Chapter 174: Education of the Hearing Impaired

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The physician who diagnoses a child as hearing impaired is often one of the first in a long progression of professionals to counsel parents on the management of their child. Often referred to as the *invisible handicap,* the presence of a hearing impairment can have devastating effects on educational, social, and vocational achievement.

When a child is identified as having a permanent hearing loss, parents often feel obliged to make immediate decisions that will have a lasting impact on the child's life. While experiencing a sense of grief over the loss of their child's hearing, they find themselves submerged in unfamiliar terminology, angered and frustrated by any delay in diagnosis, confused by the assortment of educational methods, and constrained by the particular biases of professionals who may disagree on what is best for a given hearing-impaired child. Parents look to the diagnosing physician as an expert who will provide comprehensive medical treatment and direct them to the most appropriate (re)habilitation and special educational services. The interdisciplinary team of physician, audiologist, speech pathologist, and deaf educator provides parents with a complement of services to help them cope with their child's deafness and to make informed decisions about management.

When a hearing loss occurs before basic language skills have been established, the subsequent communication deficit permeates the entire educational process. The child's mastery of language becomes the primary concern. During the preschool years, the focal point of the child's program is the habilitation of communication skills. At the elementary and secondary levels, the focus shifts to the application of language in the development of academic, social, and vocational skills. A continual effort must be made to develop the communication skills needed to take advantage of the educational, social, and vocational opportunities of the general populace.

The issues of deaf education are complex, but, when appropriate treatment and services are provided, hearing-impaired children grow to become stable, independent, and productive adults. This chapter provides information useful to physicians who treat children with hearing impairments. In particular, it highlights the history of deaf education and reviews the current educationals guidelines, pertinent issues, and available resources for hearing-impaired children and their families.

Historical Background: Education of the Deaf

Misconception about the abilities of the deaf have influenced their educational, social, and legal status since early Greek, Hebrew, and Roman times. For hundreds of years, the relationship between hearing loss and the inability to speak was not recognized (Harper-Bardach, 1986; Silverman, 1978). Because speech was the primary avenue for education and the deaf could neither speak nor understand speech, they were thought to be senseless and incapable of reason. The term "deaf and dumb" (a mistranslation of Aristotle's observation that those born deaf were also "speechless") came to be associated with mental deficiency. As a result, congenitally deaf individuals during these early times were afforded few rights and little or no social standing. They were banned from participation in religious and civic

ceremonies, and only those from influential families received even a semblance of education. The influence of these cultures on the centuries to follow sustained the false assumption that the deaf were incapable of learning.

Renaissance thinking began to change attitudes about the abilities of the deaf. The early teachers of this period were usually physicians or clergy who took special interest in the care and treatment of a particular deaf person. The emphasis was most often on religious instruction rather than on pragmatic communication or integration into the hearing society. One of the first to recognize that the deaf could be educated was Girolamo Cardano (1501-1576), a physician who taught the deaf through associating written symbols with objects and pictures. In 1555, Pedro Ponce de Leon (1520-1584), a Spanish monk, used reading and writing as a means of teaching the deaf to speak. Juan Pablo Bonet (1579-1620) wrote the first book on the education of the deaf, in which he described his methods of teaching speech and language through touch and vision supplemented with signs and a manual alphabet.

By the eighteenth century, Europe was divided on the issue of which method provided the best education for the deaf. One faction, led by the French priest Charles Michael de l'Pee (1712-1789), favored manual forms of communication. De l'Pee developed and expanded sign language as the more natural and more efficient means of instruction. He tried incorporating teaching speech by the methods of his predecessors but thought it was impractical. The other faction, led by Samuel Heinicke (1729-1790) in Germany, believed that spoken language was the basis of thought and so favored oral forms of communication, teaching language through speech and lipreading. Both factions relied on vision as the primary avenue of instruction because, without hearing aids, the use of residual hearing was not feasible. The debate as to which was the better method of instruction was declared a draw by the Zurich academy in 1753.

De l'Pee's success led to the establishment of the first public school for the deaf in Paris in 1775. His school served as a training program for teachers of his French method. The specific techniques used by the oralists were often held in secret between the mentor and his disciples. Although Heinicke founded the first state-supported school for the hearing impaired in Germany in 1776, he left no successful disciples of his methods.

Deaf education in the USA is rooted in the history of the European teachers. Thomas Hopkins Gallaudet (1787-1851) founded the first permanent public school for the hearing impaired in Hartford, Connecticut in 1817. Gallaudet's school, now known as the American School for the Deaf, served as the model for the emergence of state schools for the deaf and promoted the use of sign language as the preferred method of teaching in the USA. Gallaudet had gone to England to study the successful oral methods being used there. He was discouraged, however, by the secrecy of those teachers and within the year traveled to France to learn the manual methods of the Abbé Sicard, a disciple of the Abbé de l'Pee. Efforts to establish an American oral school for the deaf were not successful until 1867 when the Clarke School for the Deaf in Northampton, Massachusetts and the Lexington School for the Deaf in New York City were founded.

