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ABSTRACT

This paper addresses incidence of hearing loss in school-age children, components of hearing conservation programs, and hearing loss education. Incidence figures for the following hearing loss categories are detailed: unilateral hearing loss, fluctuating hearing loss, minimal sensorineural hearing loss, and mild to profound hearing loss. Discussion of hearing conservation program components considers: the importance of getting the child's history early; letting teachers know which children have histories of hearing problems; guidelines for conducting screening tests; determination of needs; determination of amplification candidacy; determination of educational significance; the teacher's role; the use of informal checklists; screening by speech-language pathologists; use of a formally designed checklist; categorization of children identified during screening; possible service options as determined by student needs; and educational and audiological support. Audiologists are encouraged to provide education on noise-induced hearing loss and fluctuating hearing loss. Appendices include: (1) a flowchart of a hearing conservation program; (2) a sample questionnaire for obtaining a history of ear and hearing problems; (3) a classification of children identified with hearing loss; and (4) a matrix showing the relationship of degree and long-term hearing loss to psychosocial impact and educational needs. Contains 20 references. (DB)

Chapter 8

KEYS TO EFFECTIVE HEARING CONSERVATION PROGRAMS: HEARING STATUS OF SCHOOL-AGE CHILDREN

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The incidence of school-age children with hearing loss varies depending upon the research studied. It has been reported that 24.4% of children aged 5 to 10 years present some type of middle ear disease (Eagles, 1972). It is important for teachers and school administrators to realize that approximately 5 children per elementary class will have some degree of hearing loss in one or both ears at any time. The incidence is greater in preschool and kindergarten classes than in upper elementary grades.

HEARING LOSS CATEGORIES

Unilateral Hearing Loss

Approximately 2% of school-age children have hearing loss in only one ear (Bess, 1985). We have just begun to realize the impact unilateral listening has on speech perception, learning, self-image, social skills, behavior, etc. Research has indicated that almost half of all children with unilateral hearing loss require educational support services and/or grade retention, and many have significant behavioral or social difficulties.

Fluctuating Hearing Loss

Approximately 85% of children "outgrow" ear problems by the age of 10 (Kessner, Snow & Singer, 1974). Of the general population, 12% have histories of chronic otitis media and fluctuating hearing, and twice as many students who are considered learning disabled (LD) have had chronic ear problems than non-learning-disabled students. Incidence of chronic otitis media in the LD population has been identified as 20-25% (Reichman & Healey, 1983), although some studies have found a much higher incidence (Sarff & Ray, 1981). When the students considered to have attention deficit disorders are considered, almost three fourths have had chronic ear problems (Hagerman & Falkenstein, 1987). A study of identification of gifted students indicated that 75% of the students who had gifted characteristics but who did not score in the superior range on intelligence tests had had chronic ear problems (Silverman, Chitwood, & Waters, 1986). In summary, fluctuating hearing and degraded listening ability affect a child's optimal cognitive development and his or her ability to function in school in terms of attention, distractibility, organization, and so forth.

Minimal Sensorineural Hearing Loss

The professional literature has repeatedly emphasized that a child with hearing ability in excess of 15 dB is at risk for developing educational difficulties. However, most medical practitioners and many audiologists continue to classify children with hearing ability up to 25 dB as "normal hearing" (Bavosi & Rupp, 1984). This controversial hearing loss category (16-25 dB) affects children most in a classroom situation, where they are expected to perceive and understand information in noisy and reverberant listening environments. In studies that have considered the incidence of students who were unable to pass a 15-dB hearing screen, approximately 30% of students in the regular classroom and 75% of students receiving special education services were identified as having minimal or greater (15-40dB) hearing losses (Sarff & Ray, 1981). Whether the hearing loss is conductive and fluctuating or sensorineural, a minimal hearing loss does indeed place a student at risk for educational difficulties.

Mild to Profound Hearing Loss

Four trends in the last decade affect the state of the school-age child with hearing loss: (a) fewer deaf children are being born, (b) more children with milder degrees of hearing loss are receiving amplification, (c) more children with hearing loss also have additional disabilities, and (d) more children are being identified at earlier ages and receiving intervention prior to school age (Upfold, 1988).

