

QUICK REFERENCE GUIDE
for Parents
and Professionals



Hearing LOSS

Assessment
and Intervention
for Young Children
(Age 0-3 Years)



Sponsored by

New York State Department of Health
Division of Family Health
Bureau of Early Intervention

CLINICAL PRACTICE GUIDELINE

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FOR PARENTS AND PROFESSIONALS

HEARING LOSS
ASSESSMENT AND INTERVENTION
FOR
YOUNG CHILDREN (AGE 0-3 YEARS)

SPONSORED BY
NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF FAMILY HEALTH
BUREAU OF EARLY INTERVENTION

This guideline was developed by an independent panel of professionals and parents sponsored by the New York State Department of Health. The recommendations presented in this document have been developed by the panel and do not necessarily represent the position of the Department of Health.

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Publication Titles

1. *Clinical Practice Guideline: The Guideline Technical Report.* Hearing Loss, Assessment and Intervention for Young Children (Age 0-3 Years). 8½" x 11", 354 pages. Publication No. 4967, 2007
 - 1a. *Evidence Tables—Assessment and Intervention.* 8½" x 11", 54 pages. Publication No. 4976, 2007.
2. *Clinical Practice Guideline: Report of the Recommendations.* Hearing Loss, Assessment and Intervention for Young Children (Age 0-3 Years). 5½" x 8½", 306 pages. Publication No. 4966, 2007
3. *Clinical Practice Guideline: Quick Reference Guide.* Hearing Loss, Assessment and Intervention for Young Children (Age 0-3 Years). 5½" x 8½", 218 pages. Publication No. 4965, 2007
4. *Clinical Practice Guidelines on Compact Disc:* Includes Guideline Technical Report, Evidence Tables, Report of the Recommendations, and Quick Reference Guide. Publication No. 4968, 2007

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The New York State Department of Health gratefully acknowledges the contributions of individuals who have participated as guideline panel members and peer reviewers for the development of this clinical practice guideline. Their insights and expertise have been essential to the development and credibility of the guideline recommendations.

The New York State Department of Health Bureau of Early Intervention especially appreciates the advice and assistance of the New York State Early Intervention Coordinating Council and Clinical Practice Guidelines Project Steering Committee on all aspects of this important effort to improve the quality of early intervention services for young children with hearing loss and their families.

The contents of the guideline were developed under a grant from the U.S. Department of Education. However, the contents do not necessarily represent the policy of the Department of Education, and endorsement by the federal government should not be assumed.

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Table of Contents

Hearing Loss	
Assessment and Intervention for Young Children (Age 0-3 Years)	
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Preface	xiii
Why the Bureau of Early Intervention is Developing Guidelines	xiv
Chapter I: Introduction	1
Purpose of This Clinical Practice Guideline	2
Reasons for Developing This Guideline	3
Scope of the Guideline	3
Definition of Hearing Loss	3
How the Guideline was Developed	4
Definitions of Common Terms	5
Chapter II: Background Information	7
Understanding Hearing Loss	8
How Do We Hear?	8
What is Normal Hearing?	9
What is Hearing Loss?	10
How Common is Childhood Hearing Loss?	14
What are the Risk Indicators for Hearing Loss?	15
How is Hearing Loss Detected?	15
How is Hearing Loss Confirmed?	16
What is the Impact of Hearing Loss?	17
What are Common Interventions for Children with Hearing Loss?	19
Considerations for Children with Coexisting Conditions	19
Which Professionals Work with Children with Hearing Loss?	20
Chapter III: Identification and Assessment	23
General Considerations for Identification and Assessment of Hearing Loss in Young Children	24
Methods for Identifying Possible Hearing Loss in Infants and Young Children	26
Hearing Screening	27

TABLE OF CONTENTS

Identifying Possible Hearing Loss Through Risk Factors, Clinical Clues, and Developmental Surveillance	31
Audiologic Assessment for Infants and Young Children with Suspected Hearing Loss.....	39
Assessment for Amplification	50
Medical Assessment.....	51
Developmental Assessment.....	53
Working With the Family.....	60
Chapter IV: Intervention	67
General Considerations for Planning and Implementing Interventions.....	68
Communication Interventions.....	80
American Deaf Community.....	96
Amplification Devices.....	97
Medical and Surgical Interventions	106

List of Appendices

Appendix A: Developmental Assessment Tests	117
Appendix B: Early Intervention Program Information	143
Appendix C: Newborn Hearing Screening Program Regulations	159
Appendix D: Additional Resources	169
Appendix E: Summary of Research Findings: Panel Conclusions	173
Reference List.....	183
Subject Index	191

List of Tables

TABLE 1:	COMPONENTS OF A COMPREHENSIVE HEARING ASSESSMENT.....	16
TABLE 2:	POTENTIAL IMPACT OF CHILDHOOD HEARING LOSS	18
TABLE 3:	RISK INDICATORS FOR HEARING LOSS IN INFANTS AND YOUNG CHILDREN.....	33
TABLE 4:	COMMUNICATION DEVELOPMENTAL MILESTONES.....	34
TABLE 5:	CLINICAL CLUES OF POSSIBLE HEARING LOSS.....	36
TABLE 6:	METHODS FOR AUDIOLOGIC ASSESSMENT	44
TABLE 7:	ADVANTAGES AND LIMITATIONS OF AUDIOLOGIC ASSESSMENT METHODS: PHYSIOLOGIC TESTS.....	45
TABLE 8:	ADVANTAGES AND LIMITATIONS OF AUDIOLOGIC ASSESSMENT METHODS: BEHAVIORAL TESTS.....	47
TABLE 9:	PRINCIPLES OF EFFECTIVE EARLY INTERVENTION FOR YOUNG CHILDREN WITH HEARING LOSS (JCIH).....	69
TABLE 10:	QUESTIONS WHEN CONSIDERING INTERVENTION APPROACHES.....	77
TABLE 11:	QUESTIONS WHEN SELECTING INTERVENTION SERVICE PROVIDERS.....	78
TABLE 12:	EXAMPLES OF VISUAL SUPPORTS FOR COMMUNICATION DEVELOPMENT.....	86
TABLE 13:	STAGES IN AUDITORY SKILL DEVELOPMENT.....	90
TABLE 14:	EXAMPLES OF ACTIVITIES TO STIMULATE SPEECH.....	93
TABLE 15:	STAGES IN SPEECH TRAINING.....	94
TABLE 16:	VARIABLES AFFECTING COCHLEAR IMPLANT OUTCOMES.....	110

List of Figures

FIGURE 1:	STRUCTURE OF THE EAR.....	9
FIGURE 2:	AUDIOGRAM.....	11
FIGURE 3:	EXAMPLES OF HEARING LOSS CONFIGURATIONS.....	12
FIGURE 4:	COMMUNICATION APPROACHES MODEL	80
FIGURE 5:	COMPONENTS OF COCHLEAR IMPLANT SYSTEMS.....	108

Hearing Loss

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Hearing Loss

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Foreword

Providing an optimal program of early intervention for young children with developmental disabilities and their families requires knowledge of the most current information on research and practice. However, analyzing research studies and determining their relevance to practice can be a perplexing task, even for the professional. Differing methodologies and conceptual frameworks often make it difficult to judge the quality of the research, and to discern outcome patterns that can and should influence practice.

Despite the fact that this is a difficult task, practice guidelines based on a sophisticated and rigorous analysis of the extant research literature can convey essential information for the design and implementation of optimal early intervention programs. Where there is limited available evidence, an unusual level of care and thoughtfulness must be taken to discern patterns that can inform practice. This is especially true for children at risk for or with confirmed hearing loss, or who are deaf. Fortunately, the introduction of universal newborn hearing screening in New York State has made the early detection of congenital hearing loss possible for the vast majority of infants. The identification of infants and young children with late onset or progressive hearing loss, as well as the comprehensive assessment of these children, however, continues to pose an unusually complex set of challenges. Importantly, a family's choice of communication modality must be considered in early intervention planning. Therefore, interdisciplinary involvement, critical to providing optimum early intervention, must be informed and sensitive to the desires of families from hearing and Deaf cultures. This necessitates that each member of the interdisciplinary team be knowledgeable and responsive to the sometimes-differing goals of families that can influence early intervention decisions. Particularly in this circumstance, it is even more essential that practice guidelines be developed to assist clinicians and parents in making informed choices regarding the selection of an early intervention approach for young children with hearing loss and their families. The *Clinical Practice Guideline for Hearing Loss* has been the result of a sophisticated and methodologically sound approach to accurately gather and summarize information based on the available evidence. This guideline is of extraordinary value to practitioners from all relevant disciplines, and to parents, administrators, and others interested in the health and well-being of young children with hearing loss.

MICHAEL J. GURALNICK, Ph.D.
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PREFACE

WHY THE BUREAU OF EARLY INTERVENTION IS DEVELOPING GUIDELINES

In 1996, a multiyear effort was initiated by the New York State Department of Health (NYSDOH) to develop clinical practice guidelines to support the efforts of the statewide Early Intervention Program. As lead agency for the Early Intervention Program in New York State, the NYSDOH is committed to ensuring that the Early Intervention Program provides consistent, high-quality, cost-effective, and appropriate services that result in measurable outcomes for eligible children and their families.

This guideline is a tool to help assure that infants and young children with disabilities receive early intervention services consistent with their individual needs, resources, priorities, and the concerns of their families.

The guideline is intended to help families, service providers, and public officials by offering recommendations based on scientific evidence and expert clinical opinion on effective practices for the following:

- Early identification of children at risk or suspected of having a disability through routine developmental surveillance and screening targeted to identify specific disabilities.
- Provision of multidisciplinary evaluations and assessments that result in reliable information about a child’s developmental strengths and needs and, when possible, a diagnosis.
- The determination of effective intervention strategies and reaching agreement on the frequency, intensity, and duration of early intervention services that will lead to positive outcomes for children and families.
- The measurement of outcomes achieved.

The impact of clinical practice guidelines for the Early Intervention Program will depend on their credibility with families, service providers, and public officials. To ensure a credible product, an evidence-based, multidisciplinary consensus panel approach was used. The methodology for these guidelines was established by the Agency for Healthcare Research and Quality (AHRQ), formerly the Agency for Healthcare Policy and Research (AHCPR). This methodology was selected because it is a well-tested, effective, and scientific approach to guideline development.

The NYSDOH has worked closely with the state Early Intervention Coordinating Council throughout the guideline development process. In addition, a state-level steering committee was established to advise the department on this initiative. A national advisory group of experts in early intervention has been available to the department to review and to provide feedback on the methodology and the guideline. Their efforts have been crucial to the successful development of this guideline.

Overview of the Early Intervention Program

The New York State Early Intervention Program is part of the national Early Intervention Program for infants and toddlers with disabilities and their families, first created by Congress in 1986 under the *Individuals with Disabilities Education Act* (IDEA). IDEA is also the federal law that ensures all children and youths ages 3 to 21 years with disabilities the right to a free appropriate public education. In New York State, the Early Intervention Program is established in Article 25 of the Public Health Law and has been in effect since July 1, 1993.

To be eligible for services, children must be under 3 years of age and have a confirmed disability or established developmental delay in one or more of the following areas of development: physical, cognitive, communication, social-emotional, and adaptive development.

The Early Intervention Program offers a variety of therapeutic and support services to infants and toddlers with disabilities and their families, including family education and counseling, home visits, and parent support groups; special instruction; speech pathology and audiology; occupational therapy; physical therapy; psychological services; service coordination; nursing services; nutrition services; social work services; vision services; and assistive technology devices and services.

Major provisions of the New York State Public Health Law that govern the Early Intervention Program require:

- Local administration of the program by an Early Intervention Official (EIO) designated by the chief elected official of each of the 57 counties and New York City. The EIO is responsible for ensuring eligible children and families receive the services included in the Individualized Family Service Plan (IFSP) that is developed for the child and family.
- Identification and referral of children at risk or suspected of having a disability by primary referral sources (including physicians and other health care providers).

PREFACE


- Periodic developmental screening and tracking of at-risk children.
- Provision of service coordination services to eligible children and their families.
- A multidisciplinary evaluation of children referred to the program, at no cost to families, to determine eligibility.
- Individualized Family Service Plans (IFSP) for eligible children and their families.
- Provision of early intervention services as specified in the IFSP at no cost to the family.
- Delivery of services in natural settings in the community where peers are typically found to the maximum extent appropriate.

The mission of the Early Intervention Program is to identify and evaluate, as early as possible, those infants and toddlers whose healthy development is compromised and provide for appropriate intervention to improve child and family development. The program's goals are to:

- Support parents in meeting their responsibilities to nurture and to enhance their children's development.
- Create opportunities for full participation of children with disabilities and their families in their communities by ensuring services are delivered in natural environments to the maximum extent appropriate.
- Ensure early intervention services are coordinated with the full array of early childhood health and mental health, educational, social, and other community-based services needed by and provided to children and their families.
- Enhance child development and functional outcomes and improve family life through delivery of effective, outcome-based, high-quality early intervention services.
- Ensure that early intervention services complement the child's medical home by involving primary and specialty health care providers in supporting family participation in early intervention services.
- Assure equity of access, quality, consistency, and accountability in the service system by ensuring clear lines of public supervision, responsibility, and authority for the provision of early intervention services to eligible children and their families.

New York State Public Health Law designates the Department of Health as the lead agency for this statewide program. As the lead agency, the NYSDOH is responsible for the overall supervision and administration of the Early Intervention Program. Responsibilities include:

- Implementing statewide policies, procedures, and programmatic and reimbursement regulations.
- Implementing a comprehensive public awareness and child-find system.
- Approving, compiling, and disseminating lists of approved service coordinators, evaluators, and service providers.
- Providing training and technical assistance to municipalities and service providers to enable them to identify, locate, and evaluate eligible children; developing individualized family service plans; ensuring the appropriate provision of early intervention services; and promoting the development of new services where there is a demonstrated need.
- Safeguarding parent and child rights under the Early Intervention Program.
- Establishing and maintaining an Early Intervention Coordinating Council to advise and assist the department in program implementation.

 **Early Intervention Policy** ❖ Throughout the document, information about relevant Early Intervention Program policy is presented in boxes with this symbol.

CLINICAL PRACTICE GUIDELINE

QUICK REFERENCE GUIDE

HEARING LOSS
ASSESSMENT AND INTERVENTION
FOR
YOUNG CHILDREN (AGE 0-3 YEARS)

This *Quick Reference Guide* is an abbreviated version of the background information and guideline recommendations presented in the full text reports of this clinical practice guideline.

The full text of all the recommendations, plus a description of the methodology and evidence used to develop the recommendations, can be found in the *Clinical Practice Guideline: The Guideline Technical Report*.

The full text of all the recommendations plus an abbreviated description of the methodology and evidence used to develop the recommendations can be found in the *Clinical Practice Guideline: Report of the Recommendations*.

CHAPTER I: INTRODUCTION

PURPOSE OF THIS CLINICAL PRACTICE GUIDELINE

This *Quick Reference Guide* is based on the *Clinical Practice Guideline Technical Report* that was developed by an independent, multidisciplinary panel of clinicians and parents convened by the New York State Department of Health. The development of this and other guidelines for the statewide Early Intervention Program was sponsored by the New York State Department of Health as part of its mission to make a positive contribution to the quality of care for children with disabilities.

This clinical practice guideline on hearing loss provides parents, professionals, and others with recommendations about “best practice” based on consensus opinion of the guideline panel and scientific evidence about the efficacy of various assessment and intervention options for young children with hearing loss.

The key elements of the guideline development approach include:

- Ensuring multidisciplinary representation
- Developing a guideline that is valid, objective, and credible
- Using a process that includes a combination of systematic review of the available scientific literature, expert clinical opinion, and parent input

This guideline represents the guideline panel’s concerted attempt to find and interpret the available scientific evidence in a systematic and unbiased fashion. It is hoped that by using an evidence-based approach, the guideline provides a set of recommendations that reflect current best practices and will lead to optimal outcomes for children and their families.

The guideline is not a required standard of practice for the Early Intervention Program (EIP) administered by the State of New York. This guideline document is a tool to help providers and families make informed decisions.

Providers and families are encouraged to use this guideline, recognizing that the care provided should always be tailored to the individual. The decision to follow any particular recommendations should be made by the family and the provider based on the circumstances presented by the individual children and their families.

REASONS FOR DEVELOPING THIS GUIDELINE

The goals of developing a clinical practice guideline for young children with hearing loss are to:

- Help children and families learn about appropriate and effective services
- Provide an education and information resource for professionals
- Promote consistency in service delivery
- Facilitate productive communication among professionals
- Facilitate quality improvement in early intervention services
- Indicate where more research is needed

SCOPE OF THE GUIDELINE

This clinical practice guideline provides recommendations about best practices for identification, assessment, and intervention for young children with hearing loss. The *primary focuses* of the recommendations in this guideline are:

- Hearing loss in children from birth to 3 years of age, and
- Children with permanent bilateral sensorineural hearing loss

While the primary focus of the guideline is children from birth to 3 years of age with permanent bilateral (both ears) sensorineural hearing loss, many of the recommendations may be applicable to other children with hearing loss.

DEFINITION OF HEARING LOSS

Hearing loss is a diminished ability to detect, recognize, discriminate, perceive, and/or comprehend auditory information. Because the ability to hear sounds is crucial for the typical development of spoken language, hearing loss is classified as a communication disorder.

The level of severity of hearing loss (HL), as used in this guideline, is defined as follows:

minus 10 to plus 15 dB HL	Normal	56-70 dB HL	Moderate-Severe
16-25 dB HL	Borderline	71-90 dB HL	Severe
26-40 dB HL	Mild	>90 dB HL	Profound
41-55 dB HL	Moderate		



Early Intervention Policy ❖ A child with a diagnosis of permanent or sensorineural hearing loss that cannot be corrected with treatment or surgery is eligible for the Early Intervention Program on the basis of having a diagnosed condition with a high probability of resulting in developmental delay.

HOW THE GUIDELINE WAS DEVELOPED

A multidisciplinary panel of topic experts, general providers (both clinicians and educators), and parents worked together to develop the guideline. After determining the guideline's general scope, the guideline panel established the specific assessment and intervention topics and decided which topics were most appropriate for the evidence review process. The group then held a series of meetings to review the available research and develop recommendations. The panel's final meeting was in 2001.

For some topics, no research evidence meeting the criteria of the guideline was found. Other topics were determined to be inappropriate for a literature search and evidence evaluation. When the panel reviewed these topics, they made recommendations arrived at through consensus.

Using scientific evidence to develop guidelines


Every professional discipline today is being called upon to document the effectiveness of specific approaches in bringing about desired outcomes. Guidelines based on an evaluation of the scientific literature can help professionals, parents, and others learn what scientific evidence exists about the effectiveness of specific clinical methods. When adequate scientific evidence can be found and systematically evaluated, it provides a balanced and objective approach for making informed decisions.

DEFINITIONS OF COMMON TERMS

<i>Assessment</i>	This is the process of evaluating a child with suspected hearing loss, including the activities and tools used to measure level of functioning, establish eligibility for services, determine a diagnosis, plan intervention, and measure treatment outcomes.
<i>Family</i>	Family means the child’s primary caregivers. This might include one or both parents, siblings, grandparents, foster care parents, or others usually in the child’s home environment(s).
<i>Hearing Loss</i>	In this guideline, a hearing loss is broadly defined to include any loss of hearing from mild to profound. The primary focus of the guideline is permanent, bilateral sensorineural hearing loss.
<i>Parent(s)</i>	The term parent is used to mean the child’s primary caregiver(s). The primary caregivers are those who have significant responsibility for the welfare of the child. The primary caregiver may be someone other than the mother or father of the child.
<i>Professional</i>	A professional is any provider of a professional service who is qualified by training, experience, licensure, and/or other state requirements to provide the intended service. The term is not intended to imply any specific professional degree or qualifications other than appropriate training and credentials.
<i>Screening</i>	Screening is considered part of the process of identifying children with hearing loss. Screening may include parent interviews or questionnaires, observation of the child, or use of specific screening tests. Screening is used to identify children who need further evaluation.
<i>Target Population</i>	The target population is children with hearing loss from birth to 3 years of age. Throughout this document, the term <i>young children</i> is used to describe this target age group.
<i>Young Children</i>	This term is used broadly to describe the target age group for this guideline (children from birth to 3 years of age).

LIST OF COMMON ABBREVIATIONS

ABR	Auditory brainstem response	ITE	In-the-ear hearing aid
ASL	American Sign Language	JCIH	Joint Committee on Infant Hearing
AT	Assistive technology	kHz	Kilohertz (1,000 Hertz)
Bi-Bi	Bilingual-bicultural	LBW	Low birth weight
BTE	Behind-the-ear hearing aid	MCE	Manually coded English
CI	Cochlear implant	NICU	Neonatal intensive care unit
CPA	Conditioned play audiometry	NYSDOH	New York State Department of Health
dB	Decibel	OAE	Otoacoustic emissions
EIP	Early Intervention Program	OM	Otitis media
EIO	Early Intervention Official	OME	Otitis media with effusion
ENT	Ear, nose, and throat	SNHL	Sensorineural hearing loss
FM	Frequency modulation	SPL	Sound pressure level
HL	Hearing level	TC	Total communication
Hz	Hertz (cycles per second)	UNHS	Universal newborn hearing screening
IFSP	Individualized Family Service Plan	VLBW	Very low birth weight
		VRA	Visual reinforcement audiometry



Early Intervention Policy ❖ The terms *assessment*, *parents*, and *screening* are defined in regulations that apply to the Early Intervention Program (EIP) in New York State. *Qualified personnel* is the term used in the EIP for professionals who are qualified to deliver early intervention services. (See Appendix B, “Early Intervention Program Information.”)

Note: This version of the guideline provides only a summary of the guideline recommendations. More specific recommendations and detailed information about the research process is described in the more complete versions of the guideline.

**CHAPTER II:
BACKGROUND INFORMATION**

UNDERSTANDING HEARING LOSS

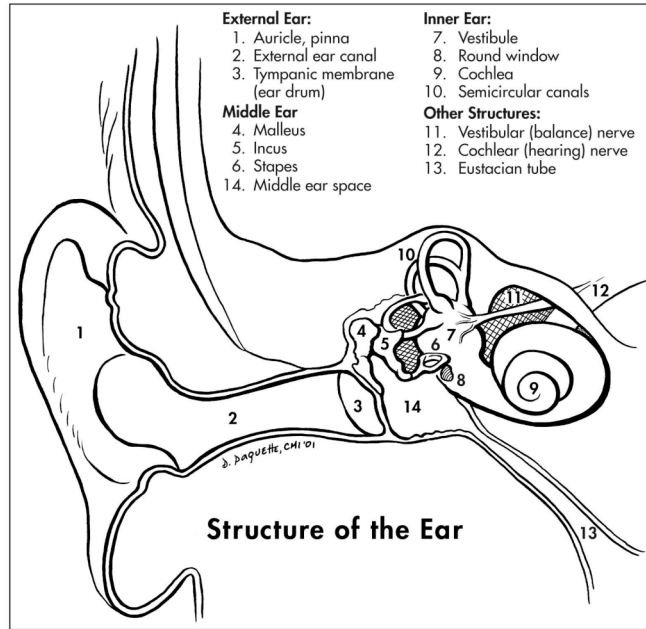
Hearing loss is a diminished ability to detect, recognize, discriminate, perceive, and/or comprehend auditory information. Because the ability to hear sounds is crucial for the typical development of spoken language, hearing loss is classified as a communication disorder.

For children, the definition of hearing loss is more stringent than that used for adults. Adults who had normal hearing as children, and then acquired hearing loss, usually have fully developed spoken language abilities. Therefore, adults may tolerate some degree of hearing loss before experiencing a communication problem. Infants and young children acquiring language for the first time need to hear all sounds in order to fully develop spoken language in a typical manner.

HOW DO WE HEAR?

For hearing to occur, sound waves must be conducted through the external ear and the middle ear (Figure 1). In individuals with normal hearing, the sound travels both by air conduction and by bone conduction until it reaches the inner ear. In the inner ear is the cochlea, which is a snail-shaped structure containing thousands of hair cells. These hair cells vibrate in response to sound. The mechanical vibrations of these hair cells in the cochlea are converted into electrical signals. The electrical signals then travel as nerve impulses through the auditory nerve to the brain, where they are interpreted.

Figure 1: Structure of the Ear



WHAT IS NORMAL HEARING?

Sounds are produced by the vibrations of objects. These vibrations create waves of disturbance in a medium such as air, a fluid, or a solid. To be considered a sound, the waves of disturbance must be audible. Sound waves vary in terms of the following:

- *Frequency*
Frequency is measured in cycles per second, called Hertz (Hz). The frequency of the vibration is related to the perception of pitch.
- *Intensity*
Intensity is measured in decibels (dB) at a certain sound pressure level (SPL). The intensity of the vibration is related to the perception of loudness.

The human auditory system is sensitive to a wide range of frequencies (20–20,000 Hz) and a wide range of *intensities* (0–140 dB SPL). Although people can hear sounds across a wide range of frequencies, they are most sensitive to sounds within the speech range (approximately 250–6,000 Hz). Sounds within that range of frequencies do not need to be as intense in order to be audible.

For the purposes of hearing testing (audiometric evaluation), the American National Standards Institute has defined the sound pressure level (loudness) at which individuals can normally detect sound as the 0 dB hearing level (HL). The 0 dB HL for a particular frequency is the normal threshold for that frequency averaged across tests with many individuals. Some individuals can detect sounds below 0 dB HL. Children with normal hearing can detect sound within the range of minus 10 to plus 15 dB HL.

WHAT IS HEARING LOSS?

If a child cannot detect sounds within the normal range, the child is considered to have hearing loss. The amount of hearing loss is measured in terms of the specific sound detection level (threshold) in decibels HL at each frequency tested. These values are plotted on a graph called an audiogram (Figure 2) that shows the configuration of the hearing loss (the frequencies at which the hearing loss is demonstrated). A typical audiogram shows the hearing level for each ear for both air-conducted and bone-conducted signals at the tested frequencies.

Degrees of hearing loss

In addition to the audiogram, the overall degree of hearing loss may be described based on the average of the child's hearing level for three frequencies within the speech frequency range (500, 1,000, and 2,000 Hz) (Figure 3, page 12). For example, if a child has a hearing threshold of 25 dB HL at 500 Hz, 30 dB HL at 1,000 Hz, and 35 dB HL at 2,000 Hz, the average would be 30 dB HL.

Figure 2: Audiogram

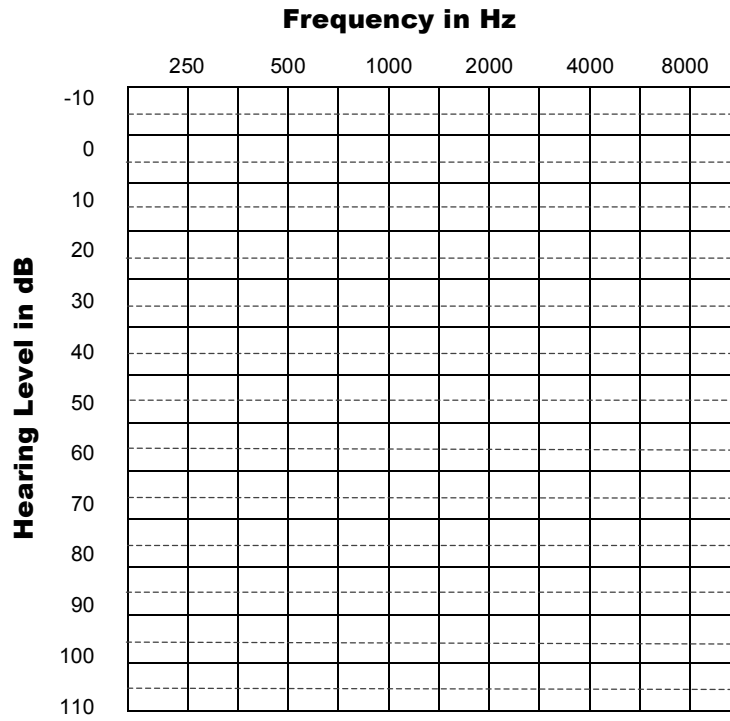
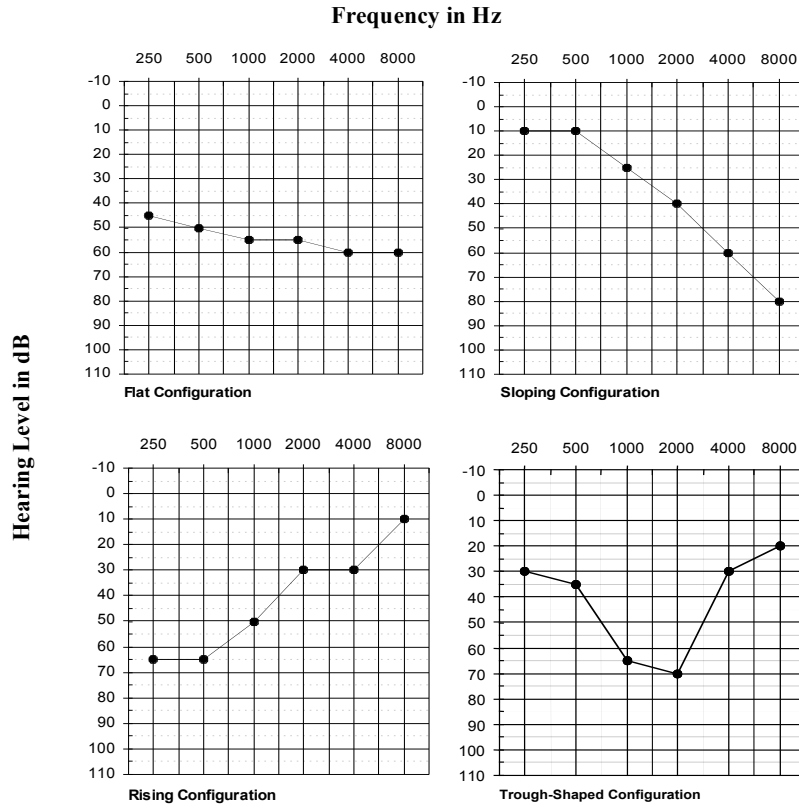


Figure 3: Examples of Hearing Loss Configurations



The decibel ranges for the various levels of hearing loss, as used in this guideline, are:

minus 10 to plus 15 dB HL	Normal	56-70 dB HL	Moderate-Severe
16-25 dB HL	Borderline	71-90 dB HL	Severe
26-40 dB HL	Mild	>90 dB HL	Profound
41-55 dB HL	Moderate		

Children with hearing losses in the mild, moderate, moderate-severe, and severe categories are sometimes referred to as “hard of hearing,” whereas children with hearing losses in the profound category may be referred to as “deaf.” All degrees of hearing loss during infancy and early childhood can affect spoken language development.