The subsequent growth of deaf education in the USA occurred in both public and private schools. Each state eventually established a public residential school. Special day schools were gradually established in more populated areas, and by the 1940s a number of

public school systems offered special services for their hearing-impaired students.

Both oral and manual methods have alternately dominated as the preferred method of instruction. Although oral programs were the most widely available until the mid-1970s, approximately 70% of the local school programs currently include manual sign language as a training component (Bess and Humes, 1990). Section 504 of Public Law:93-112, the Vocational Rehabilitation Act of 1973, began a trend toward equal rights for the disabled. In 1975 Congress enacted Public Law:94-142: Education for All Handicapped Children Act (referred to as the civil rights act for the handicapped), which required public schools to provide for handicapped children in their jurisdiction. This and subsequent related legislation continues to support the special educational needs and human rights of the hearing impaired and other disabled persons in the USA.

Legal Rights to Education

United States Public Law:94-142 entitles all disabled children from 5 to 21 years of age to (1) an education, (2) a free education, (3) an appropriate education, (4) an education in the least restrictive environment, (5) due process under the law, (6) confidentiality, and (7) evaluation using nondiscriminating tests. Federal funds are appropriated not only for direct teacher/child activities but also for support for teacher training programs, repositories of information, support for innovative programs, postsecondary education programs, and rehabilitation counseling.

PL:99-457 - Education of the Handicapped Act Amendments of 1986 - extended the entitlement of PL:94-142 through the year 1944, mandated that by 1991 similar services be provided to children ages 3 to 5 years, and allowed funding for local school systems to provide infant services (age 0 to 3). These parent-child services for the hearing impaired, offered since the 1940s and widely accepted since the 1960s, support the role of parents in facilitating speech, language, and auditory skills during the years considered most critical to their child's communication development (0 to 3 years). Services may be provided through home visits by a counselor/teacher or through parent/child visits to an instructional center.

Each state is required to enact regulations to ensure that the federal laws are implemented and to establish how federal funds will be used within the local school systems. Specific guidelines for evaluation and program listings for each state are available from their respective State Department of Education-Office of Special Educational Services (SDE-OSES). Because the federal laws offer special educational guidelines for specific disabling conditions, local programs have been planned and developed on the basis of category, degree, and incidence of impairment.

Eligibility criteria for special educational services

The degree of loss and other related issues are discussed later in this chapter. However, to determine eligibility for special educational services under PL:94-142 and related legislation, the following specific definitions are given in the Rules and Regulations for Implementation of the Education for All Handicapped Children Act of 1975 (US Dept of Health, Education and Welfare, 1977):

Deaf means a hearing impairment which is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification, which adversely affects educational performance.

(Most states include in the operation definition for deaf an unaided pure tone average of 500, 1000, and 2000 Hz of 70 dB HL (ANSI) or more in the better ear.)

Hard of hearing means a hearing impairment, whether permanent or fluctuating, which adversely affects a child's educational performance but which is not included under the definition of deaf.

(Most states include in the operational definition of hard of hearing an unaided pure tone average of 500, 1000 and 2000 Hz, between 25 and 70 dB HL (ANSI) in the better ear.)

The generic term *hearing impaired* is used to describe hearing loss that adversely affects a child's educational performance and includes both deaf and hard-of-hearing children.

Evaluation process

Federal law requires that all children suspected of having a disability be evaluated by an interdisciplinary team and that children receiving special educational services be re-evaluated every 3 years. The evaluation must be completed in a timely fashion unless a justified written request for extension is made. Because an Individualized Educational Plan (IEP) is developed on the basis of the interdisciplinary evaluation results, it is necessary to include each developmental and academic area in the evaluation. Areas typically included are academic, communication, intelligence, medical (including vision, hearing, and motor ability), and social/emotional behavior. If parents disagree with the results of the evaluation conducted by the school system, they are entitled to an independent evaluation by an agency outside the school system.

The evaluation must be conducted using nonbiased evaluation procedures. Before the enactment of this legislation, the use of standard verbal or written intelligence tests led to the placement of many hearing-impaired children into classes for the mentally retarded. The language level and overall communication ability of the hearing-impaired child potentially influences every aspect of the evaluation process. To obtain an accurate picture of the child's abilities, careful selection of appropriate tests, administration in the child's usual mode of communication, and critical interpretation of the results are necessary.

Individualized educational plan

An IEP must be developed for those eligible for special educational services after the evaluation is completed. The IEP is a legal document jointly developed and agreed on by parents and representatives of the educational agency. Professionals from outside agencies may be asked to participate when appropriate. The IEP must specify the current status of the child, annual goals and short-term objectives for instruction, the educational and support services needed to meet the goals, the type of classroom in which the instruction will take place, the extent to which the child will participate in regular school activities, the evaluation plan, and the date the services will begin. To varying degrees, the specific methods for

achieving those goals are described in the IEP.

Due process

If the parents and school system cannot agree on an educational plan, the child is entitled to due process of law. Each school system must have written guidelines available for parents describing their legal rights, including procedures for requesting due process hearings. These written guidelines are available on request for use by professionals.