The impact of early intervention has allowed many children who are deaf to function with minimal support in the regular education setting. The lack of intervention for many children with minimal or mild hearing impairments has created language, learning, and school function problems for multitudes of students. The audiogram alone is no longer the primary determinant of the degree of success a child will be able to experience in the regular education setting. The earliness of identification and rigorousness of intervention are primary factors in the success of a child's educational future. Therefore, it is paramount that effective identification programs be in place so that intervention can occur as early as possible (Downs, 1991).

COMPONENTS OF A HEARING CONSERVATION PROGRAM

The purpose of identification audiometry is to identify all children with hearing loss as defined by the screening criteria used. The challenge of the educational audiologist is to determine which of these identified children are at critical risk for developing educational difficulties because of hearing loss. The criteria and model used in an identification program can assist or confound the identification of both the educationally significant sensorineural and fluctuating conductive populations with hearing loss. When we complete the hearing screening process, we are just beginning the process of identifying children's needs. The school hearing screening program is at the beginning of a chain of events that can ultimately be considered an effective school hearing conservation program. The components, depicted in a flowchart in Appendix A, are listed below.

1. Obtain history of chronic ear problems or k[illegible] hearing loss for each child upon enrollment.
2. Inform classroom teachers of students at highest risk of educational difficulties because of hearing loss history in preschool years.
3. Identify school-age children with stable and fluctuating hearing loss via screening.
4. Recommend amplification for these students whenever appropriate.
5. Refer children with apparent otitis media for medical management.
6. Perform regular educational/hearing monitoring of children with significant histories of otitis media.
7. Determine those children who currently may have educational difficulties.
8. Obtain educational support services for children with apparent learning/school function difficulties.
9. Conduct regular audiological monitoring of all students with permanent hearing loss.
10. Provide education for students with high-frequency loss and their peers regarding the affects of noise on hearing ability.
11. Provide inservice education for teachers regarding the affects of hearing loss on listening and learning.
12. Create dialogue between the local medical community and the schools regarding children's hearing needs.

Identifying Hearing Loss: A Suggested Program

Hearing screening programs have been conducted in the schools for decades with varying degrees of effectiveness. For over two decades, it has been recognized that pure-tone screening is an ineffective method of identifying children with recurrent otitis media (Melnick, Eagles, & Levine, 1964; Brooks, 1971). Because of the episodic nature of chronic otitis media, all of the children who do not have otitis media on the day hearing screening is conducted will "pass" with both pure-tone and tympanometry screening methods, despite the chronicity of their history. As the educational impact of fluctuating minimal and mild hearing loss is accepted by educators, it is paramount that audiologists do a better job in determining effective methods for identifying this population.

Get the History Up Front

Research supports the finding that children who have had recurrent middle ear problems prior to the age of 2 years and continuing throughout the preschool years are at greatest risk for auditory, language, and cognitive development delays (Howie, 1979; Sak & Ruben, 1982). The frequency of ear problems, how long the episodes last and how much hearing loss is present are the factors that determine the impact on the development of language, listening skills, and cognition. To effectively identify the children who may experience educational difficulties from fluctuating conductive hearing loss, we need to take their history of ear and hearing problems into account as part of the screening process. The majority of children who are identified during the hearing screening process will have hearing loss due to otitis media. Therefore, with history information available, we are able to identify the majority of children who are at greatest risk for learning problems due to fluctuating hearing loss as they enter school. A questionnaire entitled History of Ear and Hearing Problems (Appendix B) is an example of a form that can be included in a school district's standard enrollment process.

"Red Flag" Children and Let the Teachers Know!

With the hearing history known prior to the start of screening, it is possible to "red flag" the children with chronic otitis media histories. At the start of each school year, primary teachers can be notified of the students in their class who have had a history of ear and hearing problems. Teachers can then be encouraged to seat the children favorably in the classroom and to be alert for behaviors that may be due to an ear and hearing problem. Via inservice education, t[illegible]chers need to be made aware of the impact of mild and fluctuating hearing loss upon paying attention, following directions, developing phonics skills and lan-

guage, and so forth. Children with otitis-prone histories who appear to be struggling may obtain support services earlier if the teachers are already aware of their potential risk for educational difficulties.