Types of hearing loss

A hearing loss can be classified as a conductive, sensory, neural, or mixed hearing loss, based on the location of the problem. A hearing loss may also be labeled as unilateral or bilateral, depending on whether the loss is in one (unilateral) or both (bilateral) ears. The degree of loss might be the same in both ears (symmetrical hearing loss), or it could be different for each ear (asymmetrical hearing loss).

Types of hearing loss include (see page 112):

- ***Conductive hearing loss*** results from problems in the outer and/or middle ear that produce a diminished efficiency with which the sound is conducted to the inner ear, and where:
 - The bone conduction thresholds are normal
 - The air conduction thresholds are in the borderline to moderate range
 - The hearing loss is not severe or profound
- ***Sensory hearing loss*** results from problems in the inner ear that prevent neural impulses from being generated by the hair cells in the cochlea and where:
 - The bone conduction is also impaired
 - The hearing loss can range from borderline to profound
 - Some frequencies show a greater loss than do others

Neural hearing loss results from problems in the auditory nerve, brainstem, or central auditory pathway that prevent neural impulses from reaching the brain in a normal manner.

Mixed hearing loss results from problems in both the middle and the inner ear. For example, children with a sensory hearing loss can also have a conductive hearing loss due to otitis media with effusion. The conductive hearing loss compounds the sensory hearing loss, increasing the child's overall degree of hearing loss.

Central auditory disorder results from problems in the processing of sound in higher auditory areas of the brain. This type of auditory problem affects more complex auditory processes such as understanding speech when there is background noise.

The term **sensorineural** hearing loss is still widely used as a general term for hearing loss that may be either sensory or neural because until recently it was difficult to differentiate one from the other using existing audiologic tests. Today, assessment methods frequently allow the differentiation of sensory hearing loss (inner ear) from neural loss (auditory nerve and brainstem).

Causes of hearing loss

Sensorineural hearing loss can result from a variety of causes, both genetic and nongenetic. Nongenetic causes include ototoxic drugs and various infections, such as meningitis (Table 3, page 33).

The most common cause of conductive hearing loss in infants and young children is otitis media with effusion (OME). OME (fluid in the middle ear) may be the result of an infection of the middle ear (acute otitis media). The conductive hearing loss associated with otitis media may be mild and fluctuating.

Only approximately 10% of children who are deaf are born into families with one or more parents with hearing loss. Approximately 90% of all children who are deaf are born to hearing parents.

HOW COMMON IS CHILDHOOD HEARING LOSS?

Approximately 1 in every 1,000 infants is born with early-onset severe-to-profound sensorineural hearing loss. Milder degrees of hearing loss may be as prevalent as in 6 of every 1,000 young children.

The New York State Universal Newborn Hearing Screening Demonstration Project found that approximately 60% of infants who were confirmed to have

sensorineural hearing loss following newborn hearing screening had mild to moderate degrees of hearing loss.

In the 1996-1997 *Annual Survey of Deaf and Hard-of-Hearing Children and Youths* by the Gallaudet University Research Institute, responses to a question about the degree of hearing loss indicated that approximately half of the 46,000 children with hearing loss who were surveyed had a hearing loss of severe or profound degree.

WHAT ARE THE RISK INDICATORS FOR HEARING LOSS?

Certain risk indicators associated with infant and childhood hearing loss have been identified (Table 3, page 33). However, many infants and young children with hearing loss have no obvious risk indicators. Similarly, a child with a risk indicator may not have hearing loss.

HOW IS HEARING LOSS DETECTED?

In the past, hearing loss was sometimes detected by formally testing only those children with risk indicators for possible hearing loss. However, using this approach, many infants and young children with hearing loss were not detected until they were older. Often, suspicion did not arise until the child demonstrated delays or disorders in the development of speech and language (usually at approximately 2 years of age).

Because of the evidence that early detection and intervention results in better outcomes for young children with hearing loss, many states, including New York State, have implemented universal hearing screening to identify newborns that might have a hearing problem. Babies who do not pass the newborn screening test are referred for further audiologic follow-up.

Although many babies who are referred for further assessment will turn out to have normal hearing, universal newborn screening can increase early detection of those infants who do have congenital or early-onset hearing losses.

Even with newborn hearing screening, parents as well as health care and early childhood professionals are still involved in detecting hearing loss in infants and young children. Screening programs can miss some infants with a mild hearing loss or a hearing loss with an unusual configuration. Furthermore, not all hearing losses are present at birth, and not all infants and children are born in a state with universal newborn screening.

HOW IS HEARING LOSS CONFIRMED?

Hearing loss is confirmed using a battery of audiologic tests. The specific tests and measures that are used depend on the age of the infant or child. However, a comprehensive hearing assessment designed to confirm hearing loss usually includes a hearing history, physiologic procedures, and behavioral procedures (Table 1).

Table 1: Components of a Comprehensive Hearing Assessment

Hearing history

- Parents' general concern about hearing and communication
- Auditory behaviors (reacting to and recognizing sounds)
- History of otitis media (ear infections and fluid within the middle ear) and other risk factors for hearing loss

Physiologic procedures or acoustic admittance measurements

- *Otoacoustic emissions (OAE)*. OAE are low-level sounds produced by the sensory hair cells of the cochlea (primarily the outer hair cells of the inner ear) as part of the normal hearing process. Hair cells that are normally-functioning emit acoustic energy that can be recorded by placing a small probe (containing a microphone) attached to a soft ear tip at the child's ear canal opening. The microphone delivers test signals into the ear canal that evoke an acoustic response from the hair cells, and the responses are recorded by a second microphone in the probe. These responses are called evoked otoacoustic emissions (EOAE or most commonly, OAE).
- *Auditory brainstem response (ABR)*. Used to estimate hearing threshold sensitivity using clicks or tones. These tests are also used to determine the integrity of the auditory pathway from the cochlea to the level of the brainstem. Small disc electrodes are pasted on the scalp and auditory potentials (electrical [neural] activity generated by the auditory nerve and brainstem) evoked by repetitive stimuli delivered by an earphone are recorded by a computer.
- *Middle ear muscle reflexes*. An involuntary middle ear muscle reflex to sounds is recorded, usually elicited by loud tones or noises.
- *Tympanometry*. Assesses function of the middle ear. A probe attached to a soft, plastic ear tip is placed at the ear canal opening, and air pressure is varied in the ear canal. Tympanometry is not a hearing test.

Table 1: Components of a Comprehensive Hearing Assessment

Behavioral audiometry testing

- *Observation* of general awareness of sound (for example, mother’s voice, environmental sounds, music) to determine a general level of auditory responsiveness or function. This is an unconditioned behavioral response procedure.
- *Visual reinforcement audiometry (VRA)*. A conditioned behavioral test procedure useful for determining threshold sensitivity in infants beginning at approximately 6 months of age (developmental age). A head-turn response upon presentation of an audiometric test stimulus is rewarded by the illumination and activation of an attractive animated toy.
- *Conditioned play audiometry (CPA)*. A conditioned behavioral test procedure useful for determining threshold sensitivity in young children beginning at approximately 2 years of age (developmental age). A play response (block-drop, ring stack) made by the child in response to the presentation of an audiometric test stimulus is rewarded, usually by social praise.

*Adapted from: Gravel 1999
(Continued from previous page)*

WHAT IS THE IMPACT OF HEARING LOSS?

Hearing loss, particularly during infancy, has adverse effects on speech and language development (Table 2, page 18). Therefore, a child’s ability to communicate with others may be affected, which in turn can impede the child’s progress in other developmental areas. Children with hearing loss who fail to develop language tend to fall behind their hearing peers in other developmental domains including cognitive and social/emotional development.

The degree, type, and configuration of the hearing loss can all influence the impact on a child’s development. The age at which the loss is acquired is also important. Some children are born with hearing loss; others may have later-onset hearing loss. Children whose hearing loss is congenital or acquired before speech is acquired (a prelingual hearing loss) tend to have more severe communication problems than do children who acquired their speech before the onset of the hearing loss.

Table 2: Potential Impact of Childhood Hearing Loss

Hearing Loss/ dB Range	Effect on Hearing and Speech
<i>Borderline/16-25 dB HL</i>	Difficulty with hearing distant or faint speech sounds such as s, sh, k, and p. Mild amplification may benefit some children.
<i>Mild/26-40 dB HL</i>	Children with mild, untreated hearing loss will be able to hear most of speech and will develop spoken language. However, hearing aids and minimal intervention may be needed to help with language development for some children.
<i>Moderate/41-55 dB HL</i>	Without intervention, a moderate hearing loss will affect and delay spoken language development but will not totally prevent it. Children with moderate hearing loss who wear hearing aids and receive appropriate training can be expected to develop almost normal spoken language.
<i>Moderate-Severe/56-70 dB HL</i>	Without intervention, children with moderate-severe hearing loss will not be able to hear most conversational speech at 3-5 feet and will have problems acquiring spoken language.
<i>Severe/71-90 dB HL</i>	Without intervention, a severe hearing loss will prevent the development of spoken language. Children with severe hearing loss can be expected to learn to use their hearing as the primary route to develop spoken language if they are provided with hearing aids, good early intervention, and continued special training.
<i>Profound/> 90 dB HL</i>	Without intervention, spoken language will not occur. With intense intervention, spoken language can develop but typically much slower than for other children and with greater difficulty. With hearing aids, some children may be able to use hearing as the primary route for spoken language development, but more often, hearing is a complement to speech reading. Many children with profound hearing loss are candidates for a cochlear implant, which may enable them to use hearing as the primary means for language acquisition.

WHAT ARE COMMON INTERVENTIONS FOR CHILDREN WITH HEARING LOSS?

For infants and young children with hearing loss, interventions focus both on improving the child's hearing and on preventing or reducing the difficulties in communication that occur because of the hearing loss. In addition, interventions often focus on providing family education and support.

Interventions focusing on the hearing loss usually include prescription of some sort of assistive device to amplify the sound. The most common assistive devices are hearing aids. The many different types of hearing aids vary considerably in style, circuitry, signal processing, number of channels, and memory. They also have a wide range in cost, flexibility, ease of use, and durability. Other assistive devices include tactile aids and frequency modulation systems. Sometimes, when conventional hearing aids have been found to have limited benefit for a young child, the child may undergo cochlear implant surgery in which an electronic device is placed in the inner ear.

A primary focus of early intervention for children with hearing loss is to promote their communicative competence. Different communication approaches vary in the degree to which they rely on audition and/or vision along an auditory-visual continuum.

CONSIDERATIONS FOR CHILDREN WITH COEXISTING CONDITIONS

Although many of the guideline recommendations generally apply to all children with hearing loss, regardless of other associated conditions, it is not within the scope of this guideline to specifically address assessment and intervention for children with hearing loss who also have other coexisting conditions that may affect the child's development such as a vision impairment or autism. As is emphasized throughout the guideline, the specific approach for any child should be individualized to the needs of the child and family.

Differentiating hearing loss from autism

Autism is a complex developmental disability in which the onset of symptoms occurs within the first three years of life. Many children with autism, especially when they are young, are sometimes nonresponsive to sounds such as human voices. Because of this lack of response to sounds, children with autism are sometimes misdiagnosed as having a hearing loss although their hearing may be normal. These children may receive unnecessary interventions for hearing loss

and fail to receive interventions designed for children with autism. Conversely, children may be identified as having autism when in fact they have a hearing loss and could benefit from amplification. Finally, there are children who have both autism and hearing loss. Consequently, the audiologic assessment of all children with autism or those who are suspected of having autism is important. Similarly, if autism is suspected in a child with hearing loss, the child should be evaluated for this problem.

Children with hearing loss and vision impairments

Deaf-blindness is a condition in which there is a combination of both hearing and vision losses. The spectrum of sensory impairments included in deaf-blindness ranges from the child who has profound hearing loss and has no light perception to the child who has some usable vision and some residual hearing. Deaf-blindness is often accompanied by additional disabilities.

Children with deaf-blindness require individualized intervention approaches to maximize their opportunities for interacting with their environment. Interventions include assistive devices to maximize any residual hearing and sight. Touch is often used as a critical component of the intervention.

WHICH PROFESSIONALS WORK WITH CHILDREN WITH HEARING LOSS?

- **Audiologist:** An audiologist is a health care professional who is trained to evaluate hearing loss and related disorders of hearing and to provide hearing related habilitation/rehabilitation to individuals with hearing loss. An audiologist uses a variety of tests and procedures to assess hearing and to fit and dispense hearing aids and other assistive devices for hearing.
- **Otolaryngologist:** An otolaryngologist is a physician who is board certified in the specialty of otolaryngology (ear, nose, and throat). Otolaryngologists specialize in the diagnosis and medical management of disorders of the ears, nose, throat, and head and neck. Otolaryngologists must complete specialty training after medical school.
- **Otologist/Neurotologist:** An otologist/neurotologist is a physician who is a board certified otolaryngologist who has undertaken additional training in the subspecialties of otology and neurotology. These physicians manage problems related primarily to hearing, balance, and facial nerve disorders. They often perform more complicated surgeries such as cochlear implants, acoustic and facial nerve tumor removal, and advanced surgery for vestibular problems.

- **Pediatric Otolaryngologist:** A pediatric otolaryngologist is a physician who is a board certified otolaryngologist with specialty training in pediatric otolaryngology. This training includes the evaluation and management of congenital neck masses and tumors, airway problems, chronic otitis media management, and varying degrees of pediatric ear problems.
- **Speech-Language Pathologist:** A speech-language pathologist is a health care professional who is trained to evaluate and treat individuals who have voice, speech, language, or swallowing disorders, including individuals with hearing loss that affects their ability to communicate.
- **Teachers of the Deaf and Hard of Hearing:** A teacher of the deaf and hard of hearing is an educator with specific training and experience teaching children with hearing loss. Teachers of the deaf and hard of hearing are trained to use various specific communication systems appropriate for young children with hearing loss. Their specific skills include working with children on speech and language development, written language support, auditory skills/training, Deaf culture, sign language development, and transition to the next educational level.

Depending on the strengths and needs of the individual child and family, there are many other professionals who may be involved in the assessment and intervention process for young children with hearing loss.

**CHAPTER III:
IDENTIFICATION AND
ASSESSMENT**

GENERAL CONSIDERATIONS FOR IDENTIFICATION AND ASSESSMENT OF HEARING LOSS IN YOUNG CHILDREN

It is important to identify children with or at risk for hearing loss as early as possible so that appropriate intervention can be initiated. Early identification and appropriate intervention may help to maximize the child’s general development and promote better long-term functional outcomes.

The screening and assessment process

Identification of hearing loss in young children is a joint process between parents and professionals that includes parental feedback about their child’s development and observation of the child by the professional. When hearing loss is suspected, a specific hearing screening or assessment process for hearing loss is initiated.

In this guideline, a hearing screening or assessment method is broadly defined as any test, measure, or procedure that can be used to identify possible hearing loss or assess the hearing status of infants and young children. Using this broad definition, screening and assessment methods include both standardized and nonstandardized tests (often based on history, direct observations, and/or physical findings), as well as sophisticated technology (such as otoacoustic emissions).

Screening, as used in this guideline, refers to a method that is intended to provide only a quick and preliminary decision about whether a child may have (or does not appear to have) a hearing loss. A hearing screening does not confirm that a child has (or does not have) a hearing loss.

Routine monitoring of a child’s development can be effective for identifying some hearing problems, but there is no reliable observational hearing screening method that can identify all young children with hearing loss.

General considerations for screening and assessment

General considerations to keep in mind when screening or assessing young children who have suspected hearing loss include making sure that the screening and assessment methods used are appropriate to the developmental stage of the child and that the screening or assessment takes place in a quiet environment, provides a positive experience for both parent and child, and accommodates the family’s schedule, culture, and language. In addition, it is important to take into consideration any factors that may affect the child’s performance during the


assessment process, including the child's overall health status and current family and environmental influences.

It is important to recognize that any screening or assessment test gives information at only one point in time. Therefore, it is important that assessment be viewed as an ongoing process that follows the child over time rather than as a single event.

Considering the cultural and family context

When working with children and families, it is essential to consider parent priorities, parenting styles, and the family's practical and emotional support system. There may be cultural and other differences in expectations about such things as the development of adaptive or self-help skills and independence, play and social interaction, pragmatic use of language, and eye contact.

If English is not the family's primary language, it is important for professionals to look for ways to communicate effectively. That includes finding professionals and/or translators who speak the primary language.



Early Intervention Policy ❖ The multidisciplinary evaluation must be conducted in the child's dominant language whenever possible.

It is important to recognize that when a young child is initially identified as having a hearing loss, the issues related to hearing and Deaf culture will probably not be familiar to most families. Some families may prefer to promote multiple communication options using spoken language, signs, and amplification, while other families may not. It is important for those working with the family to understand and be open to the various options the family will have when making decisions about their preferences for the hearing culture of the family.

What professionals need to know about hearing loss

It is important for all primary health care providers and early childhood professionals who work with children from birth to 3 years old to be knowledgeable about identifying hearing loss in young children, including:

- Typical language development in young children
- Risk factors and clinical clues for early identification of hearing loss
- The possible impact of a hearing loss on other areas of development

- Appropriate methods for hearing screening and for audiological assessment of young children
- Appropriate actions for referrals to other professionals when a hearing loss or other developmental problem is suspected.

It is recommended that the professionals who are conducting hearing screening and assessment for infants and young children have appropriate training and experience working with young children and with the specific screening and assessment technology. In addition, professionals need to have a solid knowledge base about typical newborn and early childhood development. Other key professional characteristics include understanding the significance of observation, recognizing cues from the child, being sensitive to the needs of parents, and understanding the importance of a multidisciplinary approach.

METHODS FOR IDENTIFYING POSSIBLE HEARING LOSS IN INFANTS AND YOUNG CHILDREN

The identification of infants and young children with hearing loss can occur in a variety of ways. For some infants, concern about the possibility of a hearing loss may arise at birth due to the recognition of risk factors for hearing loss (Table 3, page 33) or the results of newborn hearing screening. Sometimes, concern about a possible hearing loss is identified in very young children because of clinical clues such as lack of responsiveness to sound (Table 5, page 36) or because of lack of progress in the child's communication milestones (Table 4, page 34). Sometimes, hearing loss is not suspected until a delay in speech and language development is recognized.

In general, there are two basic types of procedures used to identify hearing loss in infants and young children:

- *Physiologic tests* elicit and measure physiologic responses to various sounds from different locations in the auditory system. These are tests of *auditory function*; they do not measure how well or what a child is able to hear. Because physiologic tests do not require voluntary responses from the child, they are frequently considered “objective” measures of auditory function.
- *Behavioral hearing tests* examine the child's responses to acoustic stimuli (specific noises and sounds) and are considered the only means of determining the child's functional use of hearing. They are used to determine what and how well a child hears (threshold sensitivity) at frequencies important for the detection of speech sounds.

In general, a battery of tests that includes both physiologic and behavioral measures is recommended for a comprehensive assessment of hearing in infants and young children. Using physiologic tests to determine the child's hearing ability is especially important when the child is too young or unable to provide reliable behavioral responses.

HEARING SCREENING

Screening for hearing loss, whether in a newborn hearing screening program or later, is intended to lead to a “yes” or “no” decision that a child either may have or does not appear to have hearing loss. There is no clinical decision making involved in screening because the tests are totally automated. Results are presented as “pass” when the child does not appear to have a hearing loss (the screening test is *negative* for hearing loss) or “refer” if the child needs further audiologic testing (the screening test is *positive* for possible hearing loss).

Hearing screening is intended to provide only a quick and preliminary decision about whether a child may have (or does not appear to have) a hearing loss. Children who do not pass a hearing screening are referred for an audiologic assessment to confirm the existence of a hearing loss and to determine the type, degree, and configuration of the loss.

Physiologic measures to identify hearing loss

The same basic physiologic procedures, either otoacoustic emissions (OAE) or auditory brainstem response (ABR), can be used for both hearing screening and for comprehensive audiologic assessment (see Audiologic Assessment, page 39). These procedures can be used for newborn hearing screening or for screening young children.

There have been many recent technological advances in hearing screening devices, particularly in automated OAE and ABR devices made specifically for screening. These new devices are much more portable, can provide a quick result, and can be used by technicians with much less training and experience. However, automated hearing screening provides only a “pass/refer” result that indicates the possibility of having (or not having) a hearing loss. This type of hearing screening cannot confirm a hearing loss.

When using automated screening devices, it is important to recognize that using equipment from different manufacturers may result in different results because the pass/fail settings may differ from one product to the next. It is also important to consider the impact of environmental noise (or electrical interference with the

ABR) on the screening results. Noise in the testing environment can reduce the ability to detect a response and thus may influence the pass/refer result.

Newborn Hearing Screening

Newborn hearing screening is important because of the role of hearing in the early development of the child. Early identification and intervention for hearing loss can help to improve overall speech, language, and other outcomes for the child and family.

Universal newborn hearing screening programs are now in place in the majority of states. These programs are designed to identify newborns at risk for hearing loss that interferes with development.

New York State regulations regarding newborn hearing screening can be found in Appendix C.

It is recommended that all newborns, both well babies and those in the neonatal intensive care unit (NICU), receive a hearing screening test before discharge from the hospital or birthing facility. For newborns who do not have access to newborn hearing screening prior to discharge, it is recommended that hearing be screened by one month of age.

Newborn Hearing Screening Program Note: *Public health law and New York State regulations (Subpart 69-8 of 10 NYCRR) require that all newborns receive a hearing screening prior to discharge from the hospital or be referred for a hearing screening that will take place after discharge from the hospital. If the screening is postdischarge, it should be performed within four weeks of the infant's discharge from the facility, if possible, and not later than twelve weeks following birth.*

Informing parents about newborn hearing screening

Parents need to be provided with information about the newborn hearing screening program. It is important for the parents to understand that the screening is not an assessment of hearing; the screening is to distinguish infants who may need further testing from infants who are unlikely to have a hearing loss.

It is important that the parents be informed about their infant's hearing screening results before the infant is discharged from the hospital or birthing facility. Parents also need to be provided with written information about monitoring hearing and communication milestones and the importance of follow-up.

Infants who pass newborn hearing screening

Even if an infant passes a newborn hearing screening, it is recommended that parents and professionals continue to monitor the child's attainment of communication milestones as part of an ongoing surveillance for possible hearing loss. This is important because:

- Mild hearing losses may not be detected by screening
- No screening test is perfect; some children who pass the screening may in fact have a hearing loss and some who do not pass may not
- A hearing loss can develop after birth (delayed onset or progressive undetected hearing loss)

If a child passes the newborn hearing screening but has risk factors for hearing loss (Table 3, page 33), it is important to consider the need for periodic audiologic monitoring.

Infants who do not pass inpatient newborn hearing screening

To reduce the likelihood of a false positive result, it is recommended that all infants who do not pass the first screen be rescreened before hospital discharge.

Newborn Hearing Screening Program Note: According to New York State regulations, if the infant fails the inpatient hearing screening, a repeat screening shall be conducted whenever possible prior to the infant's discharge from the facility to minimize the likelihood of false positive results and need for a follow-up outpatient screening.

If a newborn does not pass the hearing screening, it is important to inspect the ear tip of the screening device for debris from the ear canal which could result in an inaccurate result. If debris is observed, it is recommended that this be removed and the infant be rescreened immediately.

If an infant does not pass a newborn hearing screening before hospital discharge, it is very important for the child to have follow-up physiologic testing.

Newborn Hearing Screening Program Note: If an infant fails the inpatient screening and repeat screening (if performed), an outpatient follow-up screen should be performed to determine whether a diagnostic audiological evaluation is needed. An infant who fails the outpatient follow-up screen is suspected of having a hearing loss, and may be referred to the Early Intervention Program for an audiological evaluation.

When giving the results of the newborn hearing screening to the parents of infants who do not pass the screening, it is recommended that the focus be on the need for follow-up testing rather than on "failing" the screening test.

Screening for Hearing Loss in Young Children

Screening to identify possible hearing loss in young children may be performed as a part of the child's general health monitoring services, as a part of a specific hearing screening program (such as a preschool hearing screening program), or because there is concern about the child's hearing.

It is recommended that several factors be considered when deciding whether to first screen a child for hearing loss or refer the child directly for a full audiologic assessment. These factors include:

- The level of concern about the possible hearing loss
- The child's developmental age
- Technology available in the testing facility

For any child receiving early intervention for an identified speech/language delay or disorder, it is recommended that the child be referred directly for an audiologic assessment rather than for hearing screening.

Inappropriate methods for screening for hearing loss

It is important to recognize that for infants and young children, unconditioned behavioral response approaches (presenting a sound and observing changes in the infant's behavior, such eye shift or cessation of sucking) do not provide sufficient information to be considered a reliable screening method. Behavioral observation audiometry is not recommended as a hearing screening method for infants and young children. For older infants and young children, it may be possible to use a simplified version of behavioral tests using visual reinforcement audiometry (VRA) or conditioned play audiometry (CPA).

Parent report alone is an insufficient method of determining whether or not a hearing loss exists. When a parent has a concern, this can be a good indicator of a possible hearing problem and the need for hearing screening. However, the detection of some types and degrees of hearing loss may be missed based on parent report alone.

Follow-up after screening for hearing loss

When a screening test determines that a young child may have a hearing loss, it is recommended that the child be referred for an audiologic assessment to confirm the hearing loss and to determine its type, degree, and configuration.

IDENTIFYING POSSIBLE HEARING LOSS THROUGH RISK FACTORS, CLINICAL CLUES, AND DEVELOPMENTAL SURVEILLANCE

For many infants and young children, identification of hearing loss will not occur during the newborn period. Reasons for delayed identification include:

- Newborn screening procedures are not 100% accurate, particularly if the hearing loss is mild in degree, of an unusual configuration, or related to an auditory nerve or brainstem disorder.
- Not all hearing loss is present at birth. Some hearing loss has a delayed onset or is acquired later in childhood, and some hearing loss is fluctuating and/or progressive.
- Newborn hearing screening is not required in all states, and some children will be missed even in states that require newborn screening.

If there are no indications of a hearing problem as a result of newborn screening or if newborn screening is not performed, there are several other ways that hearing loss may be identified in infants and young children. Often, children are identified because they have specific *risk factors* for having or developing a hearing problem, or because they show certain *clinical clues*.

Risk factors

A *risk factor* is something that increases the possibility that the child will have a hearing loss (Table 3, page 33). The recognition of a risk factor only provides an indication that further assessment may be needed and that periodic hearing screening should be incorporated into the child's routine health care surveillance.

Clinical clues

For some infants and young children, a possible hearing loss will be identified when a parent or professional notices specific behaviors or signs that heighten concern about the child's hearing status. For example, the parents may notice that their infant does not pay attention to sound or may have an inconsistent response to sound. These behaviors are referred to in this guideline as *clinical clues*.

Many of the clinical clues for hearing loss are related to delays in speech and language development. Normal language milestones are specific communication behaviors grouped according to the age range when they usually first appear in typically developing children. Some general developmental milestones related to speech and language development are listed in Table 4 (page 34).

In general, the age at which a behavior or absence of a behavior starts to become a concern corresponds to the upper limit of the corresponding age range in typical development. For example, reduplicative babbling (“bababa”) usually develops between 6 and 9 months. Therefore, if a child is not babbling by the age of 9 months or is babbling with only a few or no consonants, it is considered a delay in communication milestones and is a clinical clue of a possible communication problem, including hearing loss. The clinical clues for possible hearing loss are listed in Table 5 (page 36), along with the age at which they become a concern.

Developmental surveillance

Developmental surveillance is an approach that is used to help with the identification of a variety of developmental problems. Developmental surveillance is routinely conducted by knowledgeable professionals as part of monitoring a child’s developmental status during the early childhood years. Surveillance for hearing loss in infants and young children is usually conducted as a part of general developmental surveillance during routine health care visits beginning at birth and includes:

- A general examination of the ears.
- A review of the child’s health and general developmental history (especially communication development) to see if there are risk factors or clinical clues that suggest a possible hearing problem.
- Questions to parents about the child’s health and development.
- Direct observation and examination of the child.