Least restrictive environment

The decision as to where the child will receive the most appropriate instruction is made as part of the IEP. The least restrictive environment is the setting that allows for "separate schooling or other removal of handicapped children from the regular educational environment ... only when the nature or severity of the handicap is such that education in regular classes with the use of supplementary aids and services cannot be achieved satisfactorily" (US Dept of Health, Education and Welfare, 1977). That is, the most appropriate instruction is provided with the least degree of exclusion from the regular educational setting as possible. However, the term *least restrictive environment* should not be considered synonymous with mainstreaming (participation in a class with normally hearing children). That which is the least restrictive for one child may be unduly restrictive for another. Placement decisions should be based on the overall status of the child and the current program goals.

A continuum of placement options are defined by PL:94-142. These options have been defined in many states to reflect the type of services delivered and the degree to which the child participates in the regular instructional program; that is, the degree to which the child is "mainstramed". These options are commonly described as follows:

- *Regular class with consultation* enrolls the child in a regular classroom. Support services may be offered to the classroom teacher regarding any special needs of the student.

- *Regular class with itinerant services* enrolls the child in a regular class with periodic special instruction as needed. The special educator may be responsible for providing services to students enrolled in several schools and, therefore, may not be continually available at the school site.

- *Regular class with resource instruction* enrolls the child in a regular class, with special-education instruction in areas of special need provided for up to 3 hours per day.

- *Self-contained class with mainstreaming* enrolls the child in a special-education class, with participation in regular classroom instruction in areas of strength for up to 3 hours per day.

- *Self-contained class on regular campus* enrolls the child in special education class for the entire school day. The classes are located on a regular school campus, which allows for interaction with nondisabled children for activities outside the classroom.

- *self-contained class in special school* enrolls the child in a special school for disabled children for the entire school day where the child receives specialized instruction and related services.

- *Hospital/homebound* students receive special instruction at home or in a hospital when health or other factors preclude their participation in instruction with other children. This placement is used most often for children with health impairments.

- *Residential placement* enrolls the child in a special school on a 24-hour basis. Educational services are provided on campus and extracurricular activities are designed with the special needs of the students in mind.

Communication Methods of the Deaf

Improving communication and academic achievement is the common goal of all educational programs and teaching methods used with hearing-impaired children today. Many believe that oral skills enhance the ultimate life options available to a child; however, not every deaf child is able to achieve intelligible spoken language or to be educated exclusively through spoken language. Philosophic divisions continue between (1) those who believe that because language is normally spoken first, speech should be the "first language" of the hearing-impaired child and (2) those who believe that visual (sign) language is the natural language of the deaf and, therefore, should be developed first and used as the basis for teaching other forms of communication. The following is a brief explanation of the more commonly used instructional methods and examples of some of the techniques used.

Oral methods

The goal of any oral program is for the child to learn to speak, to understand speech, and to function in a world in which people communicate through spoken language. The underlying premise is that spoken language is an innate, human capacity and that hearing-impaired children have the same biologic predisposition for language learning as does any child. Oral programs include approaches that focus on the acoustic and visual codes of spoken language. Depending on the particular technique advocated, access to these codes may be provided through audition, vision, touch, or proprioception.

The *traditional oral approach* emphasizes speechreading as the primary avenue for learning. Tactile cues provide additional information about the differences in the production of speech features that are lost to the visual sense (eg, voicing, nasality). This approach continues to be used with children who have limited or no auditory ability. With advances in hearing aids and other assistive listening devices, more emphasis has been placed on the role of residual hearing in conjunction with these traditional oral training techniques.

Auditory/oral is the contemporary descriptive term for programs that emphasize both residual hearing and speech reading as avenues for learning spoken language. Hearing aids and assistive listening devices are used in conjunction with the traditional techniques of speechreading, reading, writing, and direct touch to facilitate the development of auditory perceptual skills and spoken language. Cochlear implants and vibrotactile or electrotactile devices may be used as alternatives to conventional hearing aids when adequate auditory

responses are not achieved.

Auditory/verbal programs emphasize the exclusive use of hearing for the development of spoken language. Hearing, as a feedback mechanism, is used to facilitate spoken language through the normal sequential stages of receptive auditory skills development. The child is encouraged to use hearing as the leading modality to interpret the many aspects of speech and environmental sounds that are accomplished only through hearing. To varying degrees, the training is conducted without speechreading or other visual cues.

Cued speech was developed as an aid to speechreading and speech development. Eight hand shapes in four positions near the speaker's face are used to differentiate among speech sounds, two thirds of which look the same on the lips (Fig. 174-1) (Cornet, 1967). The addition of the hand signal distinguishes among speech sounds that look alike on the lips. A common misconception is that cued speech is a form of sign language; however, because the cues are meaningful only when used in conjunction with spoken language, cuing is considered an oral method.

Manual methods

Manual methods use various forms of sign language to develop communication competency. The underlying premise is that visual language is the natural language of the deaf and is the most efficient avenue for communication. A brief description of the forms of manual communication commonly used in the USA follows.