With a system of red flagging in place, the high-risk students are easily identifiable so that their tympanometry and hearing results can be considered more closely than other students following mass screening. For example, the audiologist may wish to rescreen a red-flagged child who has a tympanogram with extreme negative pressure or a borderline gradient measure, whereas these values would be considered "passing" for students without significant histories. The red-flagged student would then be given the benefit of the doubt and rescreened in case these borderline values suggested otitis media may be developing.

Screen, Screen, Screen (and make sure it's QUIET)

Screening should be performed as early in the school year as possible so that students with previously unidentified permanent hearing loss and children experiencing current ear problems may obtain the appropriate attention in order to curtail as much educational delay as possible.

Pure-tone screening. Screening is performed at 1000 Hz, 2000 Hz and 4000 Hz at 20 dB and any student who fails to respond at this level at any frequency in either ear is rescreened in 4 to 6 weeks. If tympanometry is not a part of the identification program, screening at 500 Hz should also be performed (ASHA, 1985).

The use of hearing screening equipment with a single hand-held earphone or an otoscope-type device has achieved some popularity. It is critical to realize that the acoustic environment requirements are much more stringent for this equipment when compared to the use of two earphones (Bienvenue, Michael, & Chaffinch, 1984). Because of the typically noisy conditions found during school hearing screening, equipment that utilizes single-ear sound presentation is probably not appropriate for use in school environments.

Tympanometry screening. ASHA has recently published guidelines for the use of acoustic immittance measures in addition to pure-tone screening methods. New components included in the protocol are the use of otoscopy and obtaining a brief history. Tympanometric width, or gradient, is suggested instead of negative pressure measures to detect children with active otitis media. Refer to these 1990 Guidelines (ASHA, 1991) for a complete review of the recommended screening criteria.

Stick to schedule. To be effective, a rescreen must be performed within 4 to 6 weeks for children failing initial hearing screening. Prompt referral for medical and/or audiological following rescreen is critical. Waiting periods longer or shorter than 4 to 6 weeks compromise the effectiveness of identifying children with ear/hearing problems that are educationally significant.

Determination of Needs: A Necessary Next Step

The vast majority of school programs have defined identification procedures but fall short in providing adequate follow-up services. Without deliberate involvement of teachers with regard to the school performance and auditory needs of children with hearing loss, there is little hope of improving the educational plight of the child with a hearing problem.

Determination of Amplification Candidacy

The majority of children will fail hearing screening because of otitis media and will be able to seek medical solutions to their hearing problems; however, a small percentage of children with minimal, unilateral, or mild to moderate hearing losses can appropriately undergo at least a trial period with amplification.

Despite being a time-honored recommendation, preferential seating is not the answer for the child with an educationally significant hearing loss. This common misconception must be clarified and emphasized to teachers, administrators, and parents so that we may avoid the common belief that favorable seating equals the redemption of good hearing. Sitting close to the teacher assists students' speechreading efforts and can enhance their alertness, but favorable seating does little to clarify the speech signal from interfering background noise (Leavitt & Flexer, 1991).

Success in the educational setting depends upon the perception and subsequent comprehension of information, primarily information provided verbally by the teacher or during group discussions in an environment that is typically noisy and reverberant. Even with special support services, the students with minimal, mild, unilateral, or fluctuating hearing loss will usually receive the majority of their education in the mainstream classroom. Consequently, it is critical that the school provide whatever amplification equipment is necessary for the child to benefit from the educational setting. Hearing technology is available in a variety of forms today. No one amplification device is the answer for all degrees of hearing loss or all individual needs. The audiologist must be open to trying not only hearing aids and personal FM systems, but also soundfield amplification systems or assistive listening devices to best meet classroom listening needs.

Determination of Educational Significance

All degrees of hearing loss affect listening ability to some degree; however, not all of the children identified with hearing loss have demonstrable difficulties learning or functioning in the educational setting. Some students function extremely well in school despite their hearing loss and other students, sometimes with lesser degrees of hearing loss, may struggle as they try to achieve in the classroom setting. For this reason, school administrators should not assume that all students with hearing loss are experiencing educational difficulties or that all of these students will perform well. Therefore, each student identified during the hearing screening process with permanent hearing loss or a significant history of fluctuating hearing loss should be screened for educational difficulties. A discussion of sev-

eral procedures for screening for educational difficulties in this student population follows.