Table 3: Risk Indicators for Hearing Loss in Infants and Young Children

1. Admission to a neonatal intensive care unit for 48 hours or longer
2. Family history of permanent childhood sensorineural hearing loss
3. In utero infection such as cytomegalovirus, herpes, toxoplasmosis, or rubella
4. Postnatal infections associated with hearing loss (such as bacterial meningitis)
5. Exposure to ototoxic medications (such as aminoglycoside antibiotics, cisplatin chemotherapy agents, and certain loop diuretics)
6. Craniofacial anomalies, especially those with abnormalities of the ear or ear canal
7. Neonatal indicators:
 - Birth weight less than 1,500 grams
 - Hyperbilirubinemia requiring exchange transfusion
 - Persistent pulmonary newborn hypertension requiring mechanical ventilation
 - Conditions requiring the use of extracorporeal membrane oxygenation (ECMO)
8. Findings associated with a syndrome known to include or be high risk for hearing loss:
 - Syndromes associated with sensorineural and/or conductive hearing loss (such as Waardenburg syndrome)
 - Syndromes associated with progressive hearing loss (such as neurofibromatosis and osteopetrosis)
 - Genetic conditions that are likely to have associated hearing loss (such as Down syndrome and Usher syndrome)
 - Neurodegenerative disorders (such as Hunter syndrome) or sensory motor neuropathies
9. Head trauma (especially with fracture of the temporal bone)
10. Recurrent or persistent otitis media with effusion (OME) for at least 3 months
11. Parental or caregiver concern regarding hearing, speech, language and/or developmental delay

Adapted from: JCIH 2000

Table 4: Communication Developmental Milestones

Birth to 3 Months

- Startles in response to loud noise
- Becomes quiet in response to sound (especially to speech)
- Smiles or coos in response to another person’s smile or voice

From 3 to 6 Months

- Fixes gaze on face
- Responds to name by looking for voice
- Looks for sound source/speaker
- Cooing, gurgling, squealing, and vocal play

From 6 to 9 Months

- Imitates vocalizing to another
- Has different vocalizations for different states (happy, angry, hungry)
- Imitates familiar sounds and actions
- Begins reduplicative (canonical) babbling (“bababa,” “mamamama”)
- Vocal play with intonational patterns, sounds that become speech-like in quality (vowel-like and consonant-like)

From 9 to 12 Months

- Indicates requests with actions; coordinates actions between objects and adults (directs adult’s attention to object of desire; pats, pulls, tugs on adult; points to object of desire)
- Imitates new sounds/actions
- Shows consistent patterns of reduplicative babbling, produces vocalizations that sound like first words (such as “ma-ma,” “da-da”)

From 12 to 18 Months

- Single-word productions begin
- Gets attention/requests objects using words (such as “mommy”)
- Uses ritual words (“bye,” “hi,” “please,” “uh-oh,” “peek-a-boo”)
- Protests: says “no,” shakes head, moves away, pushes objects away

Table 4: Communication Developmental Milestones

From 18 to 24 Months

- Uses mostly words to communicate
- Begins to use some two-word combinations
- By 24 months, uses combinations with relational meanings (such as “more cookie,” “daddy shoe”)
- By 24 months, has at least 50 words, can be approximations of adult form

From 24 to 36 Months

- Engages in short dialogues
- Begins using language in imaginative ways
- Begins providing descriptive details to facilitate listener’s comprehension
- Begins to include the articles (“a,” “the”) and word endings (“-ing” added to verbs; regular plural “s” [cats]; “is” + adjective [ball is red]; and regular past tense “ed”)

*Adapted from: NYSDOH, Clinical Practice Guideline, Communication Disorders 1999
(Continued from previous page)*

Table 5: Clinical Clues of Possible Hearing Loss

Any one clue at any age may be a clinical clue of hearing loss

At 3 Months

- Lack of responsiveness to voice
- Lack of awareness of environmental sound
- Does not visually track to voice

At 6 Months

- Lack of awareness of sound, no localizing toward the source of a sound/speaker
- Vocalizes with little variety

At 9 Months

- Lack of connection with adult (vocal turn-taking, reciprocal social games)
- Does not associate a sound with its source (such as not responding to sound toys)
- No babbling or babbling with few or no consonants

At 12 Months

- Lack of consistent patterns of reduplicative (canonical) babbling (such as “babababa”)
- Lack of responses indicating comprehension of words
- Exclusive reliance on context for language understanding
- Lacks vocalizations that sound like first words (such as “ma-ma” or “da-da”)

At 18 Months

- Does not attempt to imitate words
- Does not spontaneously produce single words to convey meaning
- Limited comprehension vocabulary (understands less than 50 words or phrases without gesture or context clues)
- Limited production vocabulary (speaks less than 10 words)
- Speech largely unintelligible
- Lack of progress in vocabulary development from 12 to 18 months (plateau or lack of progress at any age)
- Limited consonant production

At 24 Months

- Reliance on gestures without verbalization
- Speech largely unintelligible
- Limited production vocabulary (speaks less than 50 words)

Table 5: Clinical Clues of Possible Hearing Loss

- Does not use two-word combinations

At 36 Months

- Social interactions with peers are primarily gestural
- Words limited to single syllables with no final consonants
- Few or no multiword utterances
- Does not demand a response from listeners
- Asks no questions
- Poor speech intelligibility
- Frequent tantrums when not understood

*Adapted from: NYSDOH, Clinical Practice Guideline, Communication Disorders 1999
(Continued from previous page)*

It is important to recognize that risk factors and clinical clues (Tables 3 and 5) may be useful as a predictor of hearing loss. However, not all children with risk factors or clinical clues will have hearing loss, and many children with hearing loss have no risk factors.

If a child has risk factors for hearing loss, it is important to consider the need for periodic audiologic monitoring of the child's hearing. If there appears to be significant risk or if there are clinical clues of a possible hearing loss, it is important that this information be communicated to the parents and that the child be referred for an appropriate hearing assessment.

It is important to recognize that both episodic and permanent mild to moderate hearing loss may be difficult for parents and professionals to detect because:

- The loss may fluctuate (be episodic)
- The child may be able to hear enough to respond and to develop speech and language even though there is a mild or high-frequency hearing loss
- The child may have an unusual configuration of hearing loss where some sounds are heard normally and others are difficult to hear or are not heard
- The loss may exist in only one ear

The importance of listening to parental concerns

It is important that health care providers ask concrete questions, such as the following, at each health care visit to elicit information about possible hearing loss:

- Do you have any concerns about your child’s speech/language development or hearing?
- Does your child turn to look for soft sounds or when someone is speaking from a distance?
- Does your child respond to you when you talk to him and respond to sound as you would expect him to?
- Does your child understand you when you speak softly and are out of visual range (that is, without speech reading and/or gestures)?
- Has your child had any ear infections since the last visit?
- Does your child get frequent colds, stuffy nose, or have allergies? Does your child “mouth breathe”? Does your child snore when asleep?

If the parent has a concern, it is important to follow up because there is a higher likelihood that the child may actually have a problem. However, if a parent does not indicate a concern, it is still important for the health care provider to conduct routine surveillance for possible hearing problems.

It is important to recognize that parent concerns are particularly helpful in identifying children with severe and profound sensorineural hearing loss, but it may be more difficult for parents to identify children with milder losses. Mild to moderate loss may be especially difficult to detect by observation.


Children with otitis media with effusion (OME)

It is important that routine health and developmental surveillance include specific methods for identifying acute otitis media (AOM) or otitis media with effusion (OME). It is recommended that all children with repeated episodes of OME have audiologic evaluations to determine if there is any fluctuating hearing loss associated with the OME and to rule out sensorineural hearing loss.

It is important not to put off a hearing test for a young child with recurrent OME just because of fluid in the ear because:

- One of the reasons for late identification of sensorineural hearing loss is delayed testing due to OME

- Up to 50% of children with recurrent, persistent OME have a conductive hearing loss



Early Intervention Policy ❖ Health care services that are routinely needed by all children are not reimbursable under the Early Intervention Program as early intervention services. Medical surveillance of otitis media should be provided as part of primary health care by the child's primary health care provider.

Infants treated with extracorporeal membrane oxygenation

Extracorporeal membrane oxygenation (ECMO) is a procedure that is sometimes necessary for premature newborns in the neonatal intensive care unit (NICU). It is important to recognize that this is a risk factor for hearing loss, and therefore it is important to conduct audiologic follow-up for infants treated with ECMO regardless of their auditory brainstem response (ABR) findings in the NICU.

AUDIOLOGIC ASSESSMENT FOR INFANTS AND YOUNG CHILDREN WITH SUSPECTED HEARING LOSS

In this guideline, an **audiologic assessment** (or audiologic evaluation) method is broadly defined as any assessment test, measure, or procedure that can be used to assess infants and young children with a possible hearing loss.

The audiologic assessment involves a battery of tests that includes physiologic measures as well as developmentally appropriate behavioral tests and measures of speech perception. This is important because adequate confirmation of hearing status cannot be reliably obtained from a single test measure in infants and young children. The tests used depend on the child's age (Table 6, page 44).

The overall goals of the audiologic assessment include:

- Confirming whether or not a hearing loss is present
- Determining the type, configuration, and severity of any hearing loss
- Determining the cause of the hearing loss
- Determining if intervention is needed and assisting in planning intervention strategies and options
- Establishing a baseline for measuring progress and evaluating intervention outcomes

An audiologic assessment is recommended for the further evaluation of infants and young children when:

- The child does not pass an objective physiologic screen of hearing (such as through a newborn hearing screening program)
- There is sufficient concern about the possibility of a hearing loss (such as multiple clinical clues or a child with risk factors plus clinical clues) to warrant direct referral for an audiologic assessment
- The child has an identified speech/language delay or disorder

When an initial physiologic hearing screening is not available as an option, it is recommended that an audiologic assessment be conducted if:

- There is parental concern about the child's hearing or if the parent suspects a possible hearing loss, or
- An informal behavioral observation of hearing by a health care provider suggests the possibility of a hearing loss

It is recommended that children with an identified speech/language delay or disorder receive an audiologic assessment rather than a hearing screening.

Audiologic assessment methods

Audiologic assessment methods are generally grouped into two basic categories:

- *Physiologic methods:* Objective measures of physiologic activity within the auditory pathway
- *Behavioral methods:* Developmentally appropriate measures of hearing sensitivity and function

Physiologic Procedures

Otoacoustic emissions (OAE)

OAE are low-level sounds produced by the sensory hair cells of the cochlea as part of the normal hearing process. Hair cells that are functioning properly emit acoustic energy that can be detected and recorded. A possible hearing loss in the mid- and high-frequency regions (important for hearing speech) is indicated if there are no OAE detected and recorded. It is recommended that OAE be used as part of the audiologic test battery to assess children who have been identified with possible hearing loss. However, there are some limitations to OAE (such as children with auditory neuropathy may have normal OAE), and OAE cannot determine the degree and configuration of hearing loss.

Auditory Brainstem Response (ABR)

ABR is a recording of electrophysiologic responses from the auditory nerve and the brainstem. The ABR response can provide information about both low- and high-frequency regions important for speech.

ABR can be performed using either air-conducted or bone-conducted sounds, and it is important to use both for an audiologic evaluation. Bone-conduction ABR will be normal with conductive hearing loss, but air-conduction ABR will be abnormal with all types of hearing loss.

As with OAE, there are some limitations to the use of ABR for detecting hearing loss, and there are several factors (such as noise in the environment) that may affect the accuracy of the results.

It is important to recognize that sedation may be required for obtaining ABR in infants and young children. If sedation is needed, it is important that this be administered by experienced professionals in appropriate facilities that are prepared to handle any possible adverse reactions to the sedation. Using chloral hydrate for sedation may be preferable since it does not depress respiration or interfere with test results.

Steady State Evoked Potentials (SSEP): A variation of ABR, the SSEP technique is a relatively new frequency-specific electrophysiologic response procedure that shows great promise for obtaining an objective estimate of hearing sensitivity in infants and young children. The advantage of the SSEP is that threshold estimates may be obtained in far less time than is currently needed to obtain a frequency-specific ABR.

Tympanometry: Tympanometry is used to measure the function of the middle ear system. If the eardrum and middle ear system are functioning normally, the sound will be conducted easily through the middle ear. If the eardrum and middle ear system are not functioning normally (as the result of fluid in the middle ear, for example) hearing may be affected. When considering the results of tympanometry, it is important to recognize that tympanometry is a test of middle ear function, not a test of hearing.

Acoustic Middle Ear Muscle Reflexes (MEMR): The MEMR are involuntary middle ear muscle reflexes elicited by loud tones or noises delivered into the ear canal. The presence of MEMR provides information about the function of the auditory pathway (cochlea, auditory nerve, and brainstem).

Behavioral Audiometric Test Procedures

Behavioral audiometry involves using specific test techniques to obtain voluntary behavioral responses to the presentation of calibrated sounds. Behavioral audiometric tests are used to:

- Determine whether or not a child has a hearing loss
- Determine the degree, configuration, and type of an existing hearing loss
- Monitor the child's hearing over time
- Provide information for the fitting of hearing aids or other sensory devices
- Help determine the functional benefit of hearing aids or other sensory devices

The goal of behavioral audiometric testing is to obtain a valid measure of hearing threshold sensitivity for each ear in the speech-frequency range, ideally from 250 through 6,000 Hz. Results of the audiometric assessment are displayed on an audiogram.

Behavioral audiometric test methods can be divided into two general categories: unconditioned and conditioned response procedures.

Unconditioned behavioral response procedures

The primary unconditioned behavioral response procedure is behavioral observation audiometry (BOA). BOA is an unconditioned test method that uses trained personnel to judge whether or not an infant is making behavioral responses to specific sounds. Behavioral responses might include activities such as eye widening and searching, a change in sucking activity, limb movements, awakening from a light sleep, or a general startle (Moro reflex).

Some of the limitations of using BOA for audiometric testing include:

- Using biased personnel who are aware of when the sound is presented
- Using numerous behaviors as response indicators
- Difficulty in obtaining ear-specific responses because test signals are presented through a loudspeaker in the testing room
- Many variables affecting the infant's response (for example, if the infant is awake or sleepy, what sounds are used, the level of background noise in the test setting)
- Infants habituating quickly to test signals
- Infants with normal hearing showing wide variability in response

Conditioned behavioral response procedures

Conditioned test methods are screening and assessment procedures that provide the child with reinforcement (visual, social, or edible) for motor behaviors (head-turn, block drop, button push, hand raise) made in response to sound. Infants younger than 5 to 6 months in developmental age are usually not responsive to conditioned test methods.

- *Visual Reinforcement Audiometry (VRA)*: VRA is used to determine threshold sensitivity in infants. A head-turn response is made to the presentation of a stimulus (sound). The degree, configuration, and type of hearing loss in most infants and children between 5-6 months and approximately 24 months of age can usually be tested reliably using the VRA procedure.
- *Conditioned Orienting Reflex (COR) Audiometry*: In COR, the infant must perform two tasks: 1) detect the presence of the test signal, and 2) turn toward either the right or the left side depending on the location of the loudspeaker through which the sound was presented.
- *Conditioned Play Audiometry (CPA)*: CPA is used to determine threshold sensitivity in young children beginning at approximately 2 years of age (developmental age). A play response (block drop, ring stack) in response to the presentation of an audiometric test stimulus is rewarded by social praise and/or visual reinforcement.
- *Speech Audiometry*: Speech audiometry is used to assess the child's ability to detect, discriminate, identify, and comprehend speech. Speech audiometry can be useful in determining intervention goals, in monitoring auditory skill development, and for examining the functional benefit of hearing aids or other assistive technology. The limitation of speech audiometry is that tests of speech identification require that the speech items used to test the child's auditory abilities must be within the child's receptive vocabulary.

Table 6: Methods for Audiologic Assessment

Physiologic Tests (used at any age)	Description
Otoacoustic Emissions (OAE)	Acoustic response of inner ear to clicks or tones; recorded by placing a probe (with a microphone and attached to a soft ear tip) at the child’s ear canal opening.
Auditory Brainstem Response (ABR) Audiometry (or Brainstem Auditory Evoked Response [BAER])	Electrophysiologic response of auditory nerve and brainstem to tones or clicks; recorded by pasting electrodes on the child’s scalp and recording neural activity generated by a test signal. A computer displays the response as waveforms.
Tympanometry	Measures function of the middle ear system; recorded by placing a probe attached to a soft ear tip in the child’s ear canal opening and changing air pressure in the outer ear canal.
Acoustic Middle Ear Muscle Reflexes (MEMR)	An involuntary middle ear muscle reflex elicited by loud tones or noises delivered into the ear canal; recorded following tympanometry using the same probe tip.
Behavioral Tests (used at recommended ages)	Description
Behavioral Observation Audiometry (BOA) <i>(birth-4 months)</i>	Observation of unconditioned responses (such as an eye shift or a general startle) to noisemakers, speech, or calibrated sounds.
Visual Reinforcement Audiometry (VRA) <i>(5-6 to approximately 24 months)</i>	Child is rewarded with an animated or lighted toy for a response (head-turn) made contingently upon the presentation of calibrated audiometric test signals.
Conditioned Orienting Reflex (COR) Audiometry <i>(5-6 to approximately 24 months)</i>	Child is rewarded for turning toward test sounds (calibrated audiometric test signals) delivered through loudspeakers located to the left and right sides of the infant.

Table 6: Methods for Audiologic Assessment

Behavioral Tests (used at recommended ages)	Description
Conditioned Play Audiometry (CPA) <i>(approximately 2-5 years)</i>	Child is taught to respond to calibrated audiometric test signals; the behavioral response is a play task.
Speech Audiometry <i>(beginning at 5-6 months)</i>	Assesses the child's ability to detect, discriminate, identify, and comprehend speech.

*Adapted from: Gravel 1999
(Continued from previous page)*

Table 7: Advantages and Limitations of Audiologic Assessment Methods: Physiologic Tests

	Advantages	Limitations
Physiologic Tests	<ul style="list-style-type: none"> ▪ A behavioral response from child is not needed. 	<ul style="list-style-type: none"> ▪ Examines function of only one portion of the auditory pathway; not tests of hearing.
<i>Otoacoustic Emissions (OAE)</i>	<ul style="list-style-type: none"> ▪ Differentiates cochlear from neural function; sensitive to hearing losses >30 dB; provides frequency-specific information; if OAE are present, there is no need to perform tympanometry; time-efficient; can detect possible unilateral hearing loss. 	<ul style="list-style-type: none"> ▪ Cannot tell type or degree of loss; requires child to be quiet at least for a short period; OAE may be absent because of minor outer or middle ear problems; tests only inner ear function.

Table 7: Advantages and Limitations of Audiologic Assessment Methods: Physiologic Tests

<p><i>Auditory Brainstem Response (ABR) Audiometry</i></p>	<ul style="list-style-type: none"> ▪ Can detect problems in the cochlea, auditory nerve, and brainstem; can be used to estimate hearing threshold and detect unilateral and mild hearing loss; can estimate degree, type, and slope of loss (with tone bursts and bone conduction testing). 	<ul style="list-style-type: none"> ▪ Requires experienced personnel to administer and interpret; requires specialized equipment; may require sedation in most older infants and children (to reduce movement artifact for recording threshold responses).
<p><i>Tympanometry</i></p>	<ul style="list-style-type: none"> ▪ Can detect middle ear problems, such as fluid in the middle ear. 	<ul style="list-style-type: none"> ▪ Does not test hearing, but rather integrity of middle ear.
<p><i>Acoustic Middle Ear Muscle Reflexes (MEMR)</i></p>	<ul style="list-style-type: none"> ▪ Provides information about the cochlea, auditory nerve, and brainstem; the intensity level at which the MEMR is recorded also provides information about both hearing status and middle ear function. 	<ul style="list-style-type: none"> ▪ May not detect mild or moderate hearing loss.

*Adapted from: Gravel 1999
(Continued from previous page)*

Table 8: Advantages and Limitations of Audiologic Assessment Methods: Behavioral Tests

	Advantages	Limitations
Behavioral Tests	<ul style="list-style-type: none"> Can be used to test hearing. 	<ul style="list-style-type: none"> Require the child's cooperation, attention, and motivation.
<i>Behavioral Observation Audiometry (BOA)</i>	<ul style="list-style-type: none"> Provides general information about the child's overall hearing function. 	<ul style="list-style-type: none"> Insensitive to unilateral or less than severe hearing loss (unless earphones are used); highly subject to observer bias; child fatigues rapidly to repeated stimuli; few repeatable responses; wide variability of responses in children with normal hearing.
<i>Visual Reinforcement Audiometry (VRA)</i>	<ul style="list-style-type: none"> Child responds reliably at softer levels (threshold levels) for longer periods compared to BOA; can detect mild and unilateral hearing loss if earphones are used. 	<ul style="list-style-type: none"> Requires development level of a least 5-6 months or older (must be able to sit, maintain head control, and turn head).
<i>Conditioned Orienting Reflex (COR) Audiometry</i>	<ul style="list-style-type: none"> Child responds reliably at softer levels (threshold levels) for longer periods compared to BOA. 	<ul style="list-style-type: none"> Insensitive to unilateral loss (unless earphones are used); child must determine which direction a sound is coming from for the behavioral response to be judged correct; requires developmental level of 5-6 months or older.
<i>Conditioned Play Audiometry (CPA)</i>	<ul style="list-style-type: none"> Can detect mild and unilateral loss if earphones are used. 	<ul style="list-style-type: none"> Requires cooperation of child and cognitive skills at approximately 2 years or older.
<i>Speech Audiometry</i>	<ul style="list-style-type: none"> Particularly useful for planning intervention and monitoring the development of the child's abilities to understand speech. The stimulus used is usually appealing to infants. 	<ul style="list-style-type: none"> Determining a speech threshold alone is not a sufficient test of hearing; may miss sloping or rising configurations of hearing loss.

Adapted from: Gravel 1999

Components of the audiologic assessment

It is recommended that a comprehensive assessment of hearing for infants and young children (from birth to 3 years of age) include the following components (Table 6, page 44):

- Hearing history
- Physiologic procedures
- Behavioral audiometry testing (using a developmentally appropriate response procedure), including measures of speech perception

Considerations for physiologic tests

Physiologic tests that may require sedation (such as the ABR) are recommended for children whose hearing assessment results are unreliable or inconsistent and whose hearing status remains unknown. ABR is an appropriate test for children suspected of hearing loss who are developmentally delayed or are too young (under 5 months) for reliable conditioned behavioral testing procedures.

When interpreting the results of physiologic tests such as OAE and ABR, it is important to remember that there are a variety of confounding factors that may affect the accuracy of the results. For example, using the wrong developmental normative values or setting the normal response criteria too high or too low could result in an inaccurate interpretation of the results. The results may also be confounded if the child:

- Has a progressive or late-onset hearing loss
- Has an unusual configuration of hearing loss
- Has significant brain immaturity or brain injury
- Has auditory neuropathy (normal OAE with an abnormal ABR)

Technical problems, electrical interference, environmental noise, excessive movement by the baby, or inexperience with the testing procedures can also affect the test results.

Considerations for behavioral audiometry

For behavioral audiometry, it is recommended that visual reinforcement audiometry (VRA) be included as one component of a test battery for assessment of suspected hearing loss or for ongoing monitoring for infants at least 6 months of age or older who are at high risk for hearing loss.

It is important to understand that to perform VRA successfully, a baby needs to have the developmental ability to respond to conditioned test procedures, including the motor ability to sit, maintain head control, and turn his or her head. Therefore, it is recommended that VRA only be performed on infants that are of a developmental age of at least 6 months. For premature infants, it is

recommended that the child's age be corrected for prematurity (subtract the number of weeks premature at birth from the child's chronologic age).

It is important to recognize that VRA is a different procedure than conditioned orienting reflex audiometry (COR) and may provide more reliable thresholds. This is because VRA thresholds are obtained using earphones, whereas COR test signals are delivered through loudspeakers. With VRA, the child does not need to determine which direction a sound is coming from in order for the behavioral response to be judged as correct.

It is important to recognize that some premature infants may be hypersensitive to certain stimuli (such as sound or light) and may not habituate to the task in the same way as full-term or nearly full-term babies. Some premature babies may exhibit an incorrect response to the stimuli. It is recommended that premature babies who exhibit an incorrect response to stimuli be referred for developmental assessment.

If two attempts at behavioral audiometry by a pediatric audiologist are not successful in testing the hearing status of a child within a two-month period, it is recommended that the child be referred for ABR testing.

It is recommended that the audiologic assessment include measures of the child's ability to perceive and understand speech. Such measures include:

- Speech detection threshold (SDT)
- Speech reception threshold (SRT) for two-syllable words
- Speech recognition abilities for common words and sentences that are within the child's vocabulary or at the child's language level

Speech audiometry assessment results are particularly useful for:

- Planning intervention
- Monitoring the development of the child's abilities to understand speech
- Assessing the functional benefit of the child's hearing aids or other sensory devices

Inappropriate audiologic assessment methods

It is recommended that behavioral observation audiometry (an unconditioned response procedure such as observing the child's behavior in response to noisemakers, music, or other sounds) not be used as the sole measure for the assessment of hearing in infants and children. Behavioral observation

audiometry is an unreliable method for testing hearing (too many false positive and false negative findings).

Determining a speech threshold alone is not a sufficient test of hearing. Sloping or rising configurations of hearing loss may be missed if only this measurement technique is used.

ASSESSMENT FOR AMPLIFICATION

The primary purpose of amplification is to allow the infant or young child to hear speech. Assessing a young child's need for an amplification device, such as a hearing aid, requires an audiologic assessment that obtains responses for each ear covering the frequencies important to speech. The complete audiologic assessment includes a battery of audiologic tests. However, in order to provide timely amplification to infants and young children, initial amplification is often provided without having complete audiologic information.

Providing amplification based on physiologic measures alone is recommended if behavioral measures are not appropriate because of the infant's age or developmental level. In these cases, it is recommended that behavioral measures be obtained as soon as possible to corroborate the physiologic findings.

It is recommended that the behavioral audiologic assessment for the selection of an amplification device include:

- Assessment of hearing thresholds and speech perception abilities for both ears using insert earphones
- Measurement of hearing thresholds over the full range of speech frequencies from 250 to 6,000 Hz
- Estimating the child's functional use of hearing without an amplification device using sound field testing
- Estimating the child's loudness discomfort levels for specific speech sounds and frequencies when possible
- Documentation of current unaided communication abilities to provide a performance baseline

It is recommended that children who use amplification devices receive ongoing audiologic monitoring at least every 3 months. The process of fitting a child with a hearing aid is described in the "Intervention" chapter (page 97).

MEDICAL ASSESSMENT

It is important to conduct a medical evaluation for infants and young children who have hearing impairments in order to:

- Determine the cause of hearing loss
- Identify related health conditions that might require medical attention, treatment, or observation
- Provide recommendations for medical treatment and/or referral for other services
- Provide medical clearance for amplification devices
- Provide information that may assist in determining the intervention strategy best suited to the child's health status

Components of the medical evaluation for infants and young children who have hearing impairments include a thorough history and physical examination as well as any laboratory and imaging studies that are indicated. Imaging studies can verify the presence and integrity of middle ear, cochlea, and other neural structures. Laboratory studies may be used to identify conditions that cause or are associated with hearing loss and are particularly important in identifying conditions associated with progressive hearing loss. For infants and young children with sensorineural hearing loss, diagnosis and intervention for otitis media with effusion (OME) often plays an important role.

It is recommended that every infant or young child with suspected hearing loss and/or persistent/recurrent middle ear dysfunction be referred for both an audiologic evaluation and a medical evaluation.

Otologic evaluation

Referral for an otologic evaluation is recommended for any child with:

- Middle ear dysfunction still present after 3 months of conventional medical treatment
- A confirmed persistent conductive, sensorineural, or mixed hearing loss

It is recommended that the otologic evaluation include:

- Clinical and developmental history of the child and family, paying particular attention to risk indicators for delayed onset and/or progressive hearing loss

- Physical examination, particularly of the ears, nose and throat, and neurological evaluation
- Laboratory tests when indicated, including at a minimum a urinalysis to rule out kidney problems, an electrocardiogram, and a blood test for syphilis
- When indicated, radiologic or imaging studies such as CT or MRI to evaluate the ear and central auditory pathways
- The option of genetic counseling and testing

The purpose of an otologic evaluation includes:

- Determining the cause of the hearing loss and evaluating other associated medical conditions
- Establishing the diagnosis and adequate treatment of middle ear disease for children with persistent (refractory) middle ear dysfunction
- Identifying and treating potentially reversible middle ear disease that may result in permanent hearing impairments and/or other serious medical conditions, such as cholesteatoma or intracranial infections, if untreated
- Identifying other associated medical conditions
- Providing information to guide intervention strategies
- Providing medical clearance for use of amplification devices



Early Intervention Policy ❖ Medical evaluations and tests not related to the determination of a child's eligibility for the EIP, are not reimbursable under the Early Intervention Program as early intervention services.


Other medical evaluations

It is recommended that every infant with a hearing loss receive an ophthalmologic evaluation at regular intervals to rule out concomitant late-onset vision disorders.

Because hearing loss is often a component of other conditions that may be associated with developmental delays, it is recommended that health care professionals monitor developmental milestones in all children with hearing loss and, if necessary, refer them for medical evaluation of other developmental problems.

DEVELOPMENTAL ASSESSMENT

It is important that all children with hearing loss have periodic age-appropriate developmental assessments in all areas of development. This is important because 30% to 40% of young children who are identified as having hearing loss will also have other developmental problems. Consideration of these problems is therefore an important part of the assessment process.



Early Intervention Policy ❖ All children referred to the EIP, including children with hearing loss, must receive a multidisciplinary evaluation to establish eligibility for the EIP and to help develop an Individualized Family Service Plan. The multidisciplinary evaluation must assess all five areas of development (cognitive, communication, motor, social, and adaptive/self-help). Ongoing assessment of a child's progress is part of early intervention service delivery. The multidisciplinary evaluation team should provide the family with information about the development of children with hearing loss by discussing information in these clinical practice guidelines and other sources of information.

The multidisciplinary evaluation to establish eligibility is provided at no cost to parents and must be performed using nondiscriminatory procedures as defined in program regulations. The evaluation must be performed in the child's dominant language whenever feasible.

There are five primary areas of development (cognitive, communication, motor, social, and adaptive/self-help) that overlap and interrelate to support the child's overall development. For example, if a child has a cognitive delay, visual impairment, vestibular dysfunction, or other sensory problem, it is likely to have an impact on the child's ability to benefit from certain communication interventions. Furthermore, in order for a child to benefit optimally from any intervention, it is important to have a complete understanding of the whole child and family.

Developmental assessments are important because they can provide:

- An objective description of the child's abilities and needs
- Information about coexisting cognitive delays and impairments
- Information about the child's neurosensory functioning, including vision, tactile sensitivity, balance, and coordination (vestibular function, proprioception)

- A framework for determining appropriate interventions
- A baseline for measuring progress over time

It is important that the developmental assessment include both formal and informal assessment methods. Conducting a formal developmental assessment at least once a year is recommended for children with hearing loss.

Assessing developmental milestones

It is important to recognize that children with hearing loss will vary as to when specific developmental milestones are attained. It is important to follow up on questionable, atypical findings from the developmental assessment of any young child.

Components of the developmental assessment

It is recommended that a developmental assessment for a young child with hearing loss include:


- Observation of the child during informal and structured play and of parent-child interactions
- Parental interview about the child's early development and current level of functioning
- Assessment of family resources, priorities and concerns
- Medical history
- Standardized developmental tests, where appropriate

Conducting the developmental assessment

It is important that the developmental assessment use age-appropriate testing and scoring methods, consider the child's individual abilities and needs, and make use of parental observations. It is also important that the assessment recognize *qualitative* differences as well as *quantitative* differences. For example, in addition to determining if the child is able to do a particular task, it is also important to look at *how* the child does the task.