American Sign Language (ASL or Ameslan) is regarded by many to be the natural language of the deaf. The meaning of a sign is determined by its position, configuration, direction of the palms, and specific hand or body movements. Many signs are iconic and can be understood by most people. ASL is recognized as a formal language consisting of unique vocabulary, grammar, syntax, morphology, and expressions that are distinct from other recognized languages, including English.

The grammatical and syntactic differences between ASL and English pose limitations for reading and writing English. As a result, manually coded English systems have been developed to more closely represent English. Whether English should be taught as the primary language or as a secondary language to ASL is an issue of debate.

Signed English maintains English syntax and grammar using the vocabulary (that is, signs) of ASL. Special markers may be used with a sign to designate features such as plurality, possessives, and verb tense. This form of manual communication has been endorsed by the National Association of the Deaf as the preferred language of instruction because it eases the transition from the expressive form of language to the written forms of the English language.

Seeing Essential English (SEE 1) uses literal translations of English morphology rather than conceptually based signs. Signs represent each word as it would occur in spoken English and a system of signed markers is included to identify articles, verbs, verb tenses, number, roots, prefixes, and suffixes. Because the signs are translated so literally, they do not always resemble the ASL signs on which they are based. For example, the word butterfly is

expressed by using the sign for *butter* followed by the sign for *fly* rather than using one sign to express the concept for the inset. Therefore, proficiency in ASL does not guarantee comprehension of SEE 1.

Signing Exact English (SEE 2) was developed as a modification of SEE 1 to make it more intelligible to those using ASL and yet maintain the syntax of English. English rules of grammar and syntax are applied to the conceptually based signs of ASL with the signed markers of SEE 1 used as needed for clarification of specific words.

Fingerspelling is a manual alphabet system with a hand shape and movement to represent each letter of the alphabet (Fig. 174-2). Each word in a message is spelled. Fingerspelling is most often used with other forms of manual communication to convey specific ideas for which there are no signs.

Total communication

The principal goal of total communication is to develop a language system as early as possible so that all developmental areas are enhanced. Manual signs, auditory training, and speechreading are presented as mutually reinforcing to language development. A skill established in one modality can then be used to facilitate skills in another. To provide better quality models in one modality, some programs advocate sequential rather than simultaneous presentation.

The *Rochester method* was one of the first combined methods developed to provide simultaneous presentation of both spoken language and a visible manual form. This visible speech method consists of fingerspelling each word as it is spoken. Its major disadvantage is in maintaining a good spoken language model while fingerspelling at the slower rate.

The contemporary *total communication method* provides access to English through a form of manually coded English (sign and fingerspelling); auditory training using hearing aids, cochlear implants, assistive listening devices, vibrotactile aids or electrotactile devices; speech; speechreading; reading and writing; and a combination of visual/proprioceptive/tactile cues. The signing system to be used must be decided on and consistently used. Periodic evaluation of the child's use of language through each modality helps determine how much emphasis to place on the auditory/oral and manual program components. Like all other methods, the programming designed for the child using total communication will be determined by the critical factors discussed later in this chapter.

Academic Achievement

The traditional teacher-as-lecturer style, which persists in most schools, assumes that by school age a child has acquired the communication skills necessary for formal instruction. The ability to apply those skills to academic, social, and vocational matters largely determines the child's ultimate educational success. The challenge to those in the field of deaf education is to bring the academic performance of the hearing impaired toa level comparable to that of their hearing peers. Without comparable skills, the expectations for job opportunity and life earning for the hearing impaired will continue to lag behind those of the general public. Despite advances in each of the many professional fields serving hearing-impaired students,

this challenge is unmet for many students.

For more than two decades, the Center for Assessment and Demographic Studies (CADS) at Gallaudet University's Research Institute has examined the demographic profiles and academic performance of hearing-impaired students in special-educational programs across the USA. Results of their Annual Survey of Hearing Impaired Children and Youth and the normative data collected from the Stanford Achievement Test Revised for the Hearing Impaired provide the most extensive information available on this population. The CADS survey results (Allen, 1986) currently represent 60% to 70% (over 55.000 students) of school-aged, hearing-impaired children and youth and includes both part-time and full-time special-education students in public, private, residential, and day-school programs. Results of the CADS Testing Program provide a relatively clear picture of the academic trends of hearing-impaired students in the USA.

The two areas of achievement examined over the years are reading comprehension (most strongly influenced by language ability and critical to all subjects areas) and mathematics computation (least influenced by language ability). A comparison of the test results collected in 1974 to those collected in 1983 suggests several trends regarding achievement levels (Fig. 174-3, A and B). The achievement levels of hearing-impaired students continue to lag behind those of their hearing peers for both reading comprehension and mathematic computation, with the deficit in reading comprehension more substantial than that in mathematic computation. An unexplained trend in the performance of the hearing-impaired group in 1984 is a noticeable plateau in achievement, which appears to occur at third grade level for reading and at seventh grade level for mathematics. The nature of the study (cross-sectional rather than longitudinal) and the various changes in the population demographics between 1974 and 1983 make it difficult to account for this trend. What is evident, however, is the minimal gains in reading levels for both data collection periods. Less than one grade level was achieved in reading comprehension between ages 10 and 18. Although the 1983 results showed improved overall performance when compared to 1974 results, the reading comprehension ability of the average 18-year-old hearing-impaired student is equivalent to slightly less than third grade level for both study periods.