Asking the Teacher

This is probably the most common method that is used to obtain information about how a student is functioning in the classroom. Children who are having difficulties in many areas or those with behavior problems can be easily identified in this manner. However, the effects of mild and fluctuating hearing loss are often subtle and masked by the appearance of inattention or lack of effort. Therefore, the teacher may not recognize that the student is performing at less than his or her ability because of hearing problems.

Using Informal Checklists

Many audiologists working in the schools have used some sort of checklist about student behavior and performance. Unfortunately, informal lists of questions can only be subjectively interpreted and are not usually definitive in identifying specific problem areas children may be experiencing in the classroom. Often, informal checklists fail to compare students to class peers, especially in the areas of attention and distractibility.

Screening by A Speech-Language Pathologist

It has been estimated that perhaps one third of children receiving speech and language remediation may present histories of recurrent otitis media (Shriberg & Kwiatkowski, 1982). Unfortunately, the subtle effects of minimal, unilateral, mild, and fluctuating hearing loss on language development do not always appear when using many test instruments. In addition, areas of social skills, classroom participation, and behavior, which are often affected in some way for a child with hearing loss, are not typically reflected on speech and language test measures.

Using a Formally Designed Checklist

To date, only one instrument is available that has been specifically designed to screen the classroom performance of the child with hearing loss. The Screening Instrument For Targeting Educational Risk, or S.I.F.T.E.R. (Anderson, 1989), is composed of three questions in each of five areas: Academics, Attention, Communication, Class Participation, and School Behavior. Teachers respond on a scale of 1-5 for each question. The responses are entered onto a scoring grid that indicates whether a student passes, fails, or has marginal performance in each of the areas. The S.I.F.T.E.R. can be used to screen children's classroom performance for any of the following purposes: children identified following hearing screening, students with histories of ear and hearing problems who are at risk for educational problems, children with significant hearing loss (amplified or unamplified) who have performed well in the classroom in the past, and children who were previously in restrictive special education settings who subsequently have been placed into a mainstreamed setting with lesser special support.

Children who are identified as having failing or marginal scores in any or all of the five areas could then be considered for full assessment by the school Child Study Team. The S.I.F.T.E.R. is a screening instrument and should not be used to determine a child's functioning level or need for support services.

Categorizing Children Identified During Screening

Even fairly small school districts may have more than 100 students identified with hearing problems during hearing screening. In terms of educational, medical, and audiological management needs, it may be efficient to categorize these students and deal with them individually within their categories. Once the educational information is obtained, the children who failed hearing screening can be sorted into the following categories: Educationally Significant, Medically Significant, Educationally and Medically Significant, and Neither Educationally nor Medically Significant. Following the steps of obtaining an ear problem history, screening, referral/evaluation of screen failures and gathering educational information, the children with the greatest need for educational assessment, special services, or close monitoring by the educational audiologist will be apparent. The application of these categories has been illustrated in Appendix C. It is important to note that children who experience changes in hearing and/or educational performance will be likely to change categories.

Possible Service Options as Determined by Student Needs

School systems are required to offer an array of services to special education students so that their individual educational needs can be met by an appropriate program. The needs of students with hearing loss can vary greatly depending upon many behavioral, academic, social, emotional, motoric, cognitive, and language development factors.

Educational Support

Educational support services for students with educationally significant hearing loss can be considered on a continuum. The amount of special support required by each student can vary considerably; however, children with different degrees of hearing loss typically can experience similarities in speech, language, listening, amplification, psychosocial, and educational needs. Appendix D provides examples of general educational and audiologic service needs of students with different degrees of hearing loss.

Audiological Support

Support by the educational audiologist is dictated largely by the job description within a school district (or contracted district). Typical support activities may include annual re-evaluation of students with hearing loss; regular hearing aid monitoring; assisting families in the procurement of hearing aids; helping students adjust to new amplification; monitoring a child's hearing and middle ear status; and conducting auditory training, speechreading instruction, and language habilitation. Most audiologists providing services in schools perform some or all of these support activities in addition to active participation and supervision of the identification program.

