with the family’s goals should assist audiologists in determining a child’s benefit from amplification.

The number of children with multiple impairments constitutes a significant part of the pediatric audiologist’s practice. While we frequently take on a leadership role in the management of otherwise normally developing children with hearing loss, the problems of children with multiple impairments are complex and require input from a number of professionals and parents if we are to understand their functional needs. We can embrace the challenges that these children pose, learn to recognize the special needs of their families, and provide invaluable expertise that will foster parental efforts to assume responsibility for their children.

**Acknowledgments**

I would like to thank Fred Bess and Mary Sue Finoszumski for their assistance with the development of the amplification survey reported herein. In addition, many thanks go to Rachel Absher, Michelle Hillis, Megan Hoefl, Holly Huta, Carol Maniaci, and Sara Webber for numerous hours of copying, envelope stuffing, and data entry.

**References**


Appendix

Family Needs Survey

(Adapted for Families of Children who are Deaf or Hard of Hearing by DeConde Johnson, Benson, and Seaton 1997). Reprinted with permission.

Child’s Name: __________________________
Date Completed: ________________________
Person Completing Survey: __________________
Relationship to Child: ______________________

Dear Parent:

Many families of young children who are deaf or hard of hearing have needs for information or support. Listed below are some of the needs frequently identified by families. It would be helpful if you would check the topics below for which you would like more information or to discuss with a staff person from our program. At the end there is a place for you to add other areas not included on this list. If you choose to complete this form, the information you provide will be kept confidential. If you would prefer not to complete the survey at this time, you may keep it for future reference.

Would you like more information or to discuss this topic with a staff person from our program?

<table>
<thead>
<tr>
<th>Topics</th>
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<th>Not sure</th>
<th>Yes—Discuss</th>
<th>Yes—Info</th>
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<tr>
<td><strong>General Information</strong></td>
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<td></td>
</tr>
<tr>
<td>1. How children grow and develop</td>
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<tr>
<td>2. How to play or talk with my child</td>
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<tr>
<td>3. How to teach my child</td>
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<tr>
<td>4. How to handle my child’s behavior</td>
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<tr>
<td><strong>Information—Hearing and Hearing Loss</strong></td>
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</tr>
<tr>
<td>1. How the normal ear hears and how the ear works</td>
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<tr>
<td>2. How my child hears, cause of hearing loss</td>
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<tr>
<td>3. About hearing aids</td>
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<tr>
<td>4. How hearing aids will help my child</td>
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<tr>
<td>5. About other types of hearing devices</td>
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<tr>
<td>6. How to keep the hearing aid(s) on</td>
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### Communication

<table>
<thead>
<tr>
<th></th>
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<th>Not sure</th>
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<th>Yes—Info</th>
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<tbody>
<tr>
<td>1.</td>
<td>How to teach my child to listen</td>
<td></td>
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<tr>
<td>2.</td>
<td>How will the hearing loss affect my child’s ability to learn to talk</td>
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<td>3.</td>
<td>How language develops</td>
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<td>4.</td>
<td>About sign language</td>
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<td>5.</td>
<td>How my child will communicate</td>
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<tr>
<td>6.</td>
<td>How I can communicate with my child</td>
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</tbody>
</table>

### Services and Educational Resources

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>No</th>
<th>Not sure</th>
<th>Yes—Discuss</th>
<th>Yes—Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Information about special services available for my child</td>
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<tr>
<td>2.</td>
<td>Information about special services my child may need in the future</td>
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<td>3.</td>
<td>More time to talk with my child’s teacher of therapist</td>
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<td>4.</td>
<td>Information about other conditions my child may have</td>
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<td>5.</td>
<td>Reading materials, videos, local, state and national organizations and resources about hearing loss</td>
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</tbody>
</table>

### Family and Social Support

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<thead>
<tr>
<th></th>
<th></th>
<th>No</th>
<th>Not sure</th>
<th>Yes—Discuss</th>
<th>Yes—Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Talk with someone in my family, or a friend, about my concerns</td>
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<td>2.</td>
<td>Opportunities to meet with other parents of children who are deaf or hard of hearing</td>
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<td>3.</td>
<td>Opportunities to meet deaf and hard of hearing adults</td>
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<td>4.</td>
<td>Information about parent support groups</td>
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<td>5.</td>
<td>More time for myself</td>
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<td>6.</td>
<td>Help our family to accept the hearing loss</td>
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<td>7.</td>
<td>Meet with a counselor who specializes in hearing loss issues</td>
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<td>8.</td>
<td>Explaining my child’s hearing problem to others</td>
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</table>

### Child Care and Community Services
1. Help locating good baby-sitters for my child
2. Help locating a day care program for my child
3. Help locating a doctor, dentist, etc.
4. Help with transportation

Financial

1. Paying for hearing aids
2. Paying for therapy
3. Paying for child care/respite care
4. Paying for other special equipment my child needs
5. Paying for food, housing, medical care, clothing, or transportation

Please list other topics or information that you feel would be helpful to receive or discuss:

Is there a particular person with whom you would prefer to meet?

Thank you for your time. We hope this form will be helpful to you in identifying the services that you feel are important.