Factors That Influence Communication and Education

Results of the CADS survey and other reports have identified multiple factors that influence communication and education of the hearing impaired in the USA. Specifically, these factors affect the child's ability to acquire competency in English as the language of instruction in American schools. In February 1988, the United States Federal Commission on Education of the Deaf (COED) submitted a report entitled, *Toward Equality: Education of the Deaf*, which emphasized the need for a higher level of competence in the English language among the deaf (The Commission on Education of the Deaf, 1988). A recent study by Geers and Moog (1989) suggests that such mastery of English is the predominant predictor of reading achievement. The degree to which the hearing-impaired child masters language depends on a number of patient and program variables (Nowell, 1985).

Patient variables

Type and degree of loss

A number of attempts have been made to define degree of hearing loss in a way that will predict educational needs. In general, the greater the hearing loss, the greater the impact on communication as the basic skill for learning. The child must be able to hear the range of frequencies and intensities of normal conversational speech for normal language to develop. This range of frequencies and intensities can be represented on the audiogram as the speech banana (Fig. 174-4) (Ling and Ling, 1978). The relationship between the child's unaided hearing thresholds and the speech banana is a general indicator of the amount of speech information that is detected without a hearing aid. Although a child may be classified as deaf or hard of hearing on the basis of unaided pure tone average, this classification may unduly influence the expectations of parents and teachers because it does not reflect how the child will perceive speech with a well-fitted hearing aid.

To avoid the many misconceptions associated with the terms *hard of hearing* and *deaf,* consideration should always be given to how the child functions when using amplification. For example, many children with hearing losses of 90 dB or even 100 dB consistently use their hearing aids to enhance their overall communication. Thus the generic term *hearing impaired,* which encompasses all degrees of hearing loss (mild to profound), is the preferred term when the child's ability to use residual hearing has not yet been determined.

It is difficult to predict the effects of unilateral and fluctuating conductive losses on auditory skill development, language development, and subsequent educational performance. Until recently, unilateral hearing was believed to be adequate for speech and language development with little or no impact on educational achievement. However, an estimated 35% of children with unilateral hearing loss have failed at least one grade during their educational career, and 13% have needed some type of special educational services (Bess and Humes, 1990). It has also been reported that learning-disabled children with central auditory processing deficits have a history of recurrent otitis media at a significantly higher rate (46.3%) than those learning-disabled children with no central auditory processing deficits (22%) (Downs, 1988). Although most will agree that the presence of a conductive hearing loss resulting from otitis media alters the child's ability to perceive speech and language, the long-term effects on language ability and educational achievement have not been well established.

Age of onset

The first 3 years in a child's life are recognized as a critical period for learning normal speech and language. The normally hearing child acquires basic communication skills simply by listening to speech and language models. By trial and error the child learns to understand and produce spoken language; no formal training is usually required. A hearing loss causes a disruption in this normal chain of events. Terms such as *prelinguistic* (before language acquisition), *perilinguistic* (during the normal language acquisition years), *postlinguistic* (after language acquisition), or *prevocational* (after language acquisition, but before vocational training is complete) attempt to describe the level of language development or educational status at the onset of the hearing loss. Such terminology implies a certain level of ability or

expected level of performance. Although each group requires special attention for optimal achievement, each poses a different set of programmatic issues. For example, the existing language skills of the prevocationally deafened child serve as a tool for rehabilitation, whereas the acquisition of language skills will be a continual goal of the program for the prelinguistically deafened child.

Length of deprivation

Children who have been identified early and enrolled immediately in special education are more likely to develop better communication skills. Early intervention is critical to parent education and adjustment and to avoiding lost time during the critical learning period. Some evidence suggests that periods of sound deprivation cause permanent physiologic changes in the auditory pathways of the brainstem (Webster and Webster, 1979); however, the impact of these changes on human speech perception needs further investigation.

Response to amplification

The functional gain (ie, the difference between unaided and aided audiometric thresholds) is most often the first measure used to judge whether the hearing aid is providing appropriate amplification. Ling's speech banana (Fig. 174-4), which represents the spectrum of normal speech frequencies and intensities, is commonly used as the target for aided thresholds. Unless a child can detect speech sounds at comfortable loudness levels, development of higher level auditory perceptual skills cannot be expected. In addition to aided detection, speech perception skills, such as pattern perception and word identification, should be evaluated using standard test materials or modified materials with systemic observation for younger children. If expected levels of auditory perceptual skills are not achieved with training, an alternative to conventional amplification, such as a cochlear implant or tactile device, may provide more information and greater benefit.