HEARING LOSS EDUCATION

The majority of school personnel and students are uninformed about the impact of hearing loss on listening and learning. The educational audiologist is in a unique position to provide information about hearing loss to teachers, school administrators, parents, and students.

Noise-Induced Hearing Loss

One critical area of need for hearing conservation education is informing students of the hazards of excessive noise on their hearing ability. Because of the rising numbers of children acquiring noise-induced hearing loss at ever-decreasing ages, education about the impact of excessive noise on hearing would be a worthwhile addition to the health curriculum of every school district. The audiologist is a logical instigator of this curriculum and should play a crucial role in the development of curriculum materials. Some areas that could be covered in the hearing loss curriculum include how the ear works, how noise can damage hearing, what is a hearing loss and how it can affect life quality, what kind of noises or noisy activities are most dangerous to hearing, warning signs of overexposure to noise and of hearing loss, and responsibly protecting one's ears and hearing. Information on hearing health can be presented to children as young as preschool and should be considered to be of equal importance as dental health, care of eyes and vision, and personal hygiene issues.

Fluctuating Hearing Loss

Even with an excellent hearing screening program, some children with hearing loss will remain unidentified. No valid teacher referral of students with suspected hearing loss can occur without teachers having a basic working knowledge of how hearing loss can affect a student's behavior and school performance. A brief inservice for school staff members can increase the knowledge of teachers regarding the educational impact of even minimal hearing loss, provide a more valid referral of student hearing problems by teachers, and increase the visibility and effectiveness of the audiologist in the schools.

CONCLUSION

In summary, a school hearing conservation program begins with improving the awareness of administrators and teachers of the educational impact of hearing loss. A hearing screening program should focus on identifying all children who are at risk for educationally damaging hearing loss, and on sharing information with the classroom teacher. Once children with hearing loss are identified, they must be evaluated relative to the hearing technology available to maximize children's auditory learning environment. To validate the hearing screening process within the public school context, children with identified hearing problems must also be screened for educational difficulties, including assessment for special support services when appropriate. Finally, the educational audiologist has a role in providing services to students with hearing loss and in infusing the education of students about healthy hearing habits and prevention of hearing loss into the school curriculum.