It is recommended that developmental assessment include information obtained from:


- Multiple settings (the home, day care, and other social settings)
- Multiple stimuli (pictures, objects, and sounds)
- Multiple examiners (teachers and therapists)



Early Intervention Policy ❖ The multidisciplinary evaluation team can use a combination of standardized instruments and procedures and informed clinical opinion. The multidisciplinary evaluation team must include at least two qualified personnel of different disciplines.

It is important that the developmental assessment be an ongoing process that takes place in more than one session and in more than one setting, as appropriate, because:

- A child’s performance can vary from day to day
- The child’s performance may vary depending on familiarity with the environment and the professional
- The child’s comfort level with the professional may change over time



Early Intervention Policy ❖ Ongoing assessment should be included as part of all early intervention services by all qualified personnel working with the child and family.

It is important that those assessing development in young children make sure that the child uses any prescribed hearing, vision, and postural aids the child may need to perform optimally. In addition, sensory dysfunction such as tactile sensitivity, poor motor coordination, and balance problems may need to be accommodated.

Selecting assessment materials

Standardized developmental tests are usually not normed for children with hearing loss. Therefore, standardized tests may provide information about how a child’s performance compares with that of typically developing children, but may not be as useful for understanding how a child’s development compares with that of other children with hearing loss.

It is important to recognize that no child is “untestable.” However, some tests may not be appropriate for some children. Input from parents and others who know the child well can be extremely important in determining the most appropriate materials, procedures, and adaptations to be used.

Considerations for assessing children who use amplification or other sensory aids

When conducting developmental assessments on children with an amplification device, it is recommended that the evaluator first perform a listening check of the child's amplification device or cochlear implant to ensure that it is working properly.


For children with cochlear implants, it may also be important to take precautions to assure that the device is not damaged as the result of static electricity from mats, carpeting, or other assessment equipment.

Communicating findings to parents and other professionals

It is important for all professionals involved in the assessment to communicate with each other regarding their findings and recommendations. It is also important for professionals to consider how the assessment process and results will impact on the family.

It is recommended that reports from professionals include:

- Results presented in language that is understandable to the family and others working with the child
- Strengths and limitations of the assessment tools or processes
- Information about how the child's developmental level(s) may affect the child's functional skills in activities of daily living
- Results that are useful for developing intervention goals



Early Intervention Policy ❖ The multidisciplinary evaluation team is responsible for sharing the results of the evaluation with the child's family, and ensuring the family understands the results and implications of the evaluation for intervention. The multidisciplinary evaluation team must also prepare a formal report and evaluation summary, and submit the report to the Early Intervention Official.

Assessment of Communication

Communication is the giving and receiving of information between two or more individuals. There are verbal and nonverbal components of communication.

- *Verbal (oral) communication* is the use of spoken language or other verbal utterances.
- *Nonverbal communication* involves all aspects of communication between the child and others except for spoken language. In young children, this may include the use of such things as facial expressions, pointing, and gesturing to communicate with others. Some children may learn cues or signs to facilitate communication.

Language is a rule-governed communication system that incorporates both verbal and nonverbal aspects of communication. It is composed of sounds, words, phrases, and/or gestures. Language involves both receptive language (comprehension) and expressive language (production).

Speech is the oral production of the sounds of a language in various combinations and sequences. Audition (hearing) is a prerequisite for learning the sounds of a language.

An essential goal for all children with hearing loss is to develop communication skills to their fullest potential. Most children identified with hearing loss have sufficient residual hearing to develop spoken language as their primary form of communication, if they receive appropriate amplification, as well as training to develop functional listening skills and speech.

It is important to recognize that communicative abilities begin at birth and can therefore be assessed in infants. Ongoing monitoring and assessment of communication is important because communication skills may change very quickly over time, especially if the child does not receive amplification initially.

It is important to recognize that there are various stages in auditory skill and speech perception development, including:

- Detection (being aware of sound)
- Discrimination (discriminating between two sounds)
- Identification (recognizing a sound)
- Comprehension (understanding what the sound means)

It is recommended that all children older than 6 months with hearing loss receive a complete age-appropriate assessment of their communicative competence, including:

- Parent report

- Functional listening skills (auditory skills and speech perception)
- Standardized tests of receptive and expressive language
- Use of gestures and other nonverbal communication including (but not limited to) augmentative systems and sign language
- Language samples (verbal and nonverbal)
- Oral-motor/speech-motor assessment

When assessing communication skills in infants from birth to 6 months, the recommended focus is on the attainment of communication milestones (Table 4, page 34) as well as the types of cries, babbling, laughing, and smiling. It is important to recognize that absence of canonical babbling by the age of 11 months is a significant clinical clue for hearing loss.

It is also important to understand that most language assessment instruments have been normed (developed and tested) on hearing children. While these tests can help to determine whether a child is experiencing a delay in communication, they may need to be adapted for children with hearing loss, particularly for children whose communication depends on visual information such as cues or signs. (See Appendix A, "Developmental Assessment Tests.")

Considerations for children using amplification

It is recommended that the communication assessment be completed with the child using his or her individual amplification system. It may also be important to include an initial and ongoing assessment of the child's functional listening skills with and without hearing aids, and with different amounts of background noise.

Professional characteristics

It is recommended that the professional assessing the communication development of a young child with hearing loss has:

- Knowledge of hearing loss and its implications for communication development
- Expertise in working with young children with hearing loss
- Access to the results of the audiologic assessment
- Proficiency in the native language of the child and family (including ASL for deaf families)

When there are no evaluators available who are fluent in a child's native language, it is recommended that a trained interpreter participate in the evaluation process.

Assessment of Other Developmental Domains

Cognitive assessment

The cognitive domain includes learning, remembering, thinking, perceiving, feeling emotions, and experiencing the environment. Cognitive processes are complex, diverse, and highly interrelated.

Assessing cognitive ability in children with hearing loss is important because cognitive ability affects functioning in all other areas of development and has implications for intervention decisions. It is important to recognize that a child's cognitive impairment may be contributing to any communication delay exhibited by the child.

When conducting a cognitive assessment, it is important to optimize the child's ability to perform by:

- Ensuring that the child's amplification device or sensory aid is functioning appropriately
- Minimizing background noises
- Adapting materials and procedures, if necessary, for the child's hearing loss and/or communication approach

It is recommended that the assessment of cognition in young children with hearing loss include some type of performance-based (language-free) measure such as a play-based assessment or a test that allows language items to be separated from items related to cognition.

Social assessment

The social domain includes the ability to interact and relate to other people, including parents and peers. In children with hearing loss, the level of communication with family members and peers affects their social interactions and relationships.

In assessing social interactions, it is important to distinguish social and emotional difficulties that are directly related to the child's hearing loss from difficulties that arise from typical developmental phases, other developmental issues, and/or environment-specific factors.

Motor assessment

The motor domain includes the skills that allow an individual to manipulate, move around in, and explore the world. Assessment of motor development includes control of movement and posture, as well as muscle tone and strength.

Because young children with hearing loss may have associated vestibular dysfunction, it is important to assess balance during the motor assessment. It is also important to be aware of the type and location of any sensory aid worn by the child. During some parts of the assessment, it is recommended that the device be removed.

Adaptive/self-help assessment

The adaptive/self-help domain includes functional skills that allow the child to function more independently with tasks such as feeding, dressing, and toileting. It is important to assess adaptive abilities and self-help skills in children with hearing loss because an inability to communicate may have a negative impact on a child's performance of functional tasks.

WORKING WITH THE FAMILY

Informing the Family About the Diagnosis of a Hearing Loss

Adjusting to the diagnosis of hearing loss is a process that may take time as the family goes through various phases of understanding and acceptance. The first professional who informs a family about hearing loss generally has tremendous impact and will leave a lasting impression on a family.

Not all families will have the same need for information and assistance. Parents from “hearing families” may react very differently and may need more support than deaf parents who view deafness from a cultural perspective. However, the reaction of parents or their need for support cannot be assumed based on the hearing status of parents.

When parents are first told that their child may have a hearing loss, they may:

- Express disbelief
- Be upset, be angry, or feel sad
- Feel as though it is their fault or feel guilty
- Have uncertainty and concern about having a child with hearing loss

It is important to recognize that a variety of factors may influence a family's reaction to their child's diagnosis of a hearing loss. These may include:

- Preexisting family factors (such as parents' hearing status, the family's beliefs and values, parents' previous knowledge/beliefs about the condition, feelings of guilt or blaming, family circumstances, and family stressors)
- Parental confusion about what hearing loss means, implications for development, and the service system/intervention options that are available
- Parents' previous experience with other children with hearing loss
- Characteristics of the child's condition (the degree of hearing loss and whether the child has any other coexisting disabilities)
- Certainty of the diagnosis and prognosis
- The reaction of the immediate family to the confirmation of hearing loss and available support systems
- How the information is shared with the parent and the quality of the information provided

Parents' initial concerns/questions often include:

- What caused the hearing loss/why does my child have hearing loss?
- How certain is the diagnosis?
- Are there any other problems with my child?
- What are the potential treatments or interventions?

Communicating with parents

When a child has a suspected hearing loss, it is important to provide parents with balanced information about hearing loss and to assist them in setting goals for the next steps after confirmation of a hearing loss.

When informing a family about a new diagnosis of hearing loss, it is important for professionals to:

- Know how to communicate test results clearly
- Listen to parent concerns
- Provide objective, unbiased information about options
- Provide opportunities for follow-up discussions, support, and referrals

- Form a partnership with the parents
- Respect the family's decisions about the child's care

Strategies for developing a positive working relationship with parents include:

- Helping parents understand the concrete, practical implications of hearing loss (for example, whether a child can hear speech sounds)
- Repeating information and providing it in writing
- Providing parents with the opportunity to ask questions related to hearing loss and interventions
- Having referral information about parent support groups, social support, and counseling options available
- Informing parents that it may take time to adjust to parenting a child with hearing loss

It is important for parents to receive information about possible genetic causes of hearing loss and to offer a referral to a specialist in genetics to investigate the possibility of hereditary hearing loss and/or associated genetic conditions.

It is important to recognize that the child's primary health care provider has an important role to play in informing the parents about the medical concerns that may be associated with hearing loss and is an important member of the assessment and intervention team.

Assessing the Resources, Priorities, and Concerns of the Family

An assessment of the family's resources, priorities, and concerns is an important part of the overall assessment process because the strengths and needs of the family may be more predictive of outcome for both child and parents than the child's needs alone may be.

Relevant family interaction patterns include:

- The style of the parent-child interaction (for example, encouraging, caring/warm, nonintrusive, appropriately structured, and developmentally sensitive patterns of caregiver-child interactions).
- The diversity of experiences (for example, the frequency and quality of contacts with different adults, the variety of toys and materials available, and the stimulation value of the general environment).

- The ways in which the family ensures the child’s health and safety (for example, providing for routine and specialized health care, a safe home environment, and adequate nutrition).


Just as the availability of strong social support may be an important positive factor in a family’s inventory of coping resources, nonsupportive behavior from family, friends, or service providers may become a risk factor. Some of the behaviors generally considered by parents as being nonsupportive include:

- Comparisons with other children
- Focusing only on what is “wrong” with the child
- Assuming lower expectations than a child’s abilities
- Offering unsolicited and inappropriate advice
- Blaming parents for the cause of the condition
- Criticizing parental caregiving
- Pitying remarks about the child or parents

The family assessment

A family assessment is designed to help identify the family’s resources, priorities, and concerns in order to develop effective and meaningful intervention plans.

Conducting a family assessment requires skill and practice. The task for professionals is to objectively help parents articulate the family’s needs and goals. The methods include informal discussions with families, sensitive and focused interviewing techniques, as well as questionnaires and other assessment tools to help families identify, clarify, and communicate their goals and needs. It is important that professionals conducting the family assessment understand and be familiar with children who have a hearing loss and their families.



Early Intervention Policy ❖ A family assessment must be offered as part of the multidisciplinary evaluation to determine eligibility for the Early Intervention Program. The family assessment is voluntary for parents.

While some parents may find a family assessment helpful, others may find it intrusive. It is important for professionals to recognize that some families may

interpret the assessment as a message that something is “wrong” with the family’s functioning.

Importance of the family assessment

It is recommended that the family of a child with hearing loss be encouraged to participate in a family assessment process. This is important because the information gathered through this process can assist in planning effective intervention strategies, goals, and objectives.

Components of a family assessment

When conducting a family assessment, it is important for professionals to ascertain and understand:

- The family’s reaction to the diagnosis of a hearing loss
- Parents’ perspective on and experience with hearing loss and deafness
- The family’s natural style of communication (e.g., does the family use more gestural or verbal communication?)

It is recommended that family assessments include discussion of such factors as the family’s:

- Knowledge and need for information about hearing loss, including intervention approaches
- Vision of the future, both short- and long-term, for the child
- Composition (including siblings and extended family)
- Short- and long-term expectations for the child’s future
- Goals, values, language, and culture
- Stressors and tolerance for stress, as well as the family’s coping mechanisms and styles
- Current support systems and resources (including extended family members and their attitudes)
- Interaction and parenting style

It is important to recognize that the family’s cultural and ethnic background may affect:

- Which family member serves as the primary decision maker regarding the child

- Styles of interaction within the family and between the family and others
- Integration of the nuclear family within larger networks, including extended family and community groups
- Access to or ease in using different types of information
- The family's comfort with openly expressing needs

It may be useful to use a specific measurement tool, such as the Parenting Stress Index, the Coping Inventory, or the Family Resource Scale, to measure parental stress that may impact family well-being and child functioning.

Using information from the family assessment

It is recommended that information gathered in the family assessment be used to help families:

- Establish and articulate needs
- Develop realistic priorities acceptable to the family
- Become aware of available services and sources of social supports for the child and family
- Obtain specific information about expected progress and any special problems

Ongoing monitoring of the family's strengths and needs

It is important to recognize that family needs and strengths may change over time. Some families may require more frequent family assessments than do other families. It is recommended that there be ongoing family assessment based on the individual needs of the family.

CHAPTER IV: INTERVENTION

GENERAL CONSIDERATIONS FOR PLANNING AND IMPLEMENTING INTERVENTIONS

There is increasing evidence that infants acquire information about their native spoken language during the first 6 months of life. Therefore, for young children with hearing loss, early identification and the earliest possible intervention are especially important.

Interventions for most infants and young children with hearing loss focus on the following goals:

- Preventing or reducing communication problems that typically accompany early hearing loss
- Improving the child's ability to hear
- Facilitating family support and confidence in parenting a child with hearing loss

Interventions focused on developing communication skills and abilities differ depending on the type of communication approach that will be used by the child and family. Communication approach options for young children with hearing loss range from auditory/verbal (using spoken language) to using only sign language. Parents must often make an initial decision about a communication approach soon after their child has been diagnosed.

Parents must also make a decision about various options for improving their child's access to sound. The assistive device most commonly used to amplify sound is a hearing aid. Other assistive devices include FM systems and tactile aids. Some children with severe to profound hearing loss who have demonstrated little benefit from conventional hearing aids may receive a cochlear implant, an electronic device that is surgically placed in the inner ear.

Principles of effective early intervention

The Joint Committee on Infant Hearing (JCIH) Year 2000 Position Statement lists six principles of effective early intervention for children with hearing loss (Table 9, page 69). These general principles are not necessarily unique to interventions for young children with hearing loss, but for the most part are similar to many of the general considerations involved in planning and implementing early intervention for any young child with a developmental disability.

Table 9: Principles of Effective Early Intervention for Young Children With Hearing Loss (JCIH)

<i>Recognition of individual differences</i>	Individualizing the program to meet the specific needs of the child and family
<i>Developmental interventions</i>	Providing services appropriate to the developmental level of the child
<i>Direct learning</i>	Providing services directly to the child as well as to the parent, who then works with the child
<i>Program breadth and flexibility</i>	Offering a broad spectrum of services that are flexible and multifaceted
<i>Program intensity</i>	Adjusting the amount of intervention, including the number of hours of intervention per week and the family’s participation in intervention, to meet the needs of the child and family
<i>Family participation and environmental supports</i>	Supporting active participation of parents and other family members in the intervention and facilitating other appropriate support systems

Adapted from: JCIH 2000

Initiating the intervention process

It is important to recognize that early identification and intervention can result in better outcomes regardless of the degree of the child’s hearing loss. Without early intervention, even children with mild hearing loss may experience some speech and language delay.

It is recommended that intervention begin as soon as possible after confirmation of the hearing loss, optimally by the age of 6 months. Beginning intervention before the age of 6 months may help the child to achieve developmental age-appropriate linguistic milestones.

Regardless of the age at which a hearing loss is identified, it is still important to provide prompt intervention, including a high level of parent participation because this is important to improving language development.

Considering intervention options

It is important to recognize that there are a variety of intervention approaches that a family may choose. Because of the diversity of needs of children with hearing loss and their families, no one intervention approach is recommended as the most effective for all children with hearing loss. However, there is evidence that some approaches are more effective than others for achieving specific goals such as speech.

When deciding on interventions, it is recommended that parents seek guidance from qualified professionals with expertise in working with young children with hearing loss. It is important to remember that parents are the primary decision makers regarding services for their children. The role of the professional is to provide fair and unbiased information about the intervention options and to support the parents in the decision-making process.

The most positive outcomes generally result from early intervention that includes a high level of parent participation. Therefore, it is important to make decisions about intervention strategies, goals, and desired outcomes in conjunction with the participation of the parents. It is important that the interventions are acceptable to the family and that any intervention plan take into consideration the ability of the family to participate.

Factors that may influence intervention outcomes

It is important for parents and professionals to recognize that many factors may influence intervention outcomes. Factors known to impact intervention outcomes for young children with hearing loss are:

- Age of identification and age when intervention was initiated
- Family participation and support
- Benefit from amplification and assistive technology
- Quality of language input
- Amount and duration of the intervention
- Availability/accessibility of intervention services and support
- Characteristics, degree, and stability of hearing loss
- Presence of additional disabilities and/or medical conditions
- Environmental issues (such as socio-economic factors and physical/acoustical environment)

Selecting interventions

When deciding on a specific intervention, it is important that parents and professionals consider:

- The best available scientific evidence about the effectiveness of the intervention and alternatives
- Developmental needs and skills of the child
- Potential benefits as well as limitations, risks, or harms

It is also important to take into account:

- The child's chronological age and developmental level
- The type and severity of the child's hearing loss
- Other developmental or coexisting health problems
- Other therapies the child is receiving
- Family stressors, resources, priorities, and concerns
- The family's ability to participate in the intervention
- Language used by the child and the family
- Community resources, such as child care

It is important to consider the potential impact of the intervention(s) on the child and family, especially when multiple and/or time-intensive interventions are part of the intervention plan.



Early Intervention Policy ❖ In the process of developing the child and family's Individualized Family Service Plan, services available through both the Early Intervention Program and Deaf Infant Programs should be considered. These programs are not mutually exclusive and both can be accessed, as appropriate, by children with hearing loss and their families.

Considering the intervention setting

It is recommended that intervention be provided in settings that are matched to whatever best meets the needs of the child and family.



Early Intervention Policy ❖ Under the Individuals with Disabilities Education Act and New York State Public Health Law, early intervention services must be provided in *natural environments* to the maximum extent appropriate to meet the needs of the child and family. A *natural environment* means a setting that is natural or typical for the child's same-age peers who have no disabilities.

Considering the cultural context of the child and family

A child's life is always embedded in a cultural context. It is essential to consider and respect the family's culture (values and beliefs) and the family's primary language when providing interventions.

Important considerations when selecting the language to be used in the intervention include:

- Respecting the parents' preference and the native language used in the home
- Using a language that will facilitate and encourage natural interaction and communication between the child and parent(s) at home
- Allowing the child to develop a firm foundation in a first language before introducing a second language

It is recommended that a professional who is fluent in the primary language of the child conduct the child-centered interventions (interventions focused on the child). Because parent participation is such an important part of the intervention process for young children with hearing loss, it is recommended that professionals involved in parent education and training be competent in the language of the family and be familiar with the culture of the family.

If a professional fluent in the child's and/or family's primary language is not available, it is recommended that a specially trained translator interpret for the professional providing the intervention. If the professional providing the intervention is not familiar with the culture of the family, it is important to have a cultural informant to advise the professional on issues that may cause misunderstanding when providing the intervention.

Considerations for children with other disabilities and coexisting health conditions

The presence of additional developmental disabilities (such as significant cognitive or motor delay), coexisting medical conditions, or underlying genetic disorders may impact the child’s ability to participate in some interventions. For young children with coexisting health conditions that may potentially affect or limit the child’s ability to receive or participate in intervention services, it is recommended that the child have an identified health care provider (referred to as a “medical home” or primary care provider) in order to assure appropriate medical involvement, health care supervision, and coordination of care.


Important components of intervention programs

Regardless of the intervention approach selected, important components of effective intervention programs include:

- Family education and participation
- Family support
- Language development
- Auditory skill training
- Speech-language therapy
- Early peer social interaction
- Opportunities for the family to interact with adults and children with hearing loss
- Professionals with expertise in the selected intervention approach and experience with young children with hearing loss
- Ongoing monitoring and periodic assessments of the child’s progress

Ongoing monitoring and appropriate modification of the intervention

It is recommended that any intervention be tied to ongoing assessment and modification of intervention strategies as needed. Assessment and intervention are ongoing processes that must be flexible in response to the changing needs of the child and family.



Early Intervention Policy ❖ The Individualized Family Service Plan (IFSP) must be reviewed every six months and evaluated on an annual basis. This may include an evaluation of the child's developmental status if needed. The IFSP may be amended any time the parent(s) and the Early Intervention Official agree that a change is needed to better meet the needs of the child and family.

In evaluating the effectiveness of interventions and the child's progress, it is more useful to measure a broader range of functional and developmental outcomes (such as the development of speech-language skills) rather than specific, isolated physical findings such as hearing thresholds.

It is recommended that parents be informed that the types of intervention and frequency of intervention may change over time and that interventions may need to be adjusted based on ongoing reassessment of the child's progress and needs. Adjusting the intervention might mean changing some aspect of the intervention approach and/or increasing or decreasing the frequency or intensity of an intervention.

Collaboration, coordination, and integration

When planning a comprehensive intervention program for an individual child with hearing loss, it is recommended that if multiple intervention components are used, careful consideration be given to integrating the intervention approaches and/or components to make sure they are compatible and complementary.

It is important for all team members, including the parents, the EI team, and the child's health care provider, to find ways to communicate consistently and regularly with each other about the child's progress.

Professional experience

It is recommended that regardless of the communication approach that is selected for the child, professionals working with young children with hearing loss have experience and expertise that include:

- Knowledge of amplification and assistive technology
- Knowledge of communication development in children with hearing loss
- Skills in facilitating auditory and speech development in children with hearing loss
- Fluency in the selected communication approach
- Knowledge of family dynamics

Parent Participation, Parent Education, and Family Support

Approximately 90% of the children who have severe-to-profound sensorineural hearing loss have parents with normal hearing. In addition to learning about hearing loss, parents of these children may need to learn new ways of communicating or even a new language to allow them to become effective communication partners with their child. Therefore, providing support and education to parents and other family members is often a major component of the intervention.

Providing support and education specific to the needs of the child and family is an especially important aspect of promoting parent participation in the intervention process. This is important because some studies indicate that a high level of parent participation may be the single most important factor in achieving positive linguistic outcomes for the child.

Including parents and family in intervention

Because of the importance of parent participation in the intervention process, it is important to:

- Set achievable expectations, taking into account the other demands and priorities of the family
- Allow time for parents to process information and ask questions
- Make information about interventions accessible to parents

It is also important to find ways to involve siblings and other family members and caregivers in the family-oriented interventions.

Parent education

Parent education is a critical component of providing family-focused interventions. It is recommended that the goals of parent education include helping parents understand:

- What to expect regarding their child's hearing loss and general development
- The implications of various assessments
- Intervention options
- Intervention goals, objectives, and methods
- How to evaluate progress

- How to use naturally occurring opportunities to integrate intervention objectives into the child’s care at home
- How to promote the child’s language development in daily routines
- How to use the chosen communication approach effectively
- How to manage their child’s assistive technology to ensure appropriate and consistent use
- How to advocate effectively for their child

Family support

Some families will seek out support, others will not. Although the level of support preferred by the family will vary, it is important for all parents to be provided with ongoing opportunities to:

- Discuss their feelings about their child’s hearing loss and their perception of the impact on the family
- Receive support from peers and professionals
- Receive professional counseling and support

In some families, regardless of whether the parents are hearing or deaf, significant emotional and physical stress may be present, and professionals should take an active approach in assisting these families.

Helping parents make intervention decisions


It is important to recognize that parents may seek out and receive information from multiple sources about a variety of intervention approaches. Because information about some interventions may be limited or incorrect, it is important for both professionals and parents to evaluate the accuracy of such information, rather than taking claims of effectiveness at face value.

Informing parents about interventions

It is important to give parents objective and comprehensive information about:

- What is known about the effectiveness of the various intervention options
- The types of professionals who may be providing interventions
- Communication approach options
- Audiologic aspects of hearing loss including hearing aids and other assistive technology

- Description of cochlear implants and the type and severity of hearing loss for which they are appropriate
- Language development milestones
- Costs associated with the various intervention options



Early Intervention Policy ❖ Providers of early intervention services are responsible for consulting with parents and other service providers to ensure the effective provision of services and to provide support, education, and guidance regarding the provision of early intervention services.

Tables 10 and 11 are suggested questions to ask when considering intervention options.

Table 10: Questions When Considering Intervention Approaches

- What do the parents want to accomplish from this intervention? Is the intervention likely to accomplish this?
- Are there any potentially harmful consequences or side effects?
- What are the expectations for positive effects from this intervention?
- Has the intervention been validated scientifically with carefully designed research studies in young children with hearing loss?
- Can this intervention be integrated into the child's current program?
- What is the time commitment? Is it realistic?
- What are the pros and cons of this intervention? What do other parents and professionals say about it (both pro and con)?
- What claims do proponents make about this intervention? (Note: claims of immediate dramatic improvement are a "red flag.")
- Does the provider of the intervention have knowledge about the medical and developmental issues associated with the child's type of hearing loss?
- What do the child's pediatrician and other professionals who know the child think about the intervention's appropriateness?

Adapted from: Nickel 1996

Table 11: Questions When Selecting Intervention Service Providers

- What kinds of intervention, therapy, and services are available through this provider?
- Does the intervention provider have a particular philosophy for working with children with hearing loss and their families?
- What program is used for communication and language development?
- How many hours per week do these services require, and how much of this is one-on-one time with the child?
- In what kind of setting(s) is the intervention provided (for example, home, office, clinic, and group setting with peers)?
- What happens in a typical intervention session?
- What experience do the teachers and/or therapists have working with infants and young children with hearing loss?
- What experience do the teachers and/or therapists have working with children who have other disabilities in addition to hearing loss?
- What experience does the person who supervises the program have? How closely does the program supervisor work with the therapists, teachers, and parents?
- What are the requirements for ongoing training for the staff? What opportunities for ongoing training are offered to the staff?
- Are parents involved with planning as part of the intervention team?
- Is there a parent education/parent training/parent support program?
- How much and what kinds of involvement are expected of parents and family members?
- Are parents welcome to participate in or observe intervention sessions?
- What opportunities are there for integration with hearing children?
- How is the child's progress evaluated and how often?
- How are parents kept informed of the child's progress?

Adapted from: NYSDOH, Clinical Practice Guideline, Autism/Pervasive Developmental Disorders 1999

Role of the professionals working with the parents

To help support parents in the decision-making process, it is important for the professional to:

- Work collaboratively with parents to develop the intervention program
- Elicit observations from parents regarding the child's functioning
- Share regular progress reports with parents
- Give parents regular feedback based on direct observation of the child
- Consider and respect the family's values and beliefs, primary language, and chosen communication approach with the child

It is important that professionals be available to respond to parents' questions and needs on an ongoing basis because the questions, concerns, priorities, and needs of the child and family will change as the child develops.

It is recommended that professionals provide education and support to parents that will help foster their child's development. Education and support could include providing the parents with:

- Verbal, written, and/or videotaped information
- Information about other resources (books, articles, Web sites, support groups, etc.)
- Opportunities for hands-on training and supervision, and participation in group information and support meetings
- Opportunities to participate in the child's interventions
- Opportunities to talk to other parents/professionals who have experience with the interventions being considered and, when appropriate, to observe the interventions
- Opportunities to communicate with other adults and children who are deaf and hard of hearing

COMMUNICATION INTERVENTIONS

A primary focus of early intervention for all children with hearing loss is to promote their communicative competence. Communication approaches available for young children with hearing loss vary with respect to two aspects:

- The primary language
 - The primary language of the family is usually either English (or another spoken language) or American Sign Language (ASL).
- The modality (or modalities) used to convey information
 - The methods for conveying information range on a continuum from auditory (spoken) to visual (signs and cues) and combinations that include both auditory and visual approaches.

Figure 4: Communication Approaches Model

Primary Language	English or Other Spoken Language					ASL	
Auditory-Visual Continuum	Auditory	↔ Combination ↔			Visual		
Specific Communication Approaches	Auditory Verbal	Auditory Oral	Cued Speech	Total Communication	Sim Com	Bilingual	ASL

The primary language

Most communication approaches are based on a spoken language such as English (or another spoken language such as Spanish). Even if some type of signing or visual communication system is used, the signs or cues are used to support the spoken language and therefore follow the grammar of the spoken language.

The primary language shown in the top row of Figure 4 is the basic language that the child and family will use for communicating. Usually, it is the first language the child with hearing loss will learn.

A few communication approaches use American Sign Language (ASL) as the primary language. ASL is the primary language used in the Deaf community. ASL is a visual language that is based on signs (specific visual representations of objects or actions), gestures of the hands and arms, body posture, and facial

expressions. ASL is a complete language, totally distinct from English, with its own vocabulary, grammar, and syntax. ASL has no written or spoken form. Approaches that use ASL as the primary language teach English as a second language.

The auditory-visual language continuum

The second row of Figure 4 shows the auditory-visual language continuum. At one end are the approaches that emphasize the development of auditory information and a spoken language through the use of residual hearing. At the other end of the continuum are approaches that emphasize the development of language through the use of vision.