Family support

Parents who become active co-workers in their child's management are more likely to accept a life-style that promotes effective communication consistent with the method chosen. The status of the parents' hearing is an important factor in how the family accepts and copes with the child's hearing loss. Deaf children of deaf parents have the advantage of early exposure to visual forms of communication and their parents' acceptance of deafness. The parents as role models enhance the child's self-esteem and feelings of acceptance (Prinz, 1985). The reaction of the 90% of parents who are normally hearing is often that of grief and dismay. Their ability to take an active role in the initiation of rehabilitative services is often impeded by their emotional reaction to the diagnosis. Professionals must not only recognize but accept that parents experience stages of grieving (denial, guilt, depression, anger, anxiety, and coping) similar to those described by Kubler-Ross (Tanner, 1980). Those counseling parents at the time of diagnosis should be aware that terminology used to describe a child's hearing may affect parent-child interactions, expected standards of achievement, determination of educational placement, and expected response from amplification (Ross and Calvert, 1967). A follow-up counseling session, scheduled within the week with the physician or audiologist, allows the parents time to adjust to their emotional reaction before they have to consider specific recommendations for follow-up care. Although the grieving process is most evident

after the initial diagnosis, it typically recurs, albeit with lesser intensity, when the child reaches school age, pubescence, high school graudation age, the age of expected independence, and when the parents reach retirement age. These recurrences should be viewed as normal processes of acceptance. However, referral for psychologic counseling may be appropriate when parents experience difficulty coping.

Etiology and other disabilities

Although the number of more severely hearing-impaired children is actually decreasing, the percentage of those with additional handicapping conditions has increased. The large number of hearing-impaired children from the 1964 rubella epidemic have passed through the educational system; however, advances in medical technology have made it possible for more children to survive complicated births and illnesses. Any additional disabling condition, especially those related to vision or motor ability, must be given special consideration when programs and program components are selected.

Program variables

Availability of support services

Audiologic support services, speech therapy, note taking, and interpreter services are typically associated with education of the hearing impaired. With the increasing numbers of hearing-impaired children with additional disabling conditions, other types of support services are more frequently needed (eg, occupational therapy, physical therapy, adaptive physical education). Special schools for the hearing impaired can often offer stronger support services to their students than are available for hearing-impaired children attending schools with normally hearing children. Because of the number of students enrolled in these special schools, services can be provided by professionals with expertise in the unique needs of the hearing impaired. Although special education programs are available for 90% of deaf children, less than 25% of hard-of-hearing children receive adequate support services (Moores and Moores, 1989). Although more children with mild to severe degrees of hearing loss wear hearing aids, their school programs may offer only speech therapy and no other support services (Flexer, 1990).

Parent education and training

Effective parent education programs expedite the parents' acceptance of their child's condition, promote proficiency in the instructional method of choice, and engage the parents as the principal managers of the child's (re)habilitation program. These programs are most needed during the period after initial diagnosis, when information is most critical to the emotional stability of the family and the acquisition of appropriate services for the child. The program should include knowledge of hearing impairment, its effects on communication, care of amplification, instruction in specific communication techniques, behavior management, legal rights, educational placement options, and information about various associations for the hearing impaired (see Information Sources). Individual Family Service Plans (IFSP), which are required for the families of disabled infants and toddlers by PL:99-457: Education of the Handicapped Act Amendments of 1986, are likely to become more commonplace within the next few years as a mechanism for implementing family support services (Roush, 1991). The

parents' ability to fully participate will depend on the quality of education and training they receive. Parent education and training programs must be designed to accommodate a changing society, particularly in view of the number of working and single parents, to prepare parents to take an active role in the child's intervention.

State of hearing aids

Despite technologic improvements and suggested maintenance programs, the last 20 years have seen little or no improvement in the functioning of amplification. Repeated studies indicate that less than half of the hearing aids used by children in school are functioning properly (Bess and McConnell, 1981). Our clinical experience suggests that this is still true. As the primary tool for auditory training, proper functioning of the hearing aid is essential. Programs that offer audiologic services in support of auditory training are more likely to successfully monitor the hearing aid and intervene when repair is needed.

Recognizing residual hearing

The degree to which a child can use residual hearing has the strongest effect on the (re)habilitation process. The more residual hearing available (aided or unaided), the easier the process. Prognosis improves if the child's individual program takes advantage of the hearing when it is available and seeks other means of instruction when it is not. Failure to recognize a lack of residual hearing results in inappropriate teaching techniques or failure to consider alternative devices that would provide better information from sound.

Expertise of teacher

The strength of any deaf education program depends on the caliber of the teacher and the degree to which available support services are used. The teacher's knowledge of and commitment to the method of choice is the single most important factor in the quality of implementation. Professional training in deaf education includes instruction in the various communication methods used to teach the hearing impaired. The practical aspects of training, however, usually occur in a facility that ascribes to a particular methodology. Proficiency in one method of communication does not guarantee proficiency in another. The level of proficiency of the teacher determines the quality of the language model given the child. For example, Pidgin Sign, a combination of English and ASL, is commonly used by those less proficient at sign language. Because it is neither English nor ASL, Pidgin Sign is comparable to the "broken English" of one for whom English is a second language. Such language is certainly less than an optimal model for the child who will be required to apply language to reading and writing. Likewise, those involved in the auditory training aspects of (re)habilitation should be versed in speech acoustics, amplification, and speech and language development.