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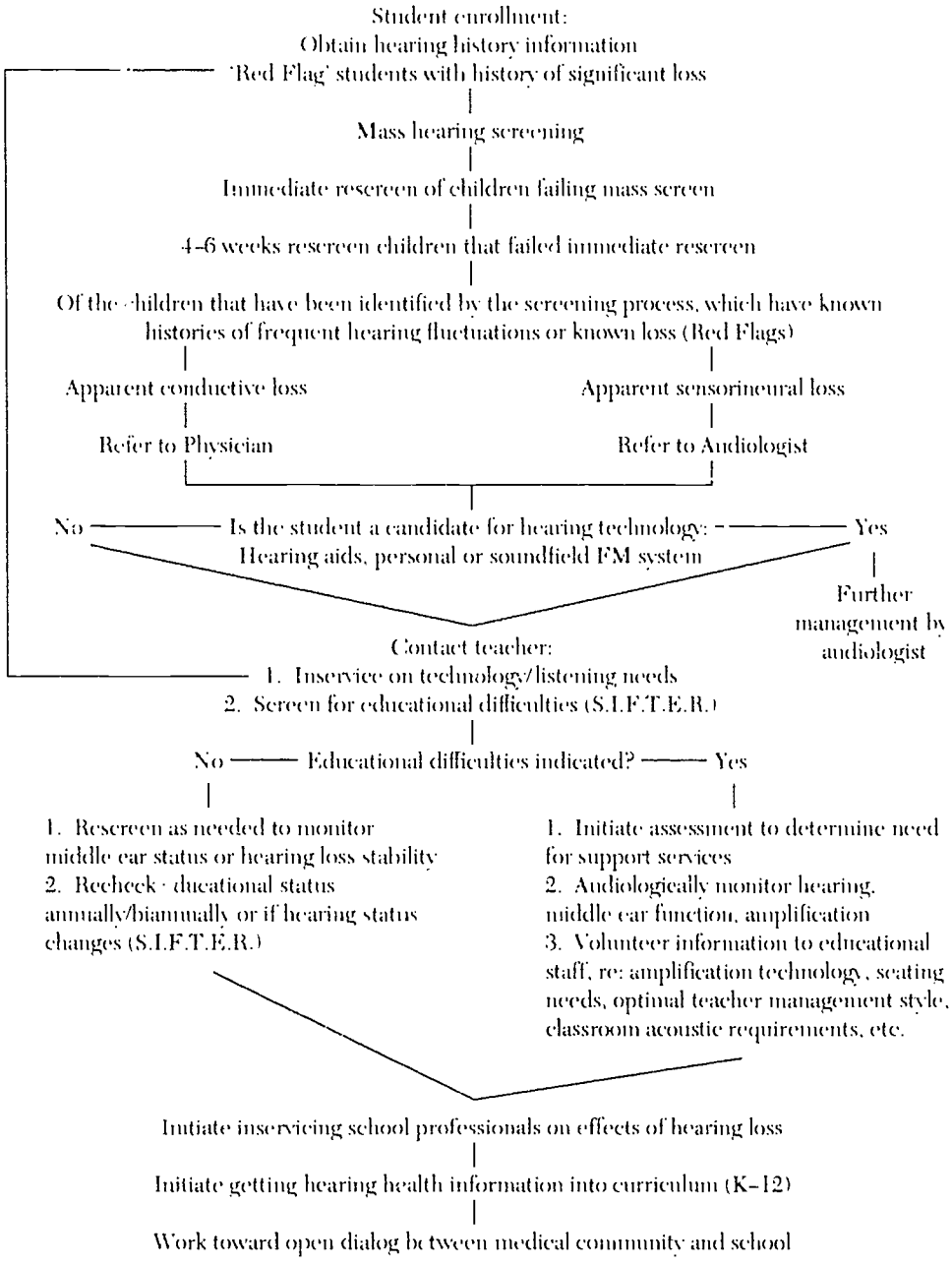
APPENDIX A
OUTCOMES OF A HEARING CONSERVATION PROGRAM



APPENDIX B
HISTORY OF EAR AND HEARING PROBLEMS

Children who have had many ear infections and periods of hearing loss are more likely to have language, vocabulary, and listening difficulties when they start school. We would like to identify these students so that we are more aware of their possible hearing problems and can be alert for present or developing learning problems.

Parent or guardian, please answer the following questions:

Child's Name _____ Birthdate _____

	NO	YES
1. Did your child have *any* ear problems before the age of 1?	_____	_____
2. Has your child ever had a draining ear?	_____	_____
3. Approximately how many ear problems has your child had in his/her life? 0–2 _____ 3–5 _____ 6-10 _____ 10 or more _____		
4. Does your child tend to have four or more ear problems each year?	_____	_____
5. Has your child had an ear problem in the last 6 months?	_____	_____
6. Has your child ever had an ear problem that lasted 3 months or longer? (with or without medication)	_____	_____
7. Has anyone related to the child had many ear problems? (parents, brothers or sisters, cousins)	_____	_____
8. Has your child ever been seen by an ear doctor (Otologist)? If yes, what doctor _____ No/Yr of last visit? _____	_____	_____
9. Has your child ever had tubes placed in his/her eardrums? If yes, how many times? _____ At what age(s)? _____	_____	_____
10. Does your child have any permanent hearing loss that you know about? (For example: deaf in one ear, can't hear high pitch sounds) Please describe:		

EAR PROBLEM = ear infection, ear aches, draining ears, medicine taken for ears, doctor noticed fluid behind eardrum, hole in eardrum, etc.