In the middle of the continuum are several approaches that combine some type of visual communication system with the auditory information from spoken language. In these combination approaches, the visual communication systems are used to support English (or another spoken language) as the primary language.

Specific communication approaches

The specific communication approaches are shown in the bottom row of Figure 4. The various communication approaches are separated by dotted lines to indicate that there is not always a hard and fast distinction between them. Definitions may vary somewhat depending on geographic location or professional discipline, but the communication approaches are generally described as follows:

- *Auditory-Verbal* approaches emphasize that hearing is essential for developing spoken language and attempt to replicate the language learning process experienced by children with normal hearing.
- *Auditory-Oral* approaches also emphasize the role of hearing for developing spoken language. However, these approaches can include supplementary visual information from spoken language such as lip reading (now referred to as “speech reading” because it involves watching the entire face, not just the lips).
- *Cued Speech* visually supplements spoken language. Eight handshapes represent the consonants of speech and four different hand locations near the face and neck represent the vowels. These handshapes are not considered signs but merely cues to enhance the visual perception of spoken language.

- *Total Communication (TC)* has been defined in several ways, but in general, the TC approach uses signs, speech, hearing, and gestures to convey the message using English grammar. TC systems that convey specific English syntax are sometimes referred to as manually coded English (MCE) systems. Example of MCE systems are Signed English, Signing Exact English, and Seeing Essential English).
- *Simultaneous Communication (SimCom)* is sometimes considered to be a component of Total Communication. It is broadly defined as the simultaneous use of signs and speech.
- *Bilingual* approach uses American Sign Language (ASL) as the primary language, and the child learns English as a second language.
- *Bilingual-Bicultural (Bi-Bi)* approach also uses ASL as the primary language and incorporates instruction in Deaf culture.
- *American Sign Language (ASL)* is a complete visual sign language that does not use English (or any other spoken language) as the basis for signs.

The communication approach used by a particular intervention program will vary. Some intervention programs may use a single approach; others may use multiple approaches. Some intervention programs may also use a specific curriculum to foster or enhance certain communication skills.

Selecting a communication approach

When parents are choosing a communication approach for their child, it is important to consider each option carefully and to weigh the benefits and limitations of each approach. Parents will need time to absorb and consider the information.

Regardless of the communication approach selected, it is important to recognize that:

- There is no one approach that has been shown to be best for all children with hearing loss or for the families of children with hearing loss
- The most positive language outcomes generally result from providing intervention early
- Family involvement in and commitment to the chosen approach are important determinants in the success of promoting and developing the communicative abilities of the child

Some communication approaches may require a family to learn a new way of communicating (such as signs or cues) or a new language (such as ASL). If parents select such an approach, their commitment to learning and using the approach is a fundamental component of the intervention.

It is important to recognize that communication approaches are not necessarily mutually exclusive. It is also important to recognize that the family's choice of a particular approach may change as the child's and family's communication skills and requirements change.

In order to assist parents in making decisions about communication approaches, it is recommended that professionals be able to provide unbiased information about all of the basic communication approaches and the role of the parent in each.

Providing a language-rich environment

Optimal language development requires a language-rich environment (spoken and/or visual). It is important to provide a home environment filled with language and learning in order to facilitate development of cognitive as well as communicative abilities.

Communicating with comfort and ease in a variety of settings is socially and emotionally healthy for children with hearing loss. Providing opportunities for multiple communication partners, peers as well as adults, is an important part of developing communication skills. Also, for children with hearing loss, just as for children with normal hearing, reading to the child from an early age is an important way to facilitate learning.

It is important to understand that language delays in children with hearing loss are usually not related to their cognitive potential.

Environmental enhancements

Depending on the communication approach used, it may be helpful to provide environmental enhancements such as:

- Provide adequate lighting to facilitate speech reading and reading signs and cues
- Control the background noise in the home because it may make it more difficult to use residual hearing effectively
- Consider assistive devices as appropriate (such as doorbell signalers, telephone flashers, vibrating alarm clocks, and captioning)

In addition, it may be useful to have the child move closer to the speaker, to assist with focusing the child's visual attention on the speaker, and to avoid situations in which the child cannot view the speaker's face.

Auditory approaches

It is important to recognize that most children with mild or moderate hearing loss will have sufficient residual hearing to develop spoken language as their primary form of communication and will probably receive an auditory communication approach.

If parents select an auditory approach (either an auditory-verbal or an auditory-oral approach), it is recommended that amplification devices or a cochlear implant be used to allow the child to have optimal access to speech in a variety of listening situations. This is important because auditory approaches rely on hearing. However, it is important to recognize that even with amplification devices or a cochlear implant, a child with hearing loss may not perceive sounds in the same way as a child with normal hearing.

When using an auditory approach, it is important for children to have opportunities to:

- Maximize their auditory potential during daily activities
- Participate in programs or activities in which they can interact with children who have normal hearing and when spoken language is the only language used

If the family chooses to use an auditory-verbal approach, it is important to recognize that this intervention approach:

- Integrates listening into developing communication and social skills
- Has parents participate in the full intervention session
- Engages parents as the primary models and facilitators of language in the child's natural settings
- Teaches parents to model language, conduct practice drills, and perform regular listening checks of the amplification devices or cochlear implant
- Does not use visual modes of communication (such as speech reading, gestures, and signs) during therapy sessions
- Teaches children to monitor their own voices in order to enhance intelligibility of their spoken language

If the family chooses an auditory-oral approach, it is important to recognize that this intervention approach:

- Teaches parents strategies for speech and oral language development with an emphasis on speech production and the development of auditory skills
- Provides direct therapy with the child, which is enhanced by parent involvement and carry-over into the child's natural environment
- Uses some supplementary visual information (such as speech reading, lip reading, facial expressions, and natural gestures) to support auditory input

Visual communication approaches to support English

If parents select a visual communication approach to support English, such as cued speech, total communication, or simultaneous communication, it is recommended that:

- Amplification devices or a cochlear implant be used
- The child (and those communicating with the child) be encouraged to use appropriate visual information (such as signs, cues, gestures, finger spelling, speech reading, facial expressions, or body language) in addition to the auditory information
- Professionals working with the child ensure a balanced use of visual input and spoken language

Important aspects of intervention strategies for visual communication approaches to support English include:

- The participation of family members in training sessions to learn and become fluent in the visual communication approach
- Parents using and facilitating the child's use of both spoken and visual language in natural settings
- Teaching children to monitor their own voices and the voices of others in order to enhance the intelligibility of their speech

In addition, it is important to use the visual communication system for all conversations when the child with hearing loss is nearby, even if the conversation is not directed at the child. Otherwise, many language-learning opportunities might be missed.

Cued speech, total communication, and simultaneous communication

If parents choose to use cued speech as their communication approach, it is important to recognize that cues can be learned fairly quickly, but it takes practice to become fluent.

If parents choose to use total communication (TC) or simultaneous communication (SimCom), it is important to recognize that:

- Parents, family members, and professionals need more than a cursory knowledge of signs in order to convey spoken English fluently in sign
- It takes time to learn to communicate easily in sign

Important aspects of intervention strategies to enhance visual communication when using TC or SimCom include:

- Focusing on the message and using every means possible to communicate
- Providing visual information (such as family photos, sign books, sign videos, pictures of how signs are formed, and visual daily schedules)
- Keeping eye contact with the child when signing
- Encouraging turn-taking, pausing, and waiting
- Encouraging other family members to sign during conversational times (such as at the dinner table)
- Arranging seating so the child with hearing loss can see who is talking and who is signing
- Learning how to interpret the conversation of others for the child

Table 12: Examples of Visual Supports for Communication Development

Daily Routines

To encourage comprehension, compliance, and independence:

- Use and reinforce the language and signs associated with all daily activities
- Use index cards or make small books with pictures the child can relate to and understand to show sequences in daily routines and activities (examples: morning routine, getting dressed, changing diapers, getting ready for bed, going for a ride).
Ideas for picture books:
 - Where are we going? (a book for the car with common destinations)
 - Who's talking on the phone? (a book of people who frequently call)
 - Where is daddy/mommy going? (a book with common places daddy/mommy goes)
 - Books with choices for daily activities (mealtime choices, play activities, TV programs)

Table 12: Examples of Visual Supports for Communication Development

- Use and practice signs for daily events and what you will be doing
- Use important associated vocabulary frequently when showing pictures and during daily activities, making close association between the signs and pictures or activities
- Keep your child informed about what’s happening in family life
- Arrange photos of family members according to where they go each day. For example, draw a picture of school with older siblings on a school bus or a picture of where mom or dad works with a picture of a parent driving (or taking other transportation) to work
- Use a family calendar with simple drawings for regular events like playgroups, day care, or church
- Take pictures of locations and events: barber shop, dentist’s office, doctor’s office, grandma’s house, babysitter, the mall, pet store, birthdays, or vacations

Behavior Management

- To encourage comprehension and cooperation, keep simple family rules posted where everyone can see them and reward appropriate behaviors with visuals or stickers
- To encourage appropriate choices, assemble pictures/photos of options or make small books illustrating what is okay and what is not okay
- For safety rules or other areas that are off limits, use big visuals with very clear meanings
- Make YES/NO charts with two sides: one depicting the correct behavior, one showing incorrect behavior. Draw a happy face on the correct behavior side and a sad face on the incorrect behavior side to help comprehension
- Plan visuals that clearly illustrate a household rule. For example, food pictures on poster paper with a big red X through them and taped on the bedroom door means “No food in the bedroom!”

Special Events/Experiences

- Use a daily calendar with pictures/photos to depict upcoming events
- Make a scrapbook for special events to reinforce vocabulary and teach past tense
- Plan pretend play activities to preteach language for upcoming events

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Bilingual and bicultural approaches using American Sign Language (ASL)

The visual communication approaches that use ASL as the primary language for a child with hearing loss include:

- Bilingual approaches
- Bilingual-bicultural (Bi-Bi) approaches

In both approaches, English is taught as a second language.

It is important for parents who choose an approach in which ASL is considered the child's primary language to be fluent in ASL so they can be good language models for the child. It is important for parents who do not already know ASL to learn ASL from a native user or a very experienced ASL user or interpreter. It is recommended that deaf role models, adults as well as other children, be included in programs that use ASL.

The Deaf community can be a tremendous source of support and guidance for parents of children with hearing loss (see page 96). It is important for hearing parents who choose to communicate with their deaf children in ASL to seek contact with members of the Deaf community. ASL is the primary language of the American Deaf Community.

If a child with usable residual hearing is enrolled in an intervention program using ASL, it is important for the parents to be strong advocates for speech-language therapy and/or listening skills therapy when the child is learning English as a second language.

It is important to recognize that it may be difficult to find a traditional ASL classroom in a community that is not close to a school for the deaf. Many preschool classrooms for children who are deaf or hard of hearing have children with a variety of types of hearing loss and differing amounts of residual hearing and speech use. Therefore, professionals may use a combination of ASL and English-based sign systems, with and without voice.

Techniques to Facilitate Listening and Speech

The majority of children diagnosed with hearing loss have some amount of residual hearing. Most children will have sufficient hearing to develop spoken language as their primary form of communication if they are provided with:

- An amplification device or cochlear implant that allows optimal auditory access to speech
- Specific training in the development of listening skills
- Therapy to promote the production of speech

A hearing loss, regardless of severity, can delay the development of auditory or listening skills. The presence of an untreated hearing loss also affects a child's ability to be intelligible to others. Speech intelligibility tends to decrease as the degree of hearing loss increases (that is, children with mild to moderate hearing losses tend to have better speech than children with profound hearing loss). Children with significant hearing loss tend to have a distinctive speech quality such as sounding breathy, labored, staccato, and arrhythmic.

A comprehensive approach to remediate the effects of hearing loss includes addressing speech development through a speech-language therapy program and improvement of auditory skills through a listening skills program. It is important for the listening skills program to focus specifically on development of the child's speech perception abilities through the use of hearing.

The auditory skills and speech skills are presented in Table 13 (page 90) and Table 14 (page 93) along with some techniques that parents and professionals can use to help children with hearing loss acquire these skills.

Table 13: Stages in Auditory Skill Development

Child's Listening Stage	Child's Auditory Skills	Parental Role	Professional Role
<i>Detection</i>	<ul style="list-style-type: none"> Is aware of sounds Becomes alert or turns to find nearby sounds if within audible range 	<ul style="list-style-type: none"> Draw the child's attention to sounds (environmental and voice) Use voice to imitate the rate, pitch, and intonation pattern of sounds that differ from one another 	<ul style="list-style-type: none"> Help the parents establish the child's full-time wearing of the amplification or assistive device Introduce and devise child-focused listening goals around environmental sounds and voice
<i>Discrimination</i>	<ul style="list-style-type: none"> Hears the differences between two or more speech sounds Learns to respond differently to different sounds 	<ul style="list-style-type: none"> Use simple vocal sounds with consonant/vowel combinations during play (such as animal or vehicle sounds, mommy/daddy voices, happy/sad voices) 	<ul style="list-style-type: none"> Plan listening goals and activities around simple consonant and vowel sounds associated with age-appropriate toys Encourage imitation skills of simple vocal sounds to establish an auditory perception/production loop
	<i>Vocal imitation</i>	<ul style="list-style-type: none"> Sing songs with simple melodies and vocabulary Match movement with sounds Pause frequently in a conversational style to encourage imitation by the child 	
<i>Identification</i>	<ul style="list-style-type: none"> Associates simple sounds and words with objects, activities, and persons Shows understanding of auditory information by repeating, pointing, or choosing from a small set of objects or pictures 	<ul style="list-style-type: none"> Tell the child the names of important toys, people, and actions, frequently repeating the words at meaningful times Make simple books with photos or pictures Find toys or pictures that differ in features of speech (such as rhythm, pitch, or intonation) 	<ul style="list-style-type: none"> Plan goals and activities around different types of age-appropriate listening tasks such as contrasting words/phrases, set size, rate of speech for phrases and sentences, repetition, use of stress and pausing, noise and distance

Table 13: Stages in Auditory Skill Development

Child's Listening Stage	Child's Auditory Skills	Parental Role	Professional Role
<i>Comprehension</i>	<ul style="list-style-type: none"> ▪ Demonstrates auditory attention and memory ▪ Responds correctly to common phrases used in the context of home activities ▪ Begins to answer questions instead of repeating them ▪ Enjoys singing and listening to children's songs and stories ▪ Shows steady increase in receptive language ▪ Begins to learn from incidental language 	<ul style="list-style-type: none"> ▪ Establish a regular story time ▪ Use common phrases in meaningful situations ▪ Sing children's songs with repetition and interesting sounds ▪ Point out rhyming words, repeat, and listen ▪ Ask simple questions frequently during conversation and story time ▪ Help child learn to follow directions, show how to "listen and do" 	<ul style="list-style-type: none"> ▪ Plan listening goals and activities around conversation skills, auditory comprehension of longer phrases and sentences, listening to stories, and answering questions ▪ Include listening for more critical elements in sentences ▪ Include activities to increase auditory memory skills ▪ Include activities for listening with background noise and at a distance

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Facilitating use of residual hearing

It is important to recognize that the majority of children with hearing loss have some degree of residual hearing. Therefore, regardless of age, degree of hearing loss, or communication approach, most children with hearing loss can benefit from training in auditory skills.

For a child with hearing loss who has residual hearing, particularly if the child is using an auditory communication approach, it is recommended that:

- Amplification devices or a cochlear implant be used to maximize the child's access to sounds in the speech range
- Parents and professionals work closely together to maintain the assistive device in optimal condition and help the child to wear the device full time

Facilitating development of auditory skills

To facilitate development of auditory skills, it is important for parents and professionals to have knowledge of the stages in auditory skill development (Table 13, page 90) and to recognize that different techniques can be used depending on the child's listening stage.

Facilitating use of speech

It is important to provide speech therapy for young children with hearing loss in order to optimize the intelligibility of their speech. It is important to use results from a speech evaluation to select the specific sounds to be included in the speech-language therapy goals. It is recommended that speech therapy follow a developmental approach with a goal of maximizing age-appropriate communication skills.

The stages of typical speech development occur in the following order:

- Simple vocalizations
- Control over voice patterns
- Emergence of clear vowels
- Coarticulation of consonants and vowels
- Blending of sounds in longer speech utterances

Because early vocalizations and babbling are crucial for the development of speech, it is recommended that parents encourage and reinforce all of the child's spontaneous vocalizations rather than correct them. It is important for a child to learn that talking is pleasurable, and when the child vocalizes, the parent responds.

Although there are a variety of ways to model and teach speech sounds to children with hearing loss, it is recommended that a sound be presented in the following order:

- Auditory
- Auditory/visual
- Tactile

Before formal speech training begins, it is important for a child to be able to imitate and to do so willingly. At this point, parents and professionals may begin to correct a child's speech.

In both formal speech-language therapy sessions and informal facilitation of speech sounds, it is recommended that all speech-language interventions be at the appropriate skill level and use words and sounds that are meaningful to the child. It is also recommended that interventions be fun and positive, and allow the child to feel success when using his/her voice.

For children with hearing loss who are learning language through or partly through the auditory channel, it is important to emphasize the aspects of speech that are less salient (less audible, less visible) when providing therapy to improve speech production.

It is essential that professionals providing the speech-language therapy have expertise in working with young children with hearing loss and have knowledge of the many techniques that can be used to optimize speech development in this population.

It is recommended that professionals providing speech-language intervention have knowledge of:

- The results of the child’s amplification device fitting so that specific speech goals can be developed
- The communication approach being used with the child to present speech and provide feedback on the child’s speech in a way that is consistent with the child’s intervention program

Before starting each speech session, it is important to perform a routine listening check to ensure that the child’s amplification device is working.

Table 14: Examples of Activities to Stimulate Speech

On-Demand Vocalizations

- To stimulate brief sounds (like “da da da”), tap the child’s upper arm or wrist while saying the target sounds
- While sitting in a rocking chair, match your vocalizations with the rhythm of rocking
- While sitting in front of the child, hold your arms out as if getting ready to give a big clap and vocalize a target sound as you bring your hands together
- Pair vocalizations with movements

Table 14: Examples of Activities to Stimulate Speech

Expressive Language – Words

- Make a list of simple one- or two-syllable words and find a real item or picture to represent each word so you can talk about the item frequently throughout the day
- Make a box to keep close at hand with about five items in it that contain the target sound so you can show and talk about each item
- Using photos or cut pictures, make “sound books” with objects and actions that contain the target sound so you can read to your child often
- Use “acoustic highlighting” to emphasize a target sound or word (for example, pausing right before the sound or word, then emphasizing the sound or word by saying it louder or in a different tone)

Expressive Language – Longer Utterances

- Select at least five short simple sentences that contain functional words and content words with the target sound to use frequently throughout the day
- Devise motivating activities for the child in which the materials can be poured, given, or unwrapped in small increments so the child can be prompted to use spoken language more

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Table 15: Stages in Speech Training

Stage	Child’s Speech Abilities	Parental Role	Professional Role
<i>Spontaneous Vocalizations</i>	<ul style="list-style-type: none"> ▪ Babbles ▪ Starts to learn that talking means vocalizing and that talking is pleasurable 	<ul style="list-style-type: none"> ▪ Place emphasis on encouraging and reinforcing all the child’s vocalizing—not on correcting the child’s vocalizations ▪ When the child vocalizes, respond 	<ul style="list-style-type: none"> ▪ Help the parents realize the importance of the child’s abundant vocalizations at early stages of speech development

Table 15: Stages in Speech Training

Stage	Child’s Speech Abilities	Parental Role	Professional Role
<i>On-Demand Vocalizations</i>	<ul style="list-style-type: none"> ▪ Can imitate and does so willingly ▪ Tries to match his or her own vocal production to the vocal sound heard ▪ May imitate without understanding 	<ul style="list-style-type: none"> ▪ With help of a professional, devise playful ways to say the target sounds when interacting with the child 	<ul style="list-style-type: none"> ▪ May begin formal speech training and begin to correct child’s speech ▪ Plan speech goals and activities around simple consonant and vowel sounds ▪ In selecting sounds, use the child’s aided abilities and a developmental speech methodology as a guide ▪ Help child develop and improve breath control for speech
<i>Expressive Language - Words</i>	<ul style="list-style-type: none"> ▪ Associates simple sounds and words with objects, activities, and persons 	<ul style="list-style-type: none"> ▪ Listen carefully to the child’s vocalizations ▪ Provide vocabulary with certain target sounds for practice and development of expressive, meaningful language 	<ul style="list-style-type: none"> ▪ Plan speech goals and activities ▪ Listen carefully to the child’s vocalizations to determine what sounds need to be reinforced, what sounds need improved quality, what sounds need to be elicited to add words to vocabulary, and whether incorrect patterns are being set
<i>Expressive Language – Longer Utterances</i>	<ul style="list-style-type: none"> ▪ Child begins to use longer utterances 	<ul style="list-style-type: none"> ▪ Provide opportunities for the child to use certain target sounds in longer utterances 	<ul style="list-style-type: none"> ▪ Plan speech goals and activities ▪ Listen carefully to the child’s vocalizations to determine what sounds need to be reinforced, what sounds need improved quality, what sounds need to be elicited to add words to vocabulary, and whether incorrect patterns are being set

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AMERICAN DEAF COMMUNITY

The American Deaf Community views deafness from the cultural perspective and is a significant and visible portion of the spectrum of diversity in the United States. When describing themselves from this cultural perspective, members of the Deaf Community use “Deaf” with a capital “D.” It is important to remember that the term “deaf” refers to a degree of hearing loss (profound), whereas the term “Deaf” refers to a cultural community or an individual who identifies himself or herself as a member of that culture.

It is important to remember that for communication purposes, American Sign Language (ASL) is the primary language of the Deaf community. However, ASL may not be the only language used by individuals within the community (other written and/or spoken languages may also be used).

At one time, a majority of the American Deaf Community was educated at residential schools for the Deaf. The educational placement of Deaf children has changed over the past few decades. Increasingly, Deaf children are educated in schools with normal hearing peers. Now, only approximately 20% of school-aged Deaf children attend residential programs that traditionally have transmitted knowledge of Deaf culture to parents, families, and Deaf individuals.

It is important to recognize that Deaf culture and the Deaf community represent a valuable source of support and guidance for parents of children with hearing loss. The National Association of the Deaf (NAD) supports the early identification of deaf and hard of hearing children. NAD endorses early intervention for children with hearing loss, guided by the following principles:

- Child-centered focus
- Valuing deafness as part of diversity
- Positive professional advice on acquiring natural languages and literacy in multiple languages
- Regular assessments and interventions
- Teams that include families, professionals, and members of the Deaf community
- Advocacy of best practices and outcomes

AMPLIFICATION DEVICES

Amplification devices (such as hearing aids) are sensory aids designed to make speech and other environmental sounds louder so that they are perceptible to individuals with hearing loss. Most young children with hearing loss use hearing aids as their primary sensory aid.

When amplification is provided, many children with hearing loss are able to use auditory information for communication, including development of spoken language. When amplification is provided, the goal is to maximize the child's ability to hear all speech sounds (low and high frequencies) within a range that is comfortable and safe.

If sound pressure levels delivered to the ear by the amplification are excessive, children may choose not to use amplification because it is uncomfortably loud. In addition, further damage to the inner ear may result. Therefore, the selection and proper fitting of amplification is an important component of the early intervention process.

Importance of providing early amplification

It is important to recognize that:

- For most children with hearing loss, amplification devices can provide access to sound and speech
- No child is too young to use some form of amplification
- Consistent and early use of appropriate amplification is critical to the optimal development of spoken language

It is recommended that the use of amplification be initiated as soon as possible after the hearing loss is confirmed. Fitting of hearing aids can occur even when there is limited audiologic information. Early referral for hearing assessment and hearing aid fitting is correlated to better levels of expressive spoken language for children with mild to severe hearing loss.



Early Intervention Policy ❖ The type, intensity, frequency, and duration of Early Intervention services and what type of amplification device is appropriate are determined through the Individualized Family Service Plan (IFSP) process. All services and assistive technology devices in the IFSP must be agreed upon by the parent and the Early Intervention Official. When disagreements occur, parents can seek due process through mediation or an impartial hearing.

It is recommended that professionals who fit amplification devices for children have the knowledge, expertise, and equipment necessary for current prescriptive pediatric hearing aid selection and evaluation procedures.

Types of hearing aids

Hearing aids vary considerably in shape, style, cost, flexibility, ease of use, and durability. They also vary in many other advanced technology options regarding circuitry, signal processing, number of channels, and memory. The most common styles of hearing aids include:

- *Behind-the-ear (BTE)*: These hearing aids fit behind the ear and have a custom-fit earmold that delivers sound to the ear. BTE hearing aids are most often used for infants and young children because they are usually durable, safe, and sufficiently flexible. An FM auditory system can be used with many BTE hearing aids.
- *In-the-ear (ITE)*: These hearing aids fit entirely in the concha and ear canal. They are not generally used for infants and toddlers because their rapid growth would require too many changes in the hearing aid casing. Furthermore, in active children, ITE hearing aids pose a risk for injury to the ear because the hard case might shatter in the event of a fall or a blow to the head.
- *Body-style*: These hearing aids are located in a case worn on the chest and connected to a receiver and an earmold via a cord. They are usually used when physical complications make head-worn amplification less appropriate or when a higher gain is required.
- *Bone-conduction style*: These hearing aids use a microphone worn on the head connected to a bone-conduction vibrator. They are used for certain types of permanent conductive hearing loss that are not medically or surgically correctable.
- *Frequency modulation (FM) auditory systems*: These systems feature a receiver for the child and a microphone for the speaker. When the FM system is used, the problem of background noise and distance between the child and the speaker is greatly reduced. FM systems can be coupled with the child's own hearing aid.

In addition to the basic style of the hearing aid, there are numerous other choices when selecting a hearing aid. Circuitry options include analog and digital, as well as digitally programmable options designed to increase flexibility. There are various signal processing options, some of which are designed to enhance

soft speech sounds and reduce potential distortions. Devices can be single channel or multichannel, and they can have single or multiple memories to permit the selection of different characteristics depending on the listening environment.

Challenges of fitting hearing aids in young children

Selecting and fitting an appropriate hearing aid or other amplification device to infants and young children presents certain challenges that are not usually encountered with older children and adults. For example:

- Audiologic information may often be incomplete when the hearing aid is first fitted
- They have smaller ears, making it difficult to get a comfortable fit and to adjust the hearing aid to avoid unsafe levels of sound, loudness discomfort levels, and acoustic feedback (ringing or whistling)
- Their limited language ability makes it necessary to fit amplification without the benefit of subjective responses and judgments

Infants and young children learning language for the first time through hearing (audition) require an overall louder signal to detect and differentiate speech sounds accurately. They also need a greater difference between the loudness of the speech signal and any interfering background noise (signal-to-noise ratio) than adults do.

Unilateral and bilateral hearing losses

When hearing loss is present in both ears (bilateral hearing loss), an amplification device for each ear (binaural amplification) is recommended unless there are audiologic or medical contraindications such as structural malformations of the outer ear or asymmetrical hearing loss (moderate loss in one ear and profound loss in the other). The use of binaural amplification increases the child's ability to:

- Identify (localize) the source and direction of sounds
- Understand speech in background noise
- Optimize auditory speech perception in both ears

It is recommended that amplification be considered for infants and children with a unilateral hearing loss (hearing loss in one ear) unless there are audiologic or medical contraindications. Contraindications include:

- Structural malformations of the outer ear (such as no pinna—the external part of the ear)
- Unilateral atresia (complete closure of one ear canal)
- Severe or profound unilateral hearing loss in the affected ear (because the amplification needed for this degree of hearing loss may distort sounds in the affected ear and interfere with sounds heard in the normally hearing ear)

Providing information to parents

When amplification devices are recommended, it is important that parents be provided with information about the types of assistive technologies, and amplification options and choices available for their child. It is important to give parents time to understand the issues and information.

It is recommended that the professional take time to explain the steps in the process of obtaining amplification devices. Parents need to have a clear understanding of the process, the timeline, and the considerations involved in acquiring the amplification device (such as the costs that might be involved) so that they can make informed decisions regarding amplification options for their child.

Parents should be informed that the Food and Drug Administration requires that all hearing aids include a trial period of 30 days before final purchase. In New York State, the trial period is 45 days. This means the parent may return the hearing aid within this period of time. It is also important to inform parents about insurance coverage that is available to cover hearing aid loss or damage.

It is important to give parents information regarding reasonable expectations about the effectiveness of amplification. The benefits may vary based on a variety of factors. Some of the factors may include:

- Degree and configuration of the hearing loss
- Amount and type of intervention
- Age at identification and confirmation of the hearing loss
- Age at which amplification use was initiated
- Consistency of amplification use
- Existence of other developmental disabilities or associated health conditions

It is important for parents to understand that even with amplification devices (hearing aids and FM systems), a child with hearing loss may not perceive sounds in the same way as a child with normal hearing. For example:

- Some sounds may be distorted
- Some sounds may be too loud or not loud enough
- Some frequencies of sound may not be audible
- Distance from the speaker may affect sound perception
- Speech may be difficult to understand in the presence of background noise

When children receive hearing aids, it is important for parents, caregivers, and professionals working with the child to understand:

- How to check to ensure the device is working
- How to turn it on and off
- How to put it on and take it off
- How to test and change the batteries or recharge the unit
- Basic troubleshooting when the device is not working
- What to do and who to call if the device is not working

It is recommended that parents be responsible for monitoring the hearing aids daily and for troubleshooting problems. It is important for parents and caregivers to be taught how to care for and maintain the hearing aids and to be provided with the accessories to do so (such as a listening stethoscope, battery tester, dri-aid kit, air blower, and wax loop).