Consistency of use of the method of choice

For the communication method to be effective, it must become a way of life for the child and family. Most parents will be unfamiliar with techniques needed to facilitate communication and will require instruction to apply those techniques in the home. In addition, the communication methods used among the professionals working with the child should also

be consistent. The advantage of special school settings is that the personnel are familiar with the method and together provide an enriched communication environment for the child.

Acoustic environment

The noise levels and reverberation in classrooms may make it impossible for a child using a hearing aid to hear. Average noise levels of 50 to 70 dB SPL are typical for regular classrooms. It has been suggested that the acceptable noise level during academic instruction - when the use of hearing aids is most critical - is 30 to 35 dB SPL; during nonacademic instruction (eg, art, physical education) the noise should be no greater than 45 dB SPL (Bess and McConnell, 1981). Preferential seating of the child near the teacher is not practical throughout the school day and does not consistently meet the signal/noise (S/N) ratio needed for satisfactory speech perception. The recommended S/N ratio of +20 dB can be easily achieved with the use of FM auditory training units or other assistive listening devices. The microphone (used near the teacher's mouth) effectively reduces the level of background noise and transmits the teacher voice via FM to the child's hearing aid at a level 15 to 30 dB above the background noise.

Basis for Choosing a Communication Method

The first question usually posed by the parents of a hearing-impaired child is whether to use sign or spoken language. An auditory/oral method will usually be appropriate for less severely hard-of-hearing children with properly fitted and well-maintained hearing aids. However, there is more controversy concerning the most appropriate method for educating severely and profoundly hearing impaired children. To date there is no confirmed technique for predicting the most appropriate method of communication for a hearing-impaired child. The method is frequently chosen based on the availability of programs and bias of the parents' counselor at the time of diagnosis.

For most hearing-impaired children, diagnostic teaching enables parents and professionals to assess the effects of patient and program variables on the child's communication ability. With this information, the child's strengths and weaknesses can be determined and then changes in methods or in the emphasis of program components can be made. The child's needs must be emphasized rather than the rate of success of a particular communication method. Because each method has its "stars" and each its "failures", it is imperative that a lack of progress be viewed not as a failure on the part of the child or parents, but as the identification of the need for a more appropriate teaching method for the child.

Two scales have been proposed to determine the likelihood of a child's ability to acquire spoken language (ie, appropriateness of oral education). The Deafness Management Quotient (DMQ), designed by Northern and Downs (1984), and the Spoken Language Predictor (SLP, depeloped by Geers and Moog (1987), weigh factors considered most important in the acquisition of spoken language. The DMQ uses a point system to weight the factors of unaided pure tone findings, central auditory system intactness, intelligence, family support, and socioeconomic status. The SLP, developed to overcome some of the inadequacies in the DMQ, considers aided speech perception skills, language competence, nonverbal intelligence, family support, and the child's speech communication attitude as the most

important factors in predicting a child's potential for developing spoken language.

Those working with a deaf child must provide parents with a realistic profile of the child's strengths and weaknesses and an unbiased account of the strengths and weaknesses of all methods. WIth that information the parents can select the communication method that best serves the needs of the child and the family. In practice, the low incidence of hearing-impaired children often precludes the availability of a wide variety of options in a given geographic area. It is not unusual for families to relocate to access programs of choice and to allow the child to continue living at home.

Issues Related to Program Placement

The current federal mandates regarding the education of disabled children have supported some of the most significant advances in the history of special education. As a result, the trend has been toward parental preference for local school enrollment to preserve the family unit and access regular (normally hearing) educational programs. Although these mandates have afforded more appropriate education for the vast majority of children with all types of disabling conditions, they also have created mixed blessings. Issues of compliance with the law, documentation, extreme interpretations of mainstreaming, and fear of litigation by the local school systems have complicated the issues of child learning, educational philosophy, and sound teaching practices. The issues of least restrictive environment, civil rights, and human rights have become associated with placement. Nevertheless, the enactment of PL:94-142 has made local school placement a viable alternative for many hearing-impaired children.

Local public schools

An increasing number of students are enrolled in the special education programs of local public school systems; however, because hearing impairment is a low incidence condition, many school systems do not have a sufficient number of children with the allowable age range to offer a wide variety of communication methods or support services. The total communication approach, by philosophy, is often considered more likely to meet the needs of more children within the public school setting. As a result, 70% of public school programs use total communication as the preferred instructional method for deaf children (Bess and Humes, 1990). In some areas, local school systems form cooperative programs to provide high-quality education. Some children travel considerable distances to benefit from these cooperatives. Where there are sufficient numbers of children to form a special class (maximum age range of 3 years for a given class), the schools may offer both total communication and auditory/oral programs. In most cases, children classified as hard of hearing are recommended for the oral program.