APPENDIX C
CATEGORIZING CHILDREN THAT ARE IDENTIFIED DURING THE ANNUAL SCHOOL HEARING LOSS IDENTIFICATION PROGRAM

Category	Description	Example	Management
Medically Significant	A child who is currently experiencing otitis media but has no apparent significant history of recurrent ear problems	Otitis media associated with upper respiratory infection; occurs once or twice/yr	Medical treatment; preferential seating, retest hearing following completion of treatment to ensure hearing problem has resolved
Educationally Significant	Sensorineural hearing loss or stable conductive hearing loss that has adversely affected a child's school achievement	30dB sensorineural loss; Moderate loss 750-2000 Hz; or sharply sloping high frequency loss including 2000 Hz	Personal hearing aids as needed, personal or sound field FM system, annual hearing evaluation, favorable seating, support services as appropriate
Educationally and Medically Significant	A child with significant history of recurrent ear infections and fluctuating hearing loss that affects educational progress and continues to cause hearing loss frequently	Otitis media continuously since infancy; unoperated eardrum perforation, chronic draining ears	Medical treatment; personal or soundfield FM, special support services as appropriate; seat preferentially; monitor hearing (3/4 times/yr)
Neither Educationally Nor Medically Significant	A child with a known stable hearing loss that has good school performance despite the hearing loss	Mild high frequency loss, mild unilateral hearing loss, loss at 1500 Hz in one ear only	Monitor hearing annually for hearing loss changes, seat favorably to allow easy visualization and encourage attention in classroom

APPENDIX D
RELATIONSHIP OF DEGREE OF LONG-TERM HEARING LOSS TO PSYCHOSOCIAL IMPACT AND EDUCATIONAL NEEDS

Degree of Hearing Loss Based on modified pure-tone average 500-4000 HZ	Possible Effect of Hearing Loss on the Understanding of Language & Speech	Possible Psychosocial Impact of Hearing Loss	Potential Educational Needs and Programs
NORMAL HEARING -10 to +15 dB HL	Children have better hearing sensitivity than the accepted normal range for adults. A child with hearing sensitivity in the -10 to +15 dB range will detect the complete speech signal even at soft conversation levels. However, good hearing does not guarantee good ability to discriminate speech in the presence of background noise		
MINIMAL (BORDERLINE 16-25 dB HL	May have difficulty hearing faint or distant speech. At 15 dB student can miss up to 10% of speech signal when teacher is at a distance greater than 3 feet and when the classroom is noisy, especially in the elementary grades when verbal instruction predominates	May be unaware of subtle conversational cues, which could cause child to be viewed as inappropriate or awkward. May miss portions of fast-paced peer interactions, which could begin to have an impact on socialization and self concept. May have immature behavior. Child may be more fatigued than classmates due to listening effort needed	May benefit from mild gain/low. MPO hearing aid or personal FM system dependent on loss configuration. Would benefit from soundfield amplification if classroom is noisy and/or reverberant. Favorable seating. May need attention to vocabulary or speech, especially with recurrent otitis media history. Appropriate medical management necessary for conductive losses. Teacher requires in-service on impact of hearing loss on language development and learning.
MILD 26-40 dB HL	At 30 dB can miss 25-40% of speech signal. The degree of difficulty experienced in school will depend upon the noise level in classroom, distance from teacher and the configuration of the hearing loss. Without amplification the child with 35-40 dB loss may miss at least 50% of the class discussions, especially when voices are faint or speaker is not in line of vision. Will miss consonants, especially when a high frequency hearing loss is present	Barriers beginning to build with negative impact on self esteem as child is accused of "hearing when he or she wants to," "day-dreaming," or "not paying attention." Child begins to lose ability for selective hearing, and has increasing difficulty suppressing background noise which makes the learning environment stressful. Child is more fatigued than classmates due to listening effort needed	Will benefit from a hearing aid and use of a personal FM or soundfield FM system in the classroom. Needs favorable seating and lighting. Refer to special education for language evaluation and educational follow-up. Needs auditory skill building. May need attention to vocabulary and language development, articulation or speechreading and/or special support in reading. May need help with self esteem. Teacher inservice required
MODERATE 41-55 dB HL	Understands conversational speech at a distance of 3-5 feet (face-to face) only if structure and vocabulary controlled. Without amplification the amount of speech signal missed can be 50% to 75% with 40 dB loss and 80% to 100% with 50 dB loss. Is likely to have delayed or defective syntax, limited vocabulary, imperfect speech production and an atonal voice quality	Often with this degree of hearing loss, communication is significantly affected, and socialization with peers with normal hearing becomes increasingly difficult. With full-time use of hearing aids/FM systems child may be judged as a less competent learner. There is an increasing impact on self-esteem	Refer to special education for language evaluation and for educational follow-up. Amplification is essential (hearing aids and FM system). Special education support may be needed, especially for primary children. Attention to oral language development, reading and written language. Auditory skill development and speech therapy usually needed. Teacher inservice required
MODERATE TO SEVERE 56-70 dB HL	Without amplification, conversation must be very loud to be understood. A 55 dB loss can cause child to miss up to 100% of speech information. Will have marked difficulty in school situations requiring verbal communication in both one-to-one and group situations. Delayed language, syntax, reduced speech intelligibility and atonal voice quality likely.	Full-time use of hearing aids/FM systems may result in child being judged by both peers and adults as a less competent learner, resulting in poorer self concept, social maturity and contributing to a sense of rejection. Inservice to address these attitudes may be helpful.	Full-time use of amplification is essential. Will need resource teacher or special class depending on magnitude of language delay. May require special help in all language skills, language-based academic subjects, vocabulary, grammar, pragmatics as well as reading and writing. Probably needs assistance to expand experiential language base. Inservice of mainstream teachers required
SEVERE 71-90 dB HL	Without amplification may hear loud voices about one foot from ear. When amplified optimally, children with hearing ability of 90 dB or better should be able to identify environmental sounds and detect all the sounds of speech. If loss is of prelingual onset, oral language and speech may not develop spontaneously or will be severely delayed. If hearing loss is of recent onset speech is likely to deteriorate with quality becoming atonal.	Child may prefer other children with hearing impairments as friends and playmates. This may further isolate the child from the mainstream, however these peer relationships may foster improved self-concept and a sense of cultural identity	May need full-time special aural/oral program with emphasis on all auditory language skills, speechreading, concept development and speech. As loss approaches 80-90 dB, may benefit from a Total Communication approach, especially in the early language-learning years. Individual hearing aid/personal FM system essential. Need to monitor effectiveness of communication modality. Participation in regular classes as much as beneficial to student. Inservice of mainstream teachers essential