Prescriptive procedures for fitting hearing aids

Recently, new methods, known as *prescriptive procedures* for hearing aid selection and fitting, have been developed that allow audiologists to fit hearing aids and other amplification devices to infants and young children. These procedures can:

- Account for individual ear canal and earmold effects
- Base initial fitting on limited amounts of audiologic information
- Avoid the need for subjective responses and judgments by the child
- Select hearing aid characteristics for the individual child, including the amount of amplification at each frequency, and the maximum loudness produced
- Verify that the amplified sound is audible within an optimum range for the child and does not exceed loudness discomfort levels

Prescriptive hearing aid fitting procedures require specific instrumentation that can measure:

- A hearing aid test box (used to measure amplification characteristics such as gain, output, and distortion)
- A tiny probe-microphone that is placed in the child's ear canal (used to measure the actual sound levels in the child's ear canal)

With young children, repeated visits to further individualize the child's amplification are important. As more audiologic information is acquired, adjustments to the amplification (using the prescriptive procedure) are necessary to ensure optimum hearing aid use. This includes use of probe microphone measures to ensure the comfort and safety of the amplification device and to ensure that speech sounds are audible. Validating that the child is benefiting from the amplification should be an ongoing part of the process.

Steps for obtaining amplification devices

Sometimes, the amplification fitting and acquisition process may begin with a trial period during which an amplification device is loaned to the child. These loaner amplification devices are used until the professional makes the final recommendation of specific hearing instruments to the parents.

It is recommended that the steps for obtaining an amplification device for a child with hearing loss include:

- Examination by an otolaryngologist (frequently termed *medical clearance* for the fitting of amplification)
- Taking impressions of the child's outer ear and ear canal for the fabrication of earmolds
- Selection and fitting of the electroacoustic characteristics (the sound levels produced by the hearing aid, as a function of frequency, as measured by specific test equipment) of the hearing instrument
- Evaluation (verification) of the hearing instruments using real ear measurements to ensure that the electroacoustic characteristics of the amplification are well matched to the hearing loss of each ear of the child
- Monitoring the device for proper functioning
- Validating that the child is developing functional communication and listening skills through hearing instrument use

It is important that amplification devices be provided to the child soon after the hearing loss is confirmed (ideally within 1 month of confirmation of the hearing loss) when use is appropriate and agreed upon by the family. It is important to remember that hearing aid fitting can take place even when there is limited audiologic information from an ABR (auditory brainstem response test) or behavioral evaluations.

Earmold considerations for fitting amplification devices or aids

It is recommended that custom earmolds be made for the child as soon as the decision has been made to initiate use of amplification. The process can be difficult and challenging because of the size of the ear canals and the frequent and unexpected movements of young children. Therefore, it is recommended that this be performed by a professional having experience with taking earmold impressions in infants and young children.

It is recommended that earmold impressions for infants and young children be made using appropriate size tools (for example, using a pediatric syringe to deliver the impression material into the child's ear canal) and that they be fabricated out of soft, nonallergenic materials to reduce the likelihood of any discomfort associated with wearing the earmolds.

Earmolds will need to be changed frequently as the child's ear grows. This is particularly true during the first year of life. (In infants under 6 months of age, it may be necessary to replace the earmolds monthly.) It is also important to replace earmolds when needed. The most common sign that an earmold needs to be replaced is the presence of acoustic feedback (whistling) during normal use.

Audiologic considerations for fitting amplification devices

In order to provide an amplification device to the child as soon as possible after the hearing loss is confirmed, the hearing aid's fitting may need to occur even when there is limited audiologic information. Examples of limited audiologic information include:

- Auditory brainstem response (ABR) thresholds alone when behavioral measures of hearing sensitivity are not possible due to the child's chronological age or developmental level
- Behavioral responses within two frequency regions (e.g., 500 Hz and 2,000 Hz) indicating broadly the amount of low- and high-frequency hearing loss in each ear
- Some combination of limited electrophysiological and behavioral responses

It is important to remember that the absence of a conventional click evoked ABR does not necessarily mean the absence of hearing. This is because the conventional click evoked ABR generally does not provide information about low-frequency auditory sensitivity and because the intensity of sounds (clicks) used to elicit the ABR is limited. Therefore, children with no ABR may have residual hearing and may benefit from hearing instruments or FM systems.

If the initial provision of amplification is based only on the ABR assessment, it is recommended that behavioral measures be obtained as soon as possible. Behavioral responses are used to corroborate and supplement the ABR results. On average, when infants have a developmental age of 6 months, a conditioned behavioral response procedure such as visual reinforcement audiometry (VRA) can be used to obtain frequency-specific hearing thresholds for the purpose of refining the hearing instrument fitting and measuring the functional benefit of the amplification device.

Hearing instrument selection considerations

It is recommended that all hearing aids prescribed for infants and young children have safety features. For example:

- Tamper-resistant battery doors (because the hearing instrument battery is small and could be a choking hazard or harmful if swallowed)
- Volume control cover (to prevent the child from changing the volume)

There is a range of coupling options available to make the hearing aid compatible with other assistive technologies. It is important to take these into consideration when selecting a hearing instrument because the listening needs of children can vary with the setting and change with development. Coupling options may include:

- FM compatibility for use with FM systems
- Direct audio input capability for direct connection between the hearing instrument and other equipment such as a microphone, television, or audiotape recorder
- Telecoil option for listening on the telephone

Selecting a hearing aid with flexible electroacoustic characteristics is also important because this makes it possible to easily adjust the sound levels and frequency response characteristics of the hearing instrument to meet the auditory needs of the child over time.

Considerations for monitoring use of amplification

After the initial fitting of the amplification device, it is recommended that monitoring of amplification be completed at least every 2 to 3 months. Infants may need to have audiologic visits as frequently as once a month in order to ensure optimal amplification device fitting.

It is important that amplification monitoring includes:

- Assessment of hearing thresholds in each ear
- A check of the adequacy of the earmold
- Electroacoustic and real-ear measures of the amplification devices
- Confirmation that the prescriptive gain and output targets are still appropriate and are being achieved
- Validation of the amplification fitting by confirming the functional benefit of the hearing instruments for the development of communication and listening skills, and determining that progress in these areas is commensurate with the child's age and cognitive abilities

It is recommended that the functional benefits of amplification be examined regularly in order to monitor the development of auditory milestones, in particular the perception of speech. For children whose auditory or communication skills are not progressing after receiving conventional hearing aids, an additional or alternative assistive device may need to be considered (for example, an FM system or cochlear implant).

Tactile aids

It is important to remember that a tactile aid may be beneficial for children with profound hearing loss in certain circumstances. A tactile aid is an assistive device that changes sound to vibration and presents the signal to the skin (using one or more vibrators). Tactile devices can be worn on the wrist, around the chest or waist, or held in the hand. It is recommended that whenever possible, the tactile aid be used in conjunction with an amplification device.

MEDICAL AND SURGICAL INTERVENTIONS


Cochlear Implants

A cochlear implant is a surgically implanted electronic device that allows the recipient to receive auditory information through electrical stimulation of the cochlear portion of the ear. A cochlear implant is designed to provide sound perception for individuals with severe to profound hearing loss who derive limited benefit from conventional amplification (hearing aids, FM systems, etc.).

The main goal of the cochlear implant is to increase access to sound in order to help the child develop or improve oral communication. If a young child receives a cochlear implant, it is essential that the communication approach for that child incorporates hearing and spoken language. If the family goals do not include the use of spoken language with the child, a cochlear implant is not recommended.

When oral communication is the goal, it is recommended that children be considered for cochlear implantation if they demonstrate little benefit from hearing aids, lack of progress in the development of auditory skills and speech, and are:

- Age 12 to 24 months with profound hearing loss, or
- Age 24 months or older with severe to profound hearing loss



Early Intervention Policy ❖ Services and devices that are medical/surgical in nature, such as cochlear implants, are not covered under the NYS Early Intervention Program (EIP). Early intervention services do include audiology services, speech-language pathology services, special instruction, psychological services, and other services that may be needed by a child with a cochlear implant to develop language and communication skills. Audiology services, including monitoring of the child's hearing loss, amplification fitting, and assessing the effectiveness of amplification devices are included as early intervention services under the NYS EIP.

How a cochlear implant works

The microphone receives the sound and transmits an electronic signal to the speech processor (Figure 5, page 108). The speech processing computer converts the sound into a distinctive code. The electronically coded signal then travels back to the headpiece (antenna) and is transmitted across the skin by radio frequency waves. When the internal implanted device receives the signal, the implanted electrodes stimulate the nerve cells in the cochlea. The resultant

neural impulses travel along the auditory pathways to the brain where they can be interpreted as sound.

At the present time, the cochlear implant device is usually implanted in only one ear, although there are studies underway examining the benefits of bilateral (both ears) implants.

Indications for cochlear implants

The process of determining candidacy for cochlear implantation involves audiologic testing, family assessments, electrophysiological testing, speech-language assessments, psychological assessments, medical assessments, and radiological assessments.

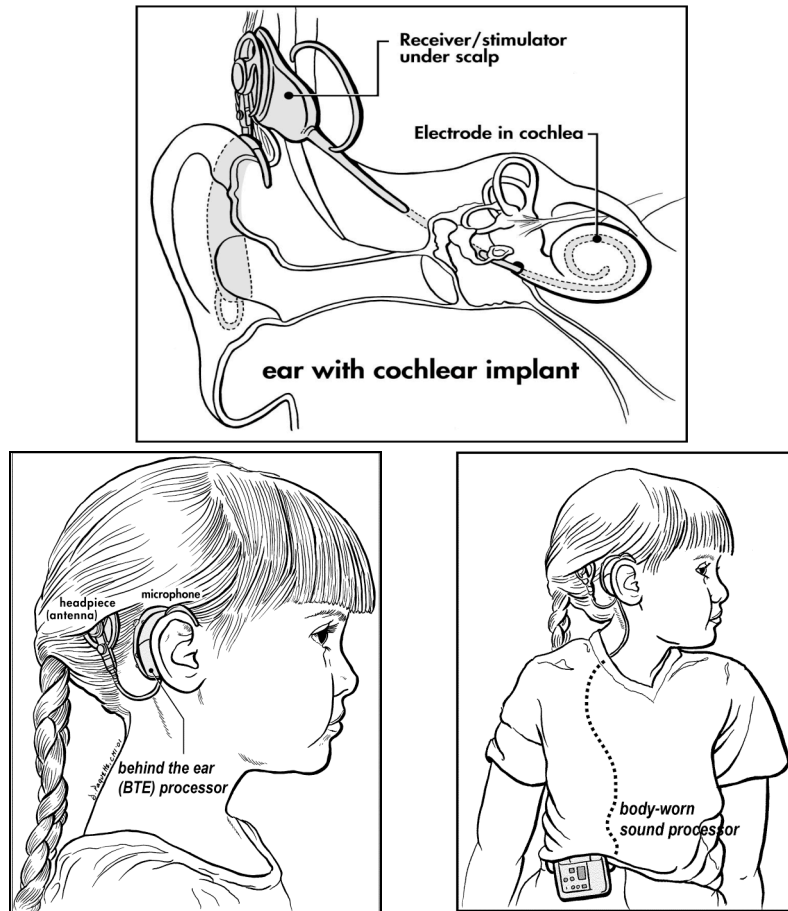
When making a decision about whether or not to provide a cochlear implant to a young child with severe or profound hearing loss, it is important to consider the following factors:

- Degree of benefit from a hearing aid trial
- Degree of residual hearing
- Degree of improvement expected with cochlear implant
- Parental interest
- Communication approach used in the home
- Availability of appropriate intervention follow-up services to allow the child to get maximal benefit from the cochlear implant
- Financial considerations
- Current indications for cochlear implantation in children (as stated by the FDA) are:
 - For children from 12 months to 2 years:
 - Profound deafness in both ears
 - Lack of progress in the development of auditory skills
 - High motivation and appropriate expectations from the family
 - For children from 2 years to 17 years:
 - Severe-to-profound sensorineural hearing loss in both ears
 - Receiving little or no useful benefit from hearing aids
 - Lack of progress in the development of auditory skills with conventional hearing aids
 - High motivation and appropriate expectations from the family

It is recommended that the decision to provide a cochlear implant not be based solely on the results of the behavioral audiogram or electrophysiologic studies.

It is important that children who are candidates for a cochlear implant receive sufficient experience with well-fitting amplification before making a decision about the implant. It is also important that they be enrolled in a program focused on the development of listening skills (auditory training) to determine whether or not they will benefit from conventional amplification or other assistive technology.

Figure 5: Components of Cochlear Implant Systems



Reasons for early implantation

When a child is a candidate for receiving a cochlear implant, early implantation (before the child is 3 years old) may result in better outcomes (speech recognition and intelligibility) than if the child receives an implant at a later age. There does not appear to be increased medical risk from early implantation compared with later implantation.

For infants who develop profound hearing loss due to meningitis, it is important to implant the device early after the meningitis episode since the cochlea can ossify (fill with bone) and may prevent optimal electrode insertion.

Contraindications and risks

Cochlear implants are not recommended for children with lesser degrees of hearing loss because:

- It is expected that children who have less than a severe loss will have equivalent, if not better, results from hearing aids
- Residual hearing could be lost in the implanted ear, which may affect the use of amplification technologies and future technical developments

If family goals do not include the use of spoken language with the child, a cochlear implant is not recommended.

Contraindications to cochlear implants generally include:

- Absent cochlea or cochlear vestibular nerves
- Active ear infections (may delay implantation)
- Medical contraindications to surgery (e.g., serious medical conditions that prohibit general anesthesia)
- Coexisting conditions or factors that limit the child's ability to tolerate the implant (e.g., severe autism, severe mental retardation)

Although not common (less than 1%), it is important to recognize that there are some general risks/complications from cochlear implantation. These might include infections, facial nerve paralysis, meningitis, cerebral spinal fluid (CSF) leak, electrode migration, and anesthesia risk.

Cochlear implant surgery and programming

Regardless of the type of device implanted, the surgery usually involves the same steps to insert the electrode into the cochlea and place the receiver/stimulator. It is important to understand that the electrodes may disrupt

any residual hearing in the implanted ear. The implant team and parent(s) choose which ear to implant. This decision is based on the patient's testing history and information.

Activating the device and programming the external speech processor begins three to six weeks after the device is implanted. The process usually requires many sessions with an audiologist. The device is optimally tuned during these sessions to provide the child with the best access to sound. Regular programming sessions to make fine adjustments on the device are required on an ongoing basis throughout the child's lifetime.

After receiving the implant, children go through a gradual learning process during which time they learn to extract meaningful information from the pattern of stimulation produced by the cochlear implant system.

After implantation, cochlear implant teams will typically work with educators and rehabilitation personnel. Cochlear implant teams include, at a minimum, the implanting surgeon and the audiologist who does mapping (setting the stimulus parameters of each electrode) and programming (determining the overall electronic functioning and coding strategies) of the device. Additional members of the team may include a speech-language pathologist (with experience in auditory training of deaf children), a teacher of the deaf, an educational consultant (to interact with educators in schools), and a psychologist (for behavioral and cognitive assessment).

Variables affecting cochlear implant outcomes

It is important to recognize that there are many variables affecting cochlear implant outcomes (Table 16).

Table 16: Variables Affecting Cochlear Implant Outcomes

Examples of variables that can affect cochlear implant outcomes include:

- Age of onset of hearing loss
- Length of time with hearing loss
- Age at implantation
- Surviving neuronal cell population
- Cochlear implant technology:
 - Speech processing
 - Electrode technology

Table 16: Variables Affecting Cochlear Implant Outcomes

- Preoperative residual hearing
- Preoperative auditory speech perception
- Surgical issues:
 - Electrode insertion depth
 - Electrode fixation
 - Electrode damage
- Device programming frequency and skills
- Communication approach
- Auditory input
- Frequency and type of auditory training

*Adapted from: Waltzman 2000
(Continued from previous page)*

What parents need to know/ask

There is a growing body of evidence indicating that in children with severe-to-profound sensorineural hearing loss, cochlear implants, in conjunction with other interventions, can:

- Enhance speech perception
- Enhance speech production and speech intelligibility
- Enhance language acquisition
- Augment education
- Increase visual attention


It is essential that children receive postimplant training, including ongoing auditory training and speech-language therapy. However, having an implant does not preclude the use of signing or cued speech. Some habilitation plans may continue use of signing or cueing.

It is important to understand that the child's ability to hear is dependent on the cochlear implant device. Without the device, the child is not able to hear.

Selecting a cochlear implant center

When selecting a cochlear implant center, important considerations include:

- Composition of the implant team (surgeons, audiologists, therapists, etc.)
- Experience of the surgeon and implant team working with young children
- Outcomes history
- Proximity of the implant center
- Insurance participation and financial considerations
- Specific plan for follow-up services



Early Intervention Policy ❖ Early Intervention services do include audiology services, speech-language pathology services, special instruction, psychological services, and other services that may be needed by a child with a cochlear implant to develop language and communication skills. Early intervention services are determined through the Individualized Family Service Plan (IFSP) process. All services in the IFSP must be agreed to by the parent and the Early Intervention Official. When disagreements about what should be included in the IFSP occur, parents can seek due process through mediation and/or an impartial hearing.

An IFSP may be amended any time the parent(s) and the Early Intervention Official agree that a change is needed to better meet the needs of the child and family.

Other Medical and Surgical Interventions

There are many types and causes of hearing loss. Some may be treatable by a medical or surgical intervention. Early identification and treatment generally result in the most favorable hearing outcomes. For some conditions that can cause hearing loss, there may be a window of opportunity to treat the condition. Additionally, many conditions resulting in hearing loss have associated medical conditions that are important to identify and treat.

Hearing loss in infants and children can be classified as either congenital or acquired, and either genetic (syndromic or nonsyndromic) or nongenetic. The nature of the hearing loss can be conductive or sensorineural or mixed.

- *Conductive hearing losses* are caused by problems in the outer and/or middle ear that prevent the normal transfer of sound waves to the cochlea in the inner ear. Many conductive hearing losses are treatable or reversible.

- *Sensorineural hearing losses* are most commonly caused by problems with the hair cells in the cochlea (sensory hearing loss) and occasionally caused by problems with the acoustic nerve or brainstem (neural hearing loss). Most sensorineural hearing losses in infants and children are not medically or surgically treatable or reversible. Amplification with hearing aids and, when indicated, cochlear implants are therefore the rehabilitative options.
- *Mixed hearing losses* are caused by problems in the outer and/or middle ear in addition to sensorineural hearing loss. For example, children with sensorineural hearing loss can also have a conductive loss due to otitis media.

Otologic evaluation of any infant or child that is diagnosed with a hearing loss is essential so that the cause of the hearing loss can be determined. Some progressive sensorineural hearing losses and many conductive and mixed hearing losses are treatable.

Sensorineural hearing loss

Most sensorineural hearing losses in children are inherited. Often, neither parent has a hearing loss, but the child inherits genes that lack key components for normal inner ear development.

- *Inherited nonsyndromic hearing loss*: Hearing losses in this category are characterized by the pattern of inheritance and have no other associated clinical signs and symptoms.
- *Inherited syndromic hearing loss*: There are numerous congenital inherited syndromes (such as Usher syndrome and CHARGE syndrome) that include associated hearing loss. These disorders usually have other associated physical and medical manifestations in addition to hearing loss.

Sensorineural hearing loss can occur in the perinatal period for many other reasons. For example:

- Prematurity and early postnatal problems are often associated with infections, high bilirubin (jaundice), and other medical conditions that may damage cochlear hair cells or central auditory pathways.
- Ototoxic medications (such as aminoglycoside antibiotics, cisplatin chemotherapy agents, and certain loop diuretics) are sometimes administered to treat life-threatening illnesses. The effects of these medications on hearing are often permanent.

- Chronic middle ear infections might lead to sensorineural hearing loss. The bacteria and their toxic products might invade the inner ear and cause hair cell damage.
- Meningitis in early childhood can result in hearing loss that is usually permanent and often progressive. Severe and profound hearing loss caused by meningitis can be treated with a cochlear implant.
- Significant head trauma can cause a cochlear concussion or a fracture through the labyrinth which might also lead to hearing loss.
- Loud noise exposure or blasts can lead to inner ear damage and hearing loss.
- Autoimmune inner ear disease can lead to sensorineural hearing loss that is often progressive. Medical therapies may halt the progression of the hearing loss if administered promptly and appropriately.
- Certain inner ear abnormalities (such as Enlarged Vestibular Aqueduct Syndrome and Mondini Malformations) may predispose children to perilymph fistula, which can cause progressive sensorineural hearing loss.
- Tumors in the region of the cochlear nerve might cause hearing loss.
- Radiation therapy for the treatment of childhood tumors directed near or through the ear may cause sensorineural hearing loss.

A discussion of all of the possible causes of hearing loss and their related medical or surgical interventions is beyond the scope of this guideline.

Referral for otologic evaluation

It is recommended that children diagnosed with hearing loss of any type be referred to an otolaryngologist for a medical and otologic evaluation that includes a thorough review of the child's medical and family history, a physical examination of the ears and head and neck, and possibly a neurotological evaluation. Additional audiologic, radiologic, and serum laboratory tests and evaluation by a medical geneticist may be requested as indicated.


An evaluation by an otolaryngologist is also recommended for children:

- With a middle ear effusion that is persistent for more than three or four months
- With chronic middle ear infections
- With conductive hearing loss and no signs of middle ear disease or effusion

- Who lose their hearing due to meningitis
- With external ear canal malformations or atresia

Ongoing otologic and audiologic monitoring

It is recommended that children with hearing loss have ongoing otologic and audiologic monitoring because hearing loss can fluctuate or progress, and medical conditions can change or evolve over time.



Early Intervention Policy ❖ Middle ear effusion, chronic middle ear infections, and conductive hearing loss that can be corrected by surgery are medical conditions requiring medical treatment. The Early Intervention Program does not cover the costs of medical interventions, surgical procedures, or primary health care services that are needed by any child.

**APPENDIX A: DEVELOPMENTAL
ASSESSMENT
TESTS**

Appendix A Contents

Adapted Pattern Perception Test (Low Verbal Early Speech Perception Test – ESPT)..... 119

Ages and Stages Questionnaires (ASQ)..... 120

Auditory – Verbal Ages and Stages of Development..... 121

Battelle Developmental Inventory (BDI) 122

Bayley Scales of Infant Development II (BSID-II) Second Edition 1993 (Third Edition Published 2005) 123

Carolina Curriculum for Infants and Toddlers With Special Needs (CCITSN)..... 124

Carolina Picture Vocabulary Test, 1985..... 125

Central Institute for the Deaf (CID) Preschool Performance Scale, 1984..... 126

Expressive One-Word Vocabulary Test Revised (EOWPVT-R)..... 127

Hawaii Early Learning Profile (HELP) 128

Hiskey-Nebraska Test of Learning Aptitude, 1966..... 129

Infant-Toddler: Meaningful Auditory Integration Scale (IT-MAIS) 130

Kaufman Assessment Battery for Children (K-ABC), 1983..... 131

MacArthur Communicative Development Inventory (CDI) 132

Meadow-Kendall Social-Emotional Assessment Inventories for Deaf and Hearing Impaired Students, 1983 133

Ordinal Scales of Psychological Development, 1989 134

Peabody Picture Vocabulary Test (PPVT) 135

Reynell Developmental Language Scales..... 136

Rossetti Infant Toddler Language Scale 137

Sequenced Inventory of Communication Development (SICD)..... 138

SKI-HI Language Development Scale (LDS) 139

Smith-Johnson Nonverbal Performance Scale, 1977 140

Vineland Adaptive Behavior Scales 141

Vineland Social-Emotional Early Childhood Scales (SEEC)..... 142

Adapted Pattern Perception Test (Low Verbal Early Speech Perception Test – ESPT)

<i>Type of Test</i>	Closed set pattern auditory perception test (discrimination tasks).
<i>Purpose</i>	To assess auditory skills development in children with hearing loss and who use hearing aids or cochlear implants.
<i>Age Range</i>	The discrimination task requires a 2-year-old developmental level.
<i>Components</i>	Includes 4 levels of pattern perception: Gross Pattern Perception, One vs. Three Syllables, Two vs. Three Syllables, One vs. Two Syllables. Only two choices per category; uses toys to represent word or sound pattern.
<i>Scoring</i>	Suggests 12 randomized presentations of discrimination task per subtest. Scoring is yes/no.
<i>Time</i>	Not specified
<i>Standardization</i>	Nonstandardized auditory discrimination task
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Discrimination task meant for structured assessment. Informal assessment with a variety of play materials is preferred for young children with hearing aids or cochlear implants

Ages and Stages Questionnaires (ASQ)

<i>Type of Test</i>	Set of 11 developmental questionnaires containing 30 items each. Sent periodically to parents of children who show potential developmental problems.
<i>Purpose</i>	To identify children who need further testing and possible referral for developmental evaluation and services.
<i>Age Range</i>	4 to 48 months. Testing is recommended at 4, 8, 12, 16, 20, 24, 30, 36, and 48 months.
<i>Components</i>	Areas screened include gross motor, fine motor, communication, personal-social, and problem solving. There are 3 versions.
<i>Scoring</i>	Parent responses to questions with “yes,” “sometimes,” or “not yet” are converted to scores used to monitor the child’s development.
<i>Time</i>	Approximately 20 minutes to complete questionnaire.
<i>Standardization</i>	The test was standardized on a sample of 2,008 children (53% were male; the occupational and ethnic statuses of families were diverse). The sample included children with disabilities and those at environmental or medical risk. Information on reliability and validity testing is included in the manual.
<i>Training</i>	Parents use their observations in a natural environment to respond to questionnaire.

Auditory – Verbal Ages and Stages of Development

<i>Type of Test</i>	Developmental checklist for parents and professionals.
<i>Purpose</i>	To track the development of children with hearing loss and who use hearing aids or cochlear implants in listening skills and receptive/expressive speech and language skills.
<i>Age Range</i>	Birth to 5 years
<i>Components</i>	Consists of checklists for Listening Skills Levels I - VIII, Expressive Speech-Language 2½ to 5 years, and Receptive Speech-Language 2½ to 5 years.
<i>Scoring</i>	Each item is scored as accomplished, emerging, or not developed.
<i>Time</i>	Not specified
<i>Standardization</i>	Nonstandardized checklist
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	The listening skills stages include numerous items for observing auditory development and for planning intervention strategies for children using hearing aids or cochlear implants.

Battelle Developmental Inventory (BDI)

<i>Type of Test</i>	Criterion-based and norm-referenced with hearing norms, using verbal instructions and nonvocal responses. This is a measure of developmental skills across five domains. A screening test with 28% of the items is included. Allows for multisource assessment.
<i>Purpose</i>	To identify handicapped children, strengths and weaknesses of nonhandicapped children, appropriate instructional plans for individual children, and monitor child's progress.
<i>Age Range</i>	Birth to 8 years
<i>Components</i>	Test has one form with five domains: personal-social, adaptive, motor, communication, and cognitive. Some testing materials are supplied with manual.
<i>Scoring</i>	Items are scored from 0-2 based on interview of caregivers or teachers, observation, and/or task performance. Emerging skills are included. Scores include percentile ranks for the overall test, domains, and some subdomains. Standard scores can be obtained for conversion of percentile scores.
<i>Time</i>	1-2 hours for entire test, 10-30 minutes for screening test, 30 minutes for cognitive domain
<i>Standardization</i>	A total of 800 children were selected based on region, gender, race, and urban/rural residency according to 1981 census statistics.
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	General information for testing children with hearing loss is provided, although none of the case studies include a child with hearing loss, and use of the assessment during the reliability and validity trials with hearing impaired children is not reported in the manual. Five cognitive domain items require supplemental materials when given to a hearing impaired child. In the cognitive domain, adaptations for hearing loss are mentioned for individual items.

Bayley Scales of Infant Development II (BSID-II) Second Edition 1993 (Third Edition Published 2005)

<i>Type of Test</i>	A standardized assessment of infant development.
<i>Purpose</i>	The test is intended to measure a child’s level of development in three domains: cognitive, motor, and behavioral.
<i>Age Range</i>	Birth to 42 months
<i>Components</i>	The BSID-II consists of three scales: mental, motor, and behavior rating scales. The test contains items designed to identify young children at risk for developmental delay.
<i>Scoring</i>	An “item set” based on age is presented in a specific order and scored with some examiner flexibility. Standardized scores are reported for either the Mental Development Index (MDI) or the Performance Development Index (PDI).
<i>Time</i>	From 30 minutes to 60 minutes
<i>Standardization</i>	BSID normative data reflect the U.S. population in terms of race/ethnicity, infant’s gender, education level of parents, and demographic location of the infant. The Bayley was standardized on 1,700 infants, toddlers, and preschoolers between 1 and 42 months of age. Norms were established using samples that did not include disabled, premature, and other at-risk children. Corrected scores may be used for these higher risk groups, but their use is controversial.
<i>Training</i>	Appropriate training and experience are necessary to correctly administer and score the assessment.
<i>Adaptation for Hearing Loss</i>	Hearing impaired children not included in standardization. A good cognitive test for infants, but a large number of items require hearing and spoken language. If too many items are scored as “other,” the resulting score may be inappropriately low. Used as a supplement to other assessments, some valuable information can be acquired.

Carolina Curriculum for Infants and Toddlers With Special Needs (CCITSN)

<i>Purpose</i>	A curriculum-based assessment used to determine curricular interventions for infants and toddlers with mild to severe special needs.
<i>Age Range</i>	Birth to 24-month level of development
<i>Components</i>	Curriculum is divided into 26 teaching sequences, which cover the 5 developmental domains. Specific activities and adaptations appropriate for diverse functional levels and disabilities, including perceptual impairment and motor delay, are included. Instructional activities are process-oriented, providing suggestions for incorporating activities into daily care and modifications for infants with motor, visual, or hearing impairments.
<i>Scoring</i>	Items scored pass-fail. Based on examiner’s judgment, infant’s performance may also be scored as partially successful. Child must successfully perform an item for 3 of 5 trials to reach teaching criterion.
<i>Time</i>	Not specified
<i>Standardization</i>	Criterion referenced. Scores not norm-referenced. Field-tested curriculum and assessment with details provided. Interrater reliability of 96.9% agreement reported for first edition.
<i>Training</i>	Formal training not required. Designed to be administered by professionals from numerous disciplines.
<i>Adaptation for Hearing Loss</i>	Many nonverbal items are included in the developmental sequences, including the cognitive section. Items requiring hearing responses are in separate sequences so they can be easily eliminated or adapted for children with hearing loss.