Within the local scholl systems, access to regular educational programs is more readily available. This trend toward mainstreaming is a result of several factors: (1) benefits of early intervention, (2) public school cooperative programs for low incidence; (3) preference by the parents for regular classes rather than special education programs; (4) a shift from a medical model to an educational model of management for the disabled; (5) better use of residual hearing by technologic advancement; and (6) development of support services within regular educational programs. Considerable efforts to successfully mainstream hearing-impaired

students have included strategies such as team teaching (combining classes of both hearing and hearing-impaired students using one teacher of the deaf and one regular education teacher) and reverse mainstreaming (having normally hearing students attend special schools). Although there are no set guidelines for identifying who will succeed in a mainstream setting, successful students share certain characteristics. Successful students (1) maximize use of residual hearing; (2) use hearing aids full-time; (3) exhibit academic performance level comparable to class members; (4) display competence in communication; (5) have a self-directed personality; (6) receive appropriate support services within the school; (7) receive parental support; and (8) have available assistive listening devices (Davis and Hardick, 1981).

State schools for the deaf

The majority of students at the state schools for the deaf reside at the school; however, those living in the area may attend as day students. As stated earlier, the advantage of the state school is the availability of support services specific for the hearing impaired. In adolescence, when the need for developing social competence intensifies and vocational preparation is more focal to the educational program, the advantages of the support offered in a special environment may be more evident to the child and family. The major disadvantage is the restricted opportunity to interact with normally hearing children. More recently, however, many state schools are working cooperatively with local school systems to provide these opportunities.

Private school alternatives

A significant number of parents choose private auditory/oral schools as an alternative to the total communication programs offered in the public schools. The administrators of several of these schools formed an association in 1981 to promote quality oral education for the hearing impaired. Currently, 24 "Option" affiliated facilities offer oral education as an alternative to the public school total communication trend by providing day and residential oral educational programs.

Postsecondary education

Until the 1960s, Gallaudet University, established in 1864, was the only postsecondary institution for the deaf in the world. Other programs, particularly vocational technical programs, such as the National Technical Institute for the Deaf (NTID), were established and receive financial support from federal legislation and offer specialized training for the hearing impaired. In addition, an increasing number of state and private colleges and universities offer support services to disabled students.

Steps for the Referring Physician

The physician who identifies a child with a hearing loss has a key role in directing the parents toward appropriate special educational services. Referral should be accomplished expeditiously.

1. Refer immediately any child considered at risk for hearing loss or whose parents express concern over the child's response to sound or speech and language development to an audiologist experienced in and specially equipped for pediatric testing. Auditory brainstem response (ABR) testing makes assessment of the peripheral auditory system possible even in newborns and can be ordered for young children who cannot participate in behavioral testing procedures. The outcome of referring concerned parents will be either reassurance about the status of the child's hearing or early identification for appropriate and timely intervention.

2. Give medical clearance for fitting hearing aids as soon as possible.

3. Refer the parents to the child's local school system or State Department of Educaton - Office of Special Educational Services (SDE-OSES) for information about legal rights and location of special educational services.

4. Keep a list of the available programs for the hearing impaired and encourage parents to investigate each for strengths and weaknesses.

5. Provide ongoing medical identification and treatment of any condition that would interfere with, complicate, or restrict (re)habilitation (eg, allergies to earmolds, outer or middle ear disease, visual difficulties).

6. Encourage parents to reassess objectively the child's progress periodically to determine the benefits of the hearing aids and effectiveness of the educational program.

7. Encourage parents to contact the local chapter of the association for the deaf and the local support group for parents of hearing-impaired children, if available.

Parents who have received sensitive guidance from their physicians credit them as instrumental in helping them cultivate a positive attitude and pursue appropriate services. We have found the following counseling techniques common to those parents who have a positive working relationship with their child's physician:

1. Information was presented in simple, nonthreatening terms. The reasons for tests and interpretation of the results were presented in a positive manner.

2. The child was treated as a whole person. Parents report that they are most comfortable with the physician who has expressed concern for the child's total development, the progress of the (re)habilitation, and the effects of the disability on the child and family.

3. The physician took time to listen. Given time, the parents began to more fully grasp the implication of a hearing impairment and could develop a positive outlook toward their child's future. The parents' outlook may interfere with their interaction with the child, their self-confidence in making decisions for their child, and their ability to follow through on instructions.

4. The physician directed parents toward appropriate information services and respected their decisions as parents.

Summary

The presence of a hearing loss changes a child's relationship with the environment at a fundamental level. As a result, the issues related to education of the hearing impaired are complex. Despite the changes in educational services resulting from federal mandates, the academic performance of the hearing impaired as a group suggests that considerable improvement of services is needed. For (re)habilitation techniques to be successful, they must be implemented as early as possible and extend beyond the educational setting as a way of life for the child and family.

Much time and energy has been spent debating which method of teaching is best. Although the intensity of this debate may be difficult to understand, it fosters quality care and promotes alternatives for a population with a wide range of needs. The successful method acknowledges the needs of the child and family and fosters communication proficiency suitable for social, academic, and vocational pursuits.

The physician's role includes not only the initial diagnosis of the hearing loss but also counseling and directing parents toward services that best meet the needs of their child, monitoring the status of the child's hearing, and assisting parents in the ongoing assessment of the child's management. Although the ultimate outcome for a given child cannot be predicted, many of the critical criteria for success have been identified and, when met, result in the quality of education every child deserves.