(continued next page)

Degree of Hearing Loss	Possible Effect of Hearing Loss on the Understanding of Language & Speech	Possible Psychosocial Impact of Hearing Loss	Potential Educational Needs and Programs
PROFOUND 91 dB HL or more	Aware of vibrations more than tonal pattern. Many rely on vision rather than hearing as primary avenue for communication and learning. Detection of speech sounds dependent upon loss configuration and use of amplification. Speech and language will not develop spontaneously and is likely to deteriorate rapidly if hearing loss is of recent onset.	Depending on auditory/oral competence, peer use of sign language, parental attitude, etc., child may or may not increasingly prefer association with the deaf culture.	May need special program for deaf children with emphasis on all language skills and academic areas. Program needs specialized supervision and comprehensive support services. Early use of amplification likely to help if part of an intensive training program. May be cochlear implant or vibrotactile aid candidate. Requires continual appraisal of needs in regard to communication and learning mode. Part-time in regular classes as much as beneficial to student.
UNILATERAL One normal hearing ear and one ear with at least a permanent mild hearing loss	May have difficulty hearing faint or distant speech. Usually has difficulty localizing sounds and voices. Unilateral listener will have greater difficulty understanding speech when environment is noisy and/or reverberant. Difficulty detecting or understanding soft speech from side of bad ear, especially in a group discussion.	Child may be accused of selective hearing due to discrepancies in speech understanding in quiet versus noise. Child will be more fatigued in classroom setting due to greater effort needed to listen. May appear inattentive or frustrated. Behavior problems sometimes evident.	May benefit from personal FM or soundfield FM system in classroom. CROS hearing aid may be of benefit in quiet settings. Needs favorable seating and lighting. Student is at risk for educational difficulties. Educational monitoring warranted with support services provided as soon as difficulties appear. Teacher inservice is beneficial.

NOTE: All children with hearing loss require periodic audiologic evaluation, rigorous monitoring of amplification and regular monitoring of communication skills. All children with hearing loss (especially conductive) need appropriate medical attention in connection with educational programming.

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