Carolina Picture Vocabulary Test, 1985

<i>Type of Test</i>	Normed and standardized on hearing impaired children who rely on sign for communication.
<i>Purpose</i>	To assess receptive vocabulary in deaf children who use sign language.
<i>Age Range</i>	2.8 to 18 years, standardized scores are given up to 12 years.
<i>Components</i>	130 black and white picture test items, nouns, verbs, and adjectives are included.
<i>Scoring</i>	The examiner gives a sign; the child selects the correct picture from a choice of 4 black and white pictures.
<i>Time</i>	10-15 minutes
<i>Standardization</i>	Voice was not used during standardization procedures, only sign. The number of children under 5 used in the trials was small; this may impact the reliability for younger children.
<i>Training</i>	Instructions indicate that no special training in sign language is required because a picture illustrating how to sign the test item is provided for the examiner. However, for examiners who do not regularly use sign, a practice session is highly recommended.
<i>Adaptations for Hearing Loss</i>	Specifically designed for deaf children who use sign language.

Central Institute for the Deaf (CID) Preschool Performance Scale, 1984

<i>Type of Test</i>	Norm-referenced with hearing norms, nonvocal instructions, nonvocal responses.
<i>Purpose</i>	Measure of intelligence through task performance.
<i>Age Range</i>	2 to 5 years
<i>Components</i>	A set of toys, including puzzles, blocks, cards, chips, and pegboards to assess performance on subtests. Includes manual planning, manual dexterity, form perception, perceptual-motor skills, and part/whole relations.
<i>Scoring</i>	All items are timed, but limits are described as generous. Instructions are conveyed by gesture and modeling. Prompts and practice are allowed to ensure understanding of the task. Optional verbal directions are included but are to be used as supplement to nonvocal instructions. All responses are nonverbal. Small number of items per subtest, but overall score is useful.
<i>Time</i>	30-60 minutes
<i>Standardization</i>	Standardized on 978 children, 521 with hearing loss greater than 30 dB. Other information on hearing loss of standardization group is not given. Data collected from 1965-1980. Partial information on reliability and validity is included.
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Test was designed for children with hearing loss, based on an older performance test of hearing children. Has been used for many years.

Expressive One-Word Vocabulary Test Revised (EOWPVT-R)

<i>Type of Test</i>	Standardized test of expressive language.
<i>Purpose</i>	To help professionals obtain a quick and valid estimate of a child's expressive language. Test can also be used to screen for possible speech defect or learning disorders and for English fluency.
<i>Age Range</i>	2 to 12 years
<i>Components</i>	Contains 100 items intended to measure a child's verbal expression, including ability to make word-picture associations. Test items are based on what the child has learned from home and formal education.
<i>Scoring</i>	Child is asked to name presented black and white pictures (in English or Spanish).
<i>Time</i>	7-15 minutes
<i>Standardization</i>	Administered to 1,118 children in the San Francisco Bay area.
<i>Training</i>	No specific requirements to administer. Fluency in Spanish is needed to administer in Spanish.
<i>Adaptations for Hearing Loss</i>	Frequently used for hearing impaired children who use spoken language to see how they compare with hearing children of the same age.

APPENDIX A

Hawaii Early Learning Profile (HELP)

<i>Purpose</i>	Designed as a family centered assessment instrument intended to facilitate comprehensive assessment by an interdisciplinary team.
<i>Age Range</i>	Children who function at or below 36 months of age.
<i>Components</i>	Test based on normal developmental sequence. Seven functional areas are assessed using a checklist of 685 developmental items. Functional areas include regulatory/sensory organization, cognitive, language, gross and fine motor, social/emotional, and self-help.
<i>Scoring</i>	Infant's performance on an item is scored as pass-fail or partially successful based on examiner's judgment. Scores are used with qualitative description of the child's developmental skills and behaviors to determine approximate developmental level within major developmental domains.
<i>Time</i>	Not specified
<i>Standardization</i>	Field-tested the curriculum and assessment but details not provided. Not standardized but uses developmental sequences from standardized tests and developmental scales.
<i>Training</i>	Assessments designed to be administered by professionals from different disciplines. Formal training not required.
<i>Adaptations for Hearing Loss</i>	Cognition and receptive language are included as the same domain, making it difficult to separate for newly diagnosed deaf children.

Hiskey-Nebraska Test of Learning Aptitude, 1966

<i>Type of Test</i>	General intelligence test for children. Norm-referenced with hearing impaired norms. Separate norms are given for hearing children.
<i>Purpose</i>	To assess general intelligence.
<i>Age Range</i>	3 to 16 years
<i>Components</i>	12 subtests are included. The first 5 are for the age of 3 to 10 years, and many of the subtests require visual memory skills.
<i>Scoring</i>	There is one form of the test and practice items for each subtest. Scores for children with hearing loss include age rating for each subtest and an overall learning age based on a quotient. Materials include a case of testing materials.
<i>Time</i>	Approximately 45-50 minutes required to administer the test. Only three subtests have time limits.
<i>Standardization</i>	The data for children with hearing loss are based on 1,079 hearing impaired children, although information regarding the degree and type of hearing loss, onset of loss, or communication method is not indicated. The children were all students at residential schools for the deaf.
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Instructions are pantomimed, and all subtests require nonverbal responses (pointing or manipulating).

Infant-Toddler: Meaningful Auditory Integration Scale (IT-MAIS)

<i>Type of Test</i>	Observational checklist for parents and professionals.
<i>Purpose</i>	To assess the development of a child's auditory perception skills.
<i>Age Range</i>	For young children. For older children, use the MAIS.
<i>Components</i>	Consists of 10 questions with explanatory paragraphs and discussion questions to guide the observations of parents and professionals working with children with hearing loss and who are developing auditory perceptual skills. Each question is rated on the following scale: 0-never, 1-rarely, 2-occasionally, 3-frequently, and 4-always.
<i>Scoring</i>	The questions are intended to generate discussions and observations between families and professionals regarding development of auditory perception in small children.
<i>Time</i>	Not specified
<i>Standardization</i>	Nonstandardized questionnaire
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Designed for children with hearing loss and who are developing auditory perceptual skills. Good for focusing attention on hearing aid or cochlear implant usage.

Kaufman Assessment Battery for Children (K-ABC), 1983

<i>Type of Test</i>	General intelligence test for children.
<i>Purpose</i>	To measure the cognitive ability and achievement of children.
<i>Age Range</i>	2.6 to 12.6 years
<i>Components</i>	One form of the test, practice items included. Nonverbal Scale is for older preschool children and up to age 12.5 years.
<i>Scoring</i>	The test has one form; practice items are included for each subtest. Some sections are timed. Results from Sequential Processing Scale and Simultaneous Processing Scale are combined for an overall index. In addition, subtests can be scored separately. Age equivalents and percentiles are supplied for all subtests.
<i>Time</i>	20-60 minutes, varies with age.
<i>Standardization</i>	Much information is given on large standardization samples, reliability, and validity studies. The number of educationally handicapped children was 108; the number of hearing-impaired children included in the standardization trial was less than 15.
<i>Training</i>	It is recommended that the test be administered and scored by appropriately trained clinical or school psychologists.
<i>Adaptations for Hearing Loss</i>	The Nonverbal Scale (4 to 12 years) is designed for hearing impaired or speech and language impaired children. Instructions are given in any reasonable verbal or nonverbal technique. It is used frequently with hearing impaired children, but the Nonverbal score is based on only a few subtests at the younger age levels.

MacArthur Communicative Development Inventory (CDI)

<i>Type of Test</i>	A parental-report language assessment protocol.
<i>Purpose</i>	To assess the development of gestures, the understanding of phrases and words, and the emergence of words and grammar in infants and toddlers.
<i>Age Range</i>	8 to 30 months
<i>Components</i>	Divided into two protocols: Words and Gestures for 8 to 16 months, and Words and Sentences for 16 to 30 months (or children whose development falls into these age ranges). Words and Gestures contains a 396-item vocabulary checklist organized into 19 semantic categories. Words and Sentences contains a 680-word vocabulary production checklist organized into 22 semantic categories.
<i>Scoring</i>	Parent-scored checklists
<i>Time</i>	Approximately 20-40 minutes for parents to complete.
<i>Standardization</i>	Normed on 1,789 typically developing infants and toddlers. Correlation studies have shown high correlations between the CDI and the EOWPVT, the Bayley, and the PPVT.
<i>Training</i>	Best scored by parents in conjunction with an early intervention program.
<i>Adaptations for Hearing Loss</i>	Can be used for children with hearing loss who sign or those who use spoken language, although the standardization group did not include children with disabilities. The results will be a comparison with typically developing children of the same age. The Words and Gestures protocol contains many items based on early nonverbal communication. Contains information regarding play skills.

Meadow-Kendall Social-Emotional Assessment Inventories for Deaf and Hearing Impaired Students, 1983

<i>Type of Test</i>	Norm-referenced on children with hearing loss; observable behaviors are rated by a familiar professional.
<i>Purpose</i>	To assess and compare the social-emotional development of hearing-impaired children.
<i>Age Range</i>	Preschool from 3 to 6 years; School age from 7 to 21 years.
<i>Components</i>	The preschool inventory contains 49 items divided into four subscales: sociable, communicative behaviors; impulsive, dominating behaviors; developmental lags; and anxious, compulsive behaviors.
<i>Scoring</i>	Each behavior is rated as being very true, true, false, or very false. Points are assigned easily on the scoring sheet, totaled, and then a Scaled Score must be calculated. Norms are provided for both boys and girls, and a percentile graph is available.
<i>Time</i>	Approximately 60 minutes.
<i>Standardization</i>	Norms are provided in the instructional manual for preschool children age 36 to 47 months, 48 to 59 months, and 60 to 83 months, based on approximately 800 children in programs for hearing-impaired children.
<i>Training</i>	Designed to be completed by teachers and other educational professionals in close contact with the child being evaluated.

Ordinal Scales of Psychological Development, 1989

<i>Type of Test</i>	Criterion-referenced, informal measure. Six scales with items arranged in a hierarchy according to expected development.
<i>Purpose</i>	Designed to measure the cognitive development of children during the sensorimotor period (birth to 2 years) as described by Piaget.
<i>Age Range</i>	Birth to 2 years
<i>Components</i>	Six scales with items arranged according to expected development. Scales include visual pursuit and object permanence, obtaining desired environmental events, vocal and gestural imitation, operational causality, object relations in space, and schemes for relating to objects.
<i>Scoring</i>	Items are scored as a behavior that is present or absent. The number of highest behavior present used as a score for the scale. Developmental profile is included for each scale. One subset must be adapted for children with hearing loss since it includes vocal imitation items and also gestural imitation items. The child's own toys can be used to engage and maintain interest.
<i>Time</i>	Approximately 1-2 hours for all six scales. Can be administered in more than one session.
<i>Standardization</i>	Emphasis on skill acquisition rather than normative data. Reliability and validity information is included in manual. Adaptations for children with hearing loss. Very flexible administration and well adapted for children needing additional accommodations. All scales except the Vocal Imitation Scale can be easily adapted for hearing impaired children. A second manual written by Dunst (1980) is very helpful when using the Ordinal Scales with children with hearing loss.
<i>Training</i>	Not specified

Peabody Picture Vocabulary Test (PPVT)

<i>Type of Test</i>	Screening test to identify language comprehension difficulties.
<i>Purpose</i>	To identify language comprehension difficulties and suggest the level of present language functioning.
<i>Age Range</i>	2.5 to 40 years
<i>Components</i>	Includes a series of 175 pictures.
<i>Scoring</i>	Child is asked to point to a black and white picture named by the examiner. Pictures are presented in a field of 4 at a time. Pointing is considered an acceptable response.
<i>Time</i>	5-15 minutes
<i>Standardization</i>	Normed on 5,028 children and adults. The PPVT has not been normed on a population with special needs.
<i>Training</i>	No specific qualifications required, but practice is recommended.
<i>Adaptations for Hearing Loss</i>	Used frequently with children with hearing loss and who use spoken language.

Reynell Developmental Language Scales

<i>Type of Test</i>	Standardized criterion-based assessment of verbal language development.
<i>Purpose</i>	To assess the receptive and expressive language development of young or developmentally delayed children.
<i>Age Range</i>	1 to 6 years
<i>Components</i>	These language scales assess Verbal Comprehension and Expressive Language. Colorful test materials engage children in the interaction.
<i>Scoring</i>	Child and examiner take turns with colorful play materials in the kit, sharing vocabulary and generating new language. For the receptive portion, the child follows the examiner's directions with the play materials. Instructions for the examiner are included with each test item so the materials can be quickly displayed when needed.
<i>Time</i>	30 minutes
<i>Standardization</i>	Standardization information is included in the manual. Results in a standard score that can be converted to a percentile.
<i>Training</i>	Not specified. Examiner needs to be very familiar with test materials and assessment items.
<i>Adaptations for Hearing Loss</i>	Standard scores are available only for children using spoken language but are used often with children with hearing loss because the testing is conducted with manipulative play items. Materials make it easy to engage withdrawn, distractible, or difficult-to-test children. The results profile the child's individual strengths and needs, and highlight significant developmental lags.

Rossetti Infant Toddler Language Scale

<i>Type of Test</i>	Criterion-referenced test to assess the language skills of young children.
<i>Purpose</i>	The scale assesses preverbal and verbal areas of communication and interaction including interaction-attachment, pragmatics, gesture, play, language comprehension, and language expression. The results from this assessment tool reflect the child's mastery of skills in each of the areas assessed at 3-month intervals.
<i>Age Range</i>	Birth to 3 years
<i>Components</i>	The test includes a parent questionnaire and test protocol to gather observed, elicited, and parent report information. Items are included only when they are considered chronologically appropriate and developmentally discriminating.
<i>Scoring</i>	The scale may be administered by any member of an infant-toddler assessment team in the home, diagnostic center, school, clinic, or hospital setting with the child's primary caregiver present.
<i>Time</i>	10-30 minutes
<i>Standardization</i>	The items developed for the scale are compilations of author observation, descriptions from developmental hierarchies, and behaviors recognized and used in the field of infant-toddler assessment. Only items that were considered discriminating and representative of a skill at an age were included in the scale. Standardization, validity, and reliability were not provided.
<i>Training</i>	The examiner should have a thorough knowledge of child development and language.
<i>Adaptations for Hearing Loss</i>	Frequently used in early childhood programs with families because it gathers information in various ways. Because of the heavy reliance on the child's verbal behavior, it can be used to help determine if the child needs an audiological evaluation to determine hearing status.

Sequenced Inventory of Communication Development (SICD)

<i>Type of Test</i>	Measurement of receptive and expressive language.
<i>Purpose</i>	Designed to evaluate the communicative abilities of children who are functioning between 4 months and 4 years of age. It is useful in remedial programming of young children with sensory impairments, language disorders, and varying degrees of mental retardation.
<i>Age Range</i>	Birth to 4 years
<i>Components</i>	Test items assess systematic cognitive, syntactic, and pragmatic aspects of communication. The receptive scale assesses awareness, discrimination, and understanding of language. The expressive scale assesses initiating, imitating, and responding behaviors, and verbal output and articulation.
<i>Scoring</i>	Usually scored with a test administrator and a recorder. Testing begins at the level where consistent success is anticipated, so a child is never given the complete test. Testing continues until 3 consecutive items are failed. Supplemented by parent report.
<i>Time</i>	30-75 minutes (age 24 months and older)
<i>Standardization</i>	Test items are normed for ages 4 months to 48 months. Articulation testing is for 2 years and older. The original study included 252 children, 21 at each of 12 age levels from 4 months to 48 months of age. The numbers in each age group from each of the 3 social classes are equal. Only Caucasian children were included; there were 124 males and 128 females. The test was later evaluated with a field test of 609 children from Detroit, with 276 black children and 333 white children.
<i>Training</i>	No special qualifications are required, but it is recommended that examiners be familiar with child language development.

SKI-HI Language Development Scale (LDS)

<i>Type of Test</i>	Criterion-based assessment arranged in sequence of expected receptive and expressive speech/language development. Divided into age-based units.
<i>Purpose</i>	To assess receptive and expressive language skills in children who have hearing impairment.
<i>Age Range</i>	Birth to 5 years
<i>Components</i>	Expected receptive and expressive language skills are arranged in units. Each unit includes a 2- to 4-month age range during which the skills could be expected to emerge. Each unit includes 4 to 10 items.
<i>Scoring</i>	For each item within a unit, a plus is given for skills that are demonstrated by the child. To advance to the next higher unit, at least half of the items must be observed.
<i>Time</i>	30-45 minutes
<i>Standardization</i>	Based on a variety of standardized assessment tools and then field-tested for validity and reliability in parent-infant programs for hearing-impaired children across the United States.
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Designed for children with hearing loss. The items are stated to allow signed or verbal responses. Items for speech development are included, but each unit includes several items so a child who is developing speech skills at a slower rate is not penalized.

APPENDIX A

Smith-Johnson Nonverbal Performance Scale, 1977

<i>Type of Test</i>	Norm-referenced with hearing-impaired norms. Measurement of cognitive abilities through observation/description of task performance.
<i>Purpose</i>	To permit interpretations of tasks already established as measures of cognitive ability for language-delayed and/or hearing-impaired children.
<i>Age Range</i>	2 to 4 years
<i>Components</i>	45 nonverbal, manipulative, sorting, drawing, and matching tasks are included.
<i>Scoring</i>	65 items based on 45 tasks are included, which are scored pass/fail, refused, or omitted. Scores are reported in percentages of children at a given age that passed each item. An overall score cannot be obtained. Instructions are given primarily through pantomime; no vocal instructions given. Only three items have time limits.
<i>Time</i>	30-45 minutes
<i>Standardization</i>	Norms for language-delayed and/or hearing-impaired children were established with 632 children. No demographic data are included, and information about hearing losses is sparse. It is reported that 36% of the sample were profoundly deaf; the remaining were hard of hearing.
<i>Training</i>	Not specified
<i>Adaptations for Hearing Loss</i>	Designed to be used with children with hearing loss; reported as being especially useful with children with mild to moderate hearing loss.

Vineland Adaptive Behavior Scales

<i>Type of Test</i>	Assesses personal and social sufficiency of people from birth to adulthood.
<i>Purpose</i>	To assess communication, daily living skills, socialization, and motor skills domains.
<i>Age Range</i>	Newborn to adult
<i>Components</i>	Three forms are available: the Interview Edition Survey, the Expanded Form, and the Classroom Edition.
<i>Scoring</i>	A respondent (either a parent, a teacher, or another professional) who knows the individual well answers behavior-oriented questions about the individual's adaptive behavior. Results can be expressed as a standard score, percentiles, or age equivalents in each domain, as well as in the form of an Adaptive Behavior Composite.
<i>Time</i>	Approximately 90 minutes
<i>Standardization</i>	The Interview Edition Survey and Expanded Form were standardized on 3,000 individuals from birth through 18 years of age. Separate norms are available for children with mental retardation, emotional disorders, and physical handicaps. An additional 3,000 children ranging in age from 3 to 12 years served as the normative group for the Classroom Edition.
<i>Training</i>	The examiner needs some level of supervised training because the Vineland involves asking open-ended questions.

Vineland Social-Emotional Early Childhood Scales (SEEC)

<i>Type of Test</i>	Norm-referenced assessment tool using semistructured interview with parent, teacher, or caregiver who knows the child well; extensive use of open-ended questions providing qualitative/quantitative information.
<i>Purpose</i>	To assess the social and emotional development of preschool children.
<i>Age Range</i>	Birth to 5.11 years
<i>Components</i>	Three clusters of observable behaviors, each with 34-44 items: Interpersonal Relationships, Play and Leisure Skills, and Coping Skills.
<i>Scoring</i>	Score of 0, 1, or 2 is given for each item. Scoring results in a composite score and overall assessment of the child's emotional skills.
<i>Time</i>	15-25 minutes
<i>Standardization</i>	Norms and reliability information are based on the original Vineland Adaptive Behavior Scale.
<i>Training</i>	Some level of supervised training is required because the instrument requires asking open-ended questions.
<i>Adaptations for Hearing Loss</i>	Easy to use with families. Untreated hearing loss is addressed as a yes/no question in the child information section. Items that involve hearing are phrased in a way that can include a visual response from the child. A small number of items can be omitted, still resulting in a valid assessment.

**APPENDIX B: EARLY
INTERVENTION
PROGRAM
INFORMATION**

New York State

B-1: EARLY INTERVENTION PROGRAM DESCRIPTION

The Early Intervention Program is a statewide program that provides many different types of early intervention services to infants and toddlers with disabilities and their families. In New York State, the Department of Health is the lead state agency responsible for the Early Intervention Program.

Early Intervention services can help families:

- Learn the best ways to care for their child
- Support and promote their child’s development
- Include their child in family and community life

Early Intervention services can be provided anywhere in the community, including:

- A child’s home
- A child care center or family day care home
- Recreational centers, playgroups, playgrounds, libraries, or any place parents and children go for fun and support
- Early childhood programs and centers

Parents help decide:

- What are appropriate early intervention services for their child and family
- The outcomes of early intervention that are important for their child and family
- When and where their child and family will get early intervention services
- Who will provide services to their child and family

Early Intervention Officials (EIO)

In New York State, all counties and the City of New York are required by public health law to appoint a public official as their Early Intervention Official.

The EIO is the person in the county responsible for:

- Finding eligible children
- Making sure eligible children have a multidisciplinary evaluation
- Appointing an initial service coordinator to help families with their child’s multidisciplinary evaluation and Individualized Family Service Plan (IFSP)
- Making sure children and families receive the early intervention services listed in their IFSPs
- Safeguarding child and family rights under the Program

The EIO is the “single point of entry” for children into the Program. This means that all children under three years of age who may need early intervention services must be referred to the EIO. In practice, Early Intervention Officials have staff who are assigned to take child referrals.

Parents are usually the first to notice a problem. Parents can refer their own children to the Early Intervention Official (see Step 1 of Early Intervention Steps, page 150). Sometimes, someone else will be the first to raise a concern about a child’s development. New York State public health law requires certain professionals, primary referral sources, to refer infants and toddlers to the Early Intervention Official if a problem with development is suspected. However, no professional can refer a child to the EIO if the child’s parent says no to the referral.

Service Coordinators

There are two types of service coordinators in New York State: an initial service coordinator and an ongoing service coordinator. The initial service coordinator is appointed by the Early Intervention Official. The initial service coordinator helps with all the steps necessary to get services, from the child’s multidisciplinary evaluation to the first IFSP.

Parents are asked to choose an ongoing service coordinator as part of the first IFSP. The main job of the ongoing service coordinator is to make sure the child and family receive the services listed in the IFSP. The ongoing service coordinator will also help change the IFSP when necessary and make sure the IFSP is reviewed on a regular basis. Parents may choose to keep the initial service coordinator, or they can choose a new person to be the ongoing service coordinator.

Eligibility

Children are eligible for the Early Intervention Program if they are under three years old AND have a disability OR developmental delay. A disability means that a child has a diagnosed physical or mental condition that often leads to problems in development (such as Down syndrome, autism, cerebral palsy, vision impairment, hearing impairment).

A developmental delay means that a child is behind in at least one area of development, including:

- Physical development (growth, gross and fine motor abilities)
- Cognitive development (learning and thinking)
- Communication (understanding and using words)
- Social-emotional development (relating to others)
- Adaptive development (self-help skills such as feeding)

A child does not need to be a U.S. citizen to be eligible for services. And, there is no income “test” for the Program. The child and family do have to be residents of New York State to participate in the Early Intervention Program.

How is Eligibility Decided?

All children referred to the Early Intervention Official have the right to a free multidisciplinary evaluation to determine if they are eligible for services. The multidisciplinary evaluation also helps parents to better understand their child’s strengths and needs, and how early intervention can help.

A child who is referred because of a diagnosed condition that often leads to developmental delay, such as Down syndrome, will always be eligible for early intervention services.

If a child has a diagnosed condition, he or she will still need a multidisciplinary evaluation to help plan for services. If a child has a delay in development and no diagnosed condition, the multidisciplinary evaluation is needed to find out if the child is eligible for the Program. A child’s development will be measured according to the “definition of developmental delay” set by New York State.

Services

Early intervention services are:

- Aimed at meeting children’s developmental needs and helping parents take care of their children
- Included in an Individualized Family Service Plan agreed to by the parent and the Early Intervention Official

Early intervention services include:

- Assistive technology services and devices
- Audiology
- Family training, counseling, home visits, and parent support groups
- Medical services for diagnostic or evaluation purposes only
- Nursing services
- Nutrition services
- Occupational therapy
- Physical therapy
- Psychological services
- Service coordination services
- Social work services
- Special instruction
- Speech-language pathology
- Vision services
- Health services needed for children to benefit from other early intervention services
- Transportation to and from early intervention services

Provision of Services

Only qualified professionals, i.e., individuals who are licensed, certified, or registered in their discipline and approved by New York State, can deliver early

intervention services. All services can be provided using any of the following service models:

- Home- and community-based visits. In this model, services are given to a child and/or parent or other family member or caregiver at home or in the community (such as a relative's home, child care center, family day care home, playgroup, library story hour, or other places parents go with their children).
- Facility- or center-based visits. In this model, services are given to a child and/or parent or other family member or caregiver where the service provider works (such as an office, a hospital, a clinic, or early intervention center).
- Parent-child groups. In this model, parents and children get services together in a group led by a service provider. A parent-child group can take place anywhere in the community.
- Family support groups. In this model, parents, grandparents, siblings, or other relatives of the child get together in a group led by a service provider for help and support, and to share concerns and information.
- Group developmental intervention. In this model, children receive services in a group setting led by a service provider, or providers without parents or caregivers. A group means two or more children who are eligible for early intervention services. The group can include children without disabilities, and can take place anywhere in the community.

REIMBURSEMENT

All services are provided at no cost to families. The program assesses Medicaid and commercial third party insurance when parents' policies are regulated by the state. County and state funds cover the costs of services.

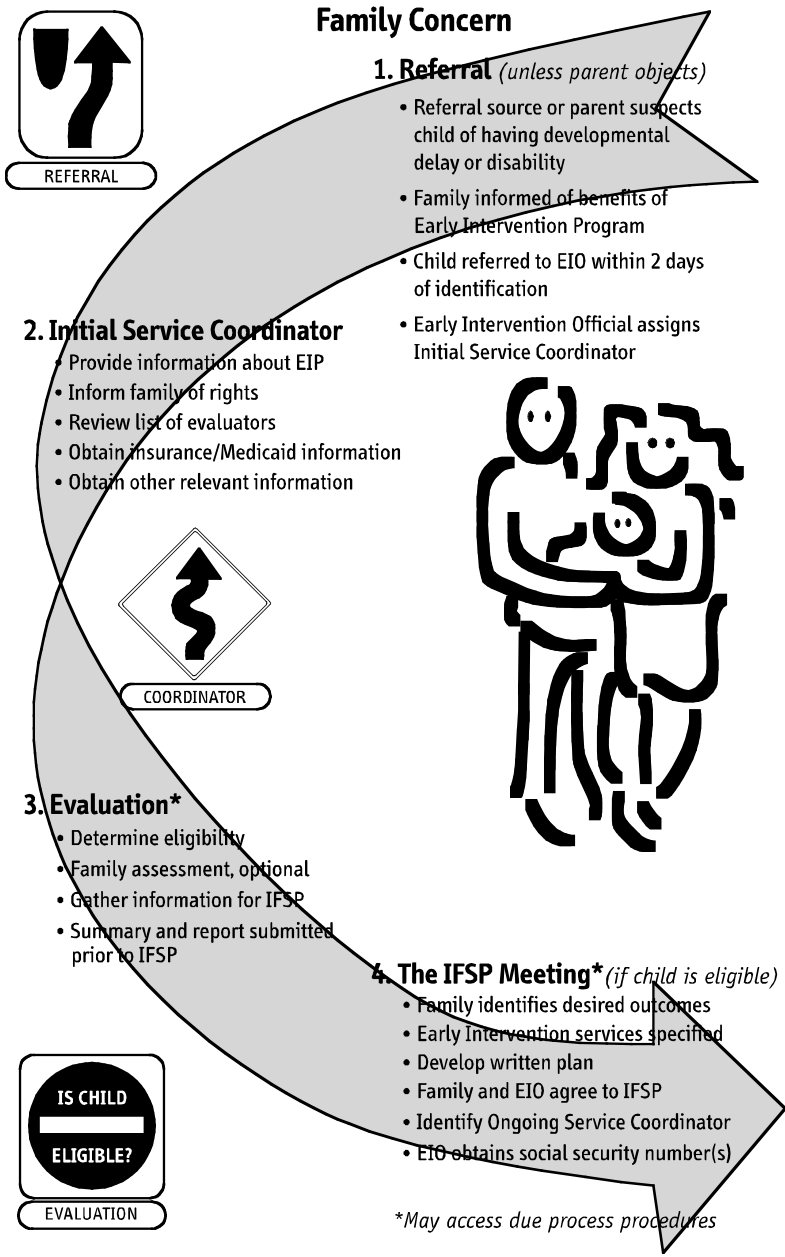
For more information about the New York State laws and regulations that apply to early intervention services, contact the state Bureau of Early Intervention.

New York State Department of Health
Bureau of Early Intervention
Corning Tower Building, Room 287
Empire State Plaza
Albany, NY 12237-0660

518-473-7016

http://www.health.ny.gov/community/infants_children/early_intervention/

bei@health.state.ny.us




6. Transition

- Plan for transition included in IFSP
- Transition to:
 - services under Section 4410 of Education Law (3-5 system)
- OR
- other early childhood services, as needed

Areas of Development


- cognitive
- physical (including vision and hearing)
- communication
- social/emotional
- adaptive development



TRANSITION

5. IFSP – Review Six Months /Evaluate Annually

- Decision is made to continue, add, modify or delete outcomes, strategies, and/or services
- If parent requests, may review sooner:
 - If parent requests an increase in services, EIO may ask for independent evaluation




REVIEW AHEAD

Early Intervention Services*

- assistive technology devices and services
- audiology
- family training, counseling, home visits and parent support groups
- medical services only for diagnostic or evaluation purposes
- nursing services
- nutrition services
- occupational therapy
- physical therapy
- psychological services
- service coordination
- social work services
- special instruction
- speech-language pathology
- vision services
- health services
- transportation and related costs

Parent/guardian consent is required for evaluation, IFSP, provision of services in IFSP, and transition.



THE IFSP MEETING

Revised 12/04

B-2: OFFICIAL EARLY INTERVENTION PROGRAM DEFINITIONS

These definitions are excerpted from New York State Code of Rules and Regulations, §69-4.1, §69-4.10 and §69-4.11. For a complete set of the regulations governing the Early Intervention Program, contact the New York State Department of Health, Bureau of Early Intervention at (518) 473-7016 or visit the Bureau’s Web page at:

http://www.health.ny.gov/community/infants_children/early_intervention/

Sec. 69-4.10 Service Model Options

- (a) The Department of Health, state early intervention service agencies, and early intervention officials shall make reasonable efforts to ensure the full range of early intervention service options are available to eligible children and their families.
 - (1) The following models of early intervention service delivery shall be available:
 - (i) home and community based individual/collateral visits: the provision by appropriate qualified personnel of early intervention services to the child and/or parent or other designated caregiver at the child’s home or any other natural environment in which children under three years of age are typically found (including day care centers and family day care homes);
 - (ii) facility-based individual/collateral visits: the provision by appropriate qualified personnel of early intervention services to the child and/or parent or other designated caregiver at an approved early intervention provider’s site;
 - (iii) parent-child groups: a group comprised of parents or caregivers, children, and a minimum of one appropriate qualified provider of early intervention services at an early intervention provider’s site or a community-based site (e.g., day care center, family day care, or other community settings);
 - (iv) group developmental intervention: the provision of early intervention services by appropriate qualified personnel to a group of eligible children at an approved early intervention provider’s site or in a community-based setting where children under three years of age are typically found (this group may also include children without disabilities); and

- (v) family/caregiver support group: the provision of early intervention services to a group of parents, caregivers (foster parents, day care staff, etc.) and/or siblings of eligible children for the purposes of:
 - (a) enhancing their capacity to care for and/or enhance the development of the eligible child; and
 - (b) providing support, education, and guidance to such individuals relative to the child's unique developmental needs.

Sec. 69-4.1 Definitions

- (b) *Assessment* means ongoing procedures used to identify:
 - (1) the child's unique needs and strengths and the services appropriate to meet those needs; and
 - (2) the resources, priorities, and concerns of the family and the supports and services necessary to enhance the family's capacity to meet the developmental needs of their infant or toddler with a disability.
- (g) *Developmental delay* means that a child has not attained developmental milestones expected for the child's chronological age adjusted for prematurity in one or more of the following areas of development: cognitive, physical (including vision and hearing), communication, social/emotional, or adaptive development.
 - (1) A developmental delay for purposes of the Early Intervention Program is a developmental delay that has been measured by qualified personnel using informed clinical opinion, appropriate diagnostic procedures, and/or instruments and documented as:
 - (i) a twelve month delay in one functional area; or
 - (ii) a 33% delay in one functional area or a 25% delay in each of two areas; or
 - (iii) if appropriate standardized instruments are individually administered in the evaluation process, a score of at least 2.0 standard deviations below the mean in one functional area or score of at least 1.5 standard deviation below the mean in each of two functional areas.
- (ag) *Parent* means a parent by birth or adoption, or person in parental relation to the child. With respect to a child who is a ward of the state, or a child who is not a ward of the state but whose parents by birth or adoption are unknown or unavailable and the child has no person in parental relation, the term "parent" means a person who has been appointed as a surrogate parent for the child in accordance with Section 69-4.16 of this subpart. This term does not include the state if the child is a ward of the state.

- (aj) *Qualified personnel* are those individuals who are approved as required by this subpart to deliver services to the extent authorized by their licensure, certification, or registration, to eligible children and have appropriate licensure, certification, or registration in the area in which they are providing services including:
- (1) audiologists;
 - (2) certified occupational therapy assistants;
 - (3) licensed practical nurses, registered nurses, and nurse practitioners;
 - (4) certified low vision specialists;
 - (5) occupational therapists;
 - (6) orientation and mobility specialists;
 - (7) physical therapists;
 - (8) physical therapy assistants;
 - (9) pediatricians and other physicians;
 - (10) physician assistants;
 - (11) psychologists;
 - (12) registered dietitians;
 - (13) school psychologists;
 - (14) social workers;
 - (15) special education teachers;
 - (16) speech and language pathologists and audiologists;
 - (17) teachers of the blind and partially sighted;
 - (18) teachers of the deaf and hearing handicapped;
 - (19) teachers of the speech and hearing handicapped;
 - (20) other categories of personnel as designated by the Commissioner.
- (al) *Screening* means a process involving those instruments, procedures, family information and observations, and clinical observations used by an approved evaluator to assess a child's developmental status to indicate what type of evaluation, if any, is warranted.

Sec. 69-4.11 (a)(10) Individualized Family Service Plan (IFSP)

- (10) The IFSP shall be in writing and include the following:
- (i) a statement, based on objective criteria, of the child's present levels of functioning in each of the following domains: physical development, including vision and hearing; cognitive development; communication development; social or emotional development; and adaptive development;
 - (ii) a physician's or nurse practitioner's order pertaining to early intervention services which require such an order and which includes a diagnostic statement and purpose of treatment;
 - (iii) with parental consent, a statement of the family's strengths, priorities and concerns that relate to enhancing the development of the child;
 - (iv) a statement of
 - (a) the major outcomes expected to be achieved for the child and the family, including timelines, and
 - (b) the criteria and procedures that will be used to determine whether progress toward achieving the outcomes is being made and whether modifications or revisions of the outcomes or services is necessary.

B-3: TELEPHONE NUMBERS FOR MUNICIPAL EARLY INTERVENTION PROGRAMS

Please visit our Web page at

http://www.health.ny.gov/community/infants_children/early_intervention/

**APPENDIX C: NEWBORN
HEARING
SCREENING
PROGRAM
REGULATIONS**

Pursuant to the authority vested in the New York State Department of Health by Section 2500-g of the Public Health Law and Chapter 585 of the Laws of 1999, Part 69 of Subchapter H of Chapter II of Title 10 (Health) of the Official Compilation of Codes, Rules and Regulations of the State of New York is amended by the addition of a new Subpart 69-8 to be effective upon filing with the Secretary of State and publication in the State Register.

Part 69

Testing for Phenylketonuria and Other Diseases and Conditions/Early Intervention Program/Newborn Hearing Screening

A new Subpart 69-8 is added as follows:

Subpart 69-8

Newborn Hearing Screening

(Statutory authority: Public Health Law Section 2500-g)

Section 69-8.1 Definitions

Section 69-8.2 General Requirements for Infant Hearing Screening Programs and Responsibilities of the Administrative Officers or Designees of Facilities

Section 69-8.3 General Requirements for Administration of the Infant Hearing Screening Program

Section 69-8.4 Procedures for Infant Hearing Screening

Section 69-8.5 General Requirements for Institutions Caring for Infants that Provide a Referral for Infants to Obtain Hearing Screening

Section 69-8.6 Responsibilities of Institutions Caring for Infants in Special Circumstances

Section 69-8.1 Definitions

- (a) Administrative officer means the chief executive officer of the hospital, as defined in section 405.3 of this title.
- (b) Audiologic evaluation means the use of physiologic and behavioral procedures to evaluate and diagnose hearing loss.
- (c) Hearing problems (hearing loss) shall mean a permanent unilateral or bilateral hearing loss of mild (30 to 40 dB HL) or greater degree in the frequency region (500-4000 Hz) important for speech recognition and comprehension.
- (d) Institution caring for infants (facility) means all general hospitals having maternity and infant services or premature infant services as defined in section 405.21 of this title and primary care hospitals and critical access hospitals as defined in section 407.1 of this title and birthing centers as defined in section 754.1 of this title.
- (e) Newborn infant (infant) means a minor child who is less than ninety days of age.
- (f) Newborn infant hearing screening (infant hearing screening) means the use of an objective electrophysiologic or otoacoustic measurement of the auditory system using equipment approved by the United States Department of Health and Human Services, Food and Drug Administration (FDA), to identify infants at risk for hearing loss.
- (g) Parent means a parent by birth or adoption, legal guardian, or any other person legally authorized to consent to medical services for the infant.
- (h) Article 28 facility shall mean a healthcare facility established under article 28 of the Public Health Law.

Section 69-8.2 General Requirements for Infant Hearing Screening Programs and Responsibilities of the Administrative Officers or Designees of Facilities

- (a) Each facility shall administer an infant hearing screening program, directly or by contract pursuant to section 400.4 of this title, as required by this part and as generally described in subdivision (b) of this section, except for those facilities identified in subdivision (c) of this section.
 - (1) Facilities that establish a contract(s) with providers of infant hearing screening shall designate a staff member responsible for contract management and general oversight of the program.
 - (2) Contracts may be established for the conduct of inpatient and/or outpatient infant hearing screening.

APPENDIX C

- (3) Contractors must be article 28 facilities or healthcare providers licensed under state education law and authorized under such law to perform infant hearing screening.
 - (4) Contractors shall have the capacity to meet general requirements for infant hearing screening programs as set forth in subdivision (b) of this section.
- (b) General requirements of an infant hearing screening program are:
- (1) The conduct of inpatient infant hearing screening prior to discharge from the facility.
 - (2) Communication of results of infant hearing screenings to parents by designated personnel, including provision of written materials supplied by the Department.
 - (3) The conduct of follow-up infant hearing screening or provision of referrals to obtain follow-up screening on an outpatient basis for those infants who fail or do not receive infant hearing screening prior to discharge from the facility. On an annual basis, facilities shall notify the Department whether the facility will conduct follow-up infant hearing screening or provide referrals for infants to obtain such screening from another facility or provider licensed under State Education Law and authorized to provide infant hearing screening.
 - (4) Referral of infants who are suspected of having a hearing loss as defined in this part to the Early Intervention Program for appropriate evaluation and early intervention services pursuant to section 69-4.3 of this title including, but not limited to:
 - i. providing a general explanation of the Early Intervention Program and the purpose of referral and the parents' right to object to the referral;
 - ii. ensuring confidentiality of referral information transmitted; and
 - iii. transmitting of personally identifying information as necessary to ensure follow-up.
 - (5) The reporting of aggregate data on infant hearing screenings to the Department upon Department request, in a format and frequency prescribed by the commissioner.
 - (6) The establishment of facility quality assurance protocols as necessary pursuant to section 405.6 of this title to determine and evaluate the effectiveness of the program in ensuring all infants are screened for hearing loss.
- (c) Facilities with 400 or fewer births annually, based on a three-year rolling average, may provide referrals for infants to receive hearing screening from an article 28 facility or a provider licensed under State Education Law and authorized under such law to perform infant hearing screening.
- (1) Such referrals shall include a prescription issued by the facility, including a request for results of the screening to be returned to that facility, for infants to

receive hearing screening from an article 28 facility or a provider licensed under State Education Law and authorized under such law to provide infant hearing screening.

- (2) Such facilities shall submit screening results returned to the facility by the outpatient provider as required by the Department to determine the effectiveness of referral procedures in ensuring infants are screened for hearing loss.

Section 69-8.3 General Requirements for Administration of the Infant Hearing Screening Program

- (a) The administrative officer of each facility caring for infants or their contractor(s) shall designate a program manager responsible for management and oversight of the infant hearing screening program.
 - (1) The program manager shall be a licensed audiologist, physician, physician's assistant, registered nurse or nurse practitioner.
 - (2) If the program manager is not an audiologist, infant hearing screening procedures and training shall be established and monitored in consultation with an audiologist.
- (b) The program manager shall be responsible for ensuring:
 - (1) training and supervision of the individuals performing the screening;
 - (2) review, recording and documentation of screening results;
 - (3) data reporting;
 - (4) staff and parent education; and,
 - (5) coordination of services and follow-up including referrals for re-screening or diagnostic audiologic evaluation as appropriate.
- (c) All personnel performing infant hearing screening must be supervised and trained in the performance of infant hearing screening.
- (d) Training shall include the following:
 - (1) the performance of infant hearing screening;
 - (2) the risks including psychological stress for the parent;
 - (3) infection control practices;
 - (4) the general care and handling of infants in hospital settings according to established hospital policies and procedures;
 - (5) the recording and documentation of screening results as directed; and,
 - (6) procedures for communicating screening results to parents.

- (e) Personnel other than licensed audiologists may perform infant hearing screening, provided that:
 - (1) the screening equipment and protocol used are fully automated;
 - (2) equipment parameters are not accessible for alteration or adjustment by such personnel; and,
 - (3) the results of the screening are determined without clinical decision-making and are reported as pass or fail.
- (f) Equipment that requires clinical decision-making shall be used to conduct infant hearing screenings only by personnel licensed under State Education Law and authorized to perform infant hearing screening.
- (g) Equipment used for infant hearing screening shall be maintained and calibrated in accordance with section 405.24 (c)(2) of this title.
- (h) The facility shall provide adequate physical space for equipment and supplies and an environment suitable to obtain reliable infant hearing screening results.

Section 69-8.4 Procedures for Infant Hearing Screening

- (a) All infants born in the facility shall receive an initial hearing screening prior to discharge from the facility, except as provided in section 69-8.2(c) of this Part.
- (b) Prior to the hearing screening, parents shall be provided educational materials, supplied by the Department to the facility, or consistent in content with Department-supplied materials, regarding infant hearing screening.
- (c) If the infant passes the hearing screening, the results shall be documented in the infant's record by the individual who performed the screening and documented in the discharge summary.
 - (1) The parent shall be informed of the screening results prior to the infant's discharge from the facility.
- (d) The parent shall be provided educational materials, supplied by the Department to the facility, on developmental milestones for communication and signs of hearing loss in young children.
- (e) In the event that an infant is not screened for hearing loss prior to discharge from the facility, the program manager shall ensure that:
 - (1) The parent is offered the opportunity to schedule an appointment for the infant to be screened for hearing loss on an outpatient basis within four weeks from the infant's discharge from the facility. Whenever practicable, the parent shall be afforded such opportunity to schedule an outpatient screening prior to the infant's discharge from the facility.
 - (2) If the parent is not provided the opportunity to schedule an appointment for an outpatient screening prior to the infant's discharge from the facility following

birth, a minimum of two documented attempts, either by United States mail or by telephone, excluding busy signals or no answer, shall be made to contact the parent post-discharge to schedule an appointment for an outpatient screening for the infant.

- (3) If the parent agrees to schedule an appointment for an outpatient hearing screening by the facility or a provider under contract with the facility, the appointment shall be scheduled and documented in the infant's record.
- (4) If the parent returns to the facility or provider under contract with the facility for an outpatient screening, the screening results shall be documented in the infant's record and reported to the Department as prescribed by the commissioner.
- (5) If the parent declines to schedule an appointment for an outpatient hearing screening for the infant by the facility or by a provider under contract with the facility, such declination shall be documented in the infant's record and discharge summary.
 - (i) The parent shall be provided instead with a prescription for the infant to obtain an outpatient hearing screening from an article 28 facility or provider licensed by and authorized under State Education Law to perform infant hearing screening.
 - (ii) The prescription shall specify that the results of the hearing screening shall be returned to the facility.
- (f) If the infant fails the inpatient hearing screening, a repeat screening shall be conducted whenever possible prior to the infant's discharge from the facility to minimize the likelihood of false positive results and need for a follow-up outpatient screening.
- (g) If the infant fails the inpatient screening and any repeat screening, if performed, an outpatient follow-up screening shall be performed to confirm the results of the inpatient screens.
- (h) If the facility has elected to conduct follow-up hearing screening either directly or through a contractual agreement, the following procedures shall be followed:
 - (1) The parent shall be informed of the infant's screening results by an individual trained as required in subdivisions (c) and (d) of section 69-8.3 to counsel the parent(s) on the importance of a follow-up screening.
 - (2) The parent shall be provided with educational materials on the importance of early detection of hearing loss, supplied by or consistent with Department materials.
 - (3) The parent shall be provided, prior to the infant's discharge, a prescription to obtain follow-up infant hearing screening post-discharge to be performed at the facility or by a provider under contract with the facility.

- (4) If the parent agrees, an appointment shall be scheduled prior to the infant's discharge from the facility, except under circumstances where such scheduling is not practicable, such as on weekends, or within ten days post-discharge.
- (5) The appointment shall be documented in the infant's record and discharge summary to facilitate follow-up by the infant's primary healthcare provider.
- (6) If an infant does not present for a scheduled appointment for a follow-up screening based on the infant's failure of an in-patient screen, the facility or provider under contract with the facility shall make at least two documented attempts either by United States mail or by telephone, excluding a busy signal or no answer, to contact the parent and reschedule the appointment.
- (7) If the facility or provider under contract with the facility cannot reach the family or for any other reason cannot schedule and complete a follow-up screening within seventy-five days from discharge, the infant shall be referred to the Early Intervention Official in his or her county of residence as an at-risk child in accordance with section 69-4.3 of this title, unless the parent objected to the referral at the time of the inpatient hearing screening.
- (8) If the parent declines to schedule a follow-up screening with the facility or provider under contract with the facility for an infant who has failed the inpatient infant hearing screening, the following procedures shall be used:
 - (i) The parent(s) shall be provided with a prescription issued by the facility for the infant to obtain a follow-up screening from a provider licensed under State Education Law, and authorized under such law to perform infant hearing screening.
 - a. The prescription shall include a request that results of the screening be submitted back to the facility.
 - (ii) The parent shall be provided with a list of qualified providers of infant hearing screening, which shall consist of providers licensed under state education law and authorized under such law to perform infant hearing screening and article 28 facilities.
 - (iii) The individual counseling the parent shall document in the infant's record and discharge summary the parent(s)' decision not to schedule an appointment with the facility and the issuance of a prescription to obtain follow-up screening from another qualified provider.
 - (iv) The infant's primary healthcare provider, when such provider is known, shall be notified of the parent(s)' decision to obtain a follow-up outpatient screening.
 - (v) If the prescription is filled and the results of the follow-up screening are returned to the facility, such results shall be documented in the infant's record.

- (i) If the facility elects to refer infants who fail the inpatient hearing screening to other facilities or providers licensed under the State Education Law and authorized by such law to perform infant hearing screening on an outpatient basis, the following procedures shall be used:
- (1) The parent shall be informed that the screening should be completed within four weeks from the infant's discharge from the facility, if possible, and not later than twelve weeks following birth.
 - (2) The parent shall be provided with educational materials on the importance of early detection of hearing loss, supplied by the Department to the facility, or consistent in content with Department-supplied materials, and a list of licensed providers and/or article 28 facilities where infant hearing screening may be obtained.
 - (3) The parent shall receive a prescription for an outpatient screening by a provider licensed under the State Education Law and authorized under such law to perform infant hearing screening, or by an article 28 facility. Such prescription shall state that results shall be returned to the facility.
 - (4) The parent shall be informed that if results of a follow-up outpatient screening are not returned to the facility, the infant will be referred as an at-risk child to the Early Intervention Official in their county of residence for follow-up purposes, unless the parent(s) object to such a referral, in accordance with section 69-4.3 of this part.
 - (5) The referral, including issuance of a prescription, shall be documented in the infant's record and discharge summary to facilitate follow-up by the infant's primary healthcare provider.
 - (6) (The infant's primary healthcare provider, when such provider is known, shall be notified of the inpatient results and need for a follow-up outpatient screening.
 - (7) If results of a follow-up outpatient screening are not returned to the facility within seventy-five days, the infant shall be referred as an at-risk child to the Early Intervention Official in his/her county of residence for follow-up purposes, in accordance with section 69-4.3 of this part, unless the parent has objected to such a referral.

Section 69-8.5 General Requirements for Institutions Caring for Infants that Provide a Referral for Infants to Obtain Hearing Screening.

- (a) This section shall apply to those exempt from direct administration of the infant hearing screening program. The administrative officer of a facility as described in subdivision (c) of section 69-8.2 of this Part shall designate a program manager responsible for infant hearing screening, who shall ensure infants are referred for an outpatient screening for hearing loss.

- (b) The program manager for infant hearing screening shall ensure that infants are referred, prior to discharge from the facility, to a provider licensed under State Education Law and authorized under such law to perform infant hearing screening or an article 28 facility.
 - (1) The parent shall be informed that the screening should be completed within four weeks of the infant's discharge from the facility, if possible, and not later than twelve weeks following birth.
 - (2) The parent shall be provided with educational materials on the importance of early detection of hearing loss, supplied by or consistent with department materials; and, a list of licensed providers and/or article 28 facilities where infant hearing screening may be obtained.
 - (3) The parent shall receive a prescription for an outpatient screening by an article 28 provider or a provider licensed under the State Education Law and authorized by such law to perform infant hearing screening. The prescription shall require that results be returned to the facility issuing the prescription.
 - (4) The referral, including issuance of a prescription, shall be documented in the infant's record and discharge summary to facilitate follow-up by the infant's primary healthcare provider.
- (c) The program manager shall be responsible for ensuring that results of infant hearing screening reported to the facility are documented in the infant's record and reported to the Department, as prescribed by the commissioner.
- (d) The Department may seek corrective action, as necessary, to ensure infants are screened for hearing loss under the referral process provided for in this section.

Section 69-8.6 Responsibilities of Institutions Caring for Infants in Special Circumstances

- (a) In the event that an infant is transferred from one facility to another such facility, the facility discharging the infant to home shall be responsible for ensuring that infant hearing screening services are provided to the infant in a manner consistent with the applicable provisions set forth in this part.

If the infant fails both an initial and follow-up screening, the infant shall be referred for an evaluation to the Early Intervention Official in his or her county of residence, according to the procedures set forth in Section 69-4.3 of this part, unless the parent objects.

- (b) Medically unstable infants shall receive infant hearing screening prior to discharge to home, and as early as development or medical stability will permit such screening. In instances where the medical condition of the infant contraindicates infant hearing screening, a decision to forego such screening may be made and documented in the medical record.

**APPENDIX D: ADDITIONAL
RESOURCES**

APPENDIX D

Alexander Graham Bell Association for the Deaf & Hard of Hearing

3417 Volta Place, NW
Washington, DC 20007
Internet: www.agbell.org

Voice (202) 337-5220
TTY (202) 337-5221
Fax (202) 337-8314

American Academy of Audiology

11730 Plaza America Drive, Suite 300
Reston, VA 20190
Internet: www.audiology.org

Toll Free (800) AAA-2336
Voice (703) 790-8466
Fax (703) 790-8631

American Association of Otolaryngology-Head and Neck Surgery (AAO-HNS)

One Prince Street
Alexandria, VA 22314
Internet: www.entnet.org

Voice (703) 836-4444
Fax (703) 683-5100

American Speech-Language-Hearing Association (ASHA)

10801 Rockville Pike
Rockville, MD 20852
Internet: www.asha.org

Voice/TTY (301) 897-5700
Toll Free (800) 638-8255
Fax (301) 897-7355

The Hearing Loss Association of America

7910 Woodmont Avenue, Suite 1200
Bethesda, MD 20814
Internet: www.hearingloss.org

Voice/TTY (301) 657-2248
Fax (301) 913-9413

DB-LINK: National Consortium on Deaf-Blind

Teaching Research
Western Oregon University
345 N. Monmouth Avenue
Monmouth, OR 97361
Internet: www.dblink.org

Voice (800) 438-9376
TTY (800) 854-7013
Fax (503) 838-8150

Gallaudet University

800 Florida Avenue, NE
Washington, DC 20002-3695
Internet: www.gallaudet.edu

TTY/Voice (202) 651-5000
Hearing & Speech Ext. 5328
Fax (202) 651-5324

House Ear Institute (HEI)

2100 West Third Street
Los Angeles, CA 90057
Internet: www.hei.org

Voice (213) 483-4431
TTY (213) 484-2642
Fax (213) 483-8789

John Tracy Clinic

806 West Adams Blvd.
Los Angeles, CA 90007-2505
Internet: www.jtc.org

Voice (213) 748-5481
Toll Free (800) 522-4582
TTY (213) 747-2924
Fax (213) 749-1651

League for the Hard of Hearing

50 Broadway, Sixth Floor
New York, NY 10004
Internet: www.lhh.org

Voice (917) 305-7700
TTY (917) 305-7999
Fax (917) 305-7888

National Association of the Deaf (NAD)

8630 Fenton Street, Suite 820
Silver Spring, MD 20910-3819
Internet: www.nad.org

Voice (301) 587-1788
TTY (301) 587-1789
Fax (301) 587-1791

National Center for Hearing Assessment and Management (NCHAM)

Utah State University
2880 Old Main Hill
Logan, Utah 84322
Internet: www.infanthearing.org

Voice (435) 797-3584
Fax (435) 797-3816

National Institute on Deafness and Other Communication Disorders (NIDCD)

1 Communication Avenue
Bethesda, MD 20892-3456
Internet: www.nidcd.nih.gov

Voice (800) 241-1044
TTY (800) 241-1055
Fax (301) 770-8977

New York State Technical Assistance Program for Deafblind Children

NYSTAP
525 West 120th Street, Box 223
Teachers College
Columbia University
New York, NY 10027
Internet: www.tc.columbia.edu/nystap

Toll Free (866) NYSTAP-3
TDD (212) 678-3879
Fax (212) 678-3462

Note: Inclusion of these organizations is not intended to imply an endorsement by the guideline panel or the NYSDOH. The guideline panel has not specifically reviewed the information provided by these organizations.

**APPENDIX E: SUMMARY OF
RESEARCH
FINDINGS: PANEL
CONCLUSIONS**

Assessment: Newborn Screening and Identification of Hearing Loss

General use of ABR or OAE as methods for newborn hearing screening

1. Newborn hearing screening can be effective in early identification of infants with hearing loss (Apostolopoulos 1999, Desai 1997, Gill 1998, Kennedy 1999/Wessex 1998, Norton 2000, Stevens 1990, Yang 1993).
2. When used for newborn hearing screening, both ABR and OAE appear to be useful methods with good sensitivity and specificity for identifying infants who have sensorineural hearing loss (Apostolopoulos 1999, Desai 1997, Gill 1998, Kennedy 1999/Wessex 1998, Norton 2000, Stevens 1990, Yang 1993).
3. ABR appears to be more effective than transient evoked otoacoustic emissions (TEOAE) and distortion product otoacoustic emissions (DPOAE) for identifying moderate hearing loss at 1 kHz (Norton 2000).
4. When used as newborn hearing screening tests, transient evoked otoacoustic emissions (TEOAE), distortion product otoacoustic emissions (DPOAE), and ABR tests:
 - Do not have good sensitivity or specificity for identifying mild hearing loss
 - Are equally effective in identifying infants with profound sensorineural hearing loss when using a pure-tone average of 2 and 4 kHz (frequencies important in measuring the ability to understand speech)
 - May not appropriately identify some newborns who are later diagnosed with hearing loss (Norton 2000).
5. The test environment for both auditory brainstem response (ABR) and otoacoustic emissions (OAE) testing is an important contributor to the successful completion of the tests. A noisy environment or electrical interference can result in less accurate screening and test results. Noise in the testing environment eliminates the ability to detect a response because the signal-to-noise ratio is not as good (Stevens 1990).

Auditory brainstem response (ABR) testing

6. The use of automated ABR technology can be practical and useful for newborn hearing screening but is not as accurate as conventional ABR testing (Chen 1996, Jacobson 1990).
7. When interpreting results of a newborn screening with either conventional or automated ABR screening technology, it is useful to consider the following factors:

- Specific technology/model of the equipment
 - Cutoff criteria for “Pass”/“Refer”
 - Age of the child when tested
 - Expertise of the tester
 - Environmental factors that may affect the test results (Jacobson 1990).
8. The ability of newborn hearing screening to detect sensorineural hearing loss using ABR is improved when both air-conducted and bone-conducted click ABR are used (Yang 1993).
 9. Newborn hearing screening using ABR in infants who have had extracorporeal membrane oxygenation (ECMO) yields a very low sensitivity and a low specificity. Therefore, audiological follow-up for these infants is necessary, even when the ABR is normal (Desai 1997).

Evoked otoacoustic emissions (OAE) testing

10. Transient evoked otoacoustic emissions (TEOAE) may be useful in screening for hearing loss in high-risk infants. However, TEOAE may miss mild degrees or unusual configurations of hearing loss (Apostolopoulos 1999, Stevens 1990).
11. For infants who are high risk for hearing loss, transient evoked otoacoustic emissions (TEOAE) can be helpful in identifying the need for further evaluation for possible hearing loss (Gill 1998).
12. Infants who are high risk for delayed onset or progressive hearing loss and pass the hearing screening still need ongoing surveillance for hearing loss (Gill 1998).
13. The transient evoked otoacoustic emissions (TEOAE) test has decreasing utility (fewer successful test completions) as the age of the infant increases beyond 3 months of age because as the movement and activity of the infant increases and the infant sleeps less, it becomes more difficult to facilitate the quiet state necessary for testing (Stevens 1990).

Acoustic reflex testing (AR)

14. Acoustic reflex (AR) measurements take longer and are not as sensitive for identifying mild to moderate hearing loss, and therefore are not as efficient for screening hearing in newborns (Hirsch 1992).
15. Acoustic reflex (AR) measurements may be useful for in-depth assessment for children with a suspected hearing loss (Hirsch 1992).

Behavioral screening tests

16. Behavioral hearing screening tests, such as an automated crib-based hearing screener (i.e., the Crib-o-gram), are not useful screening methods for identifying hearing loss in newborns (Durieux-Smith 1985).
17. Screening for hearing loss in newborns using an automated crib-based screener does not provide good predictions of future hearing status (Durieux-Smith 1985).

Risk factors to predict future hearing loss

18. Identification of risk factors may be useful for predicting hearing loss. However, risk factors for hearing loss are not identified at birth in 30%-40% of children with permanent hearing loss (Watkin 1991).
19. Some children from the neonatal intensive care unit (NICU) with possible neurological insults or extreme prematurity may show a resolution of diagnosed hearing loss due to maturation (development over time) (Chen 1996).
20. Infants with head and neck deformities are at high risk for hearing loss, especially when gestational age is less than 36 weeks and there are other coexisting risk factors such as meningitis and ototoxic medications (especially in combination with certain diuretics) (Smith 1992).

Assessment: Identification and Assessment of Hearing Loss in Young Children*Auditory brainstem response (ABR)*

1. Frequency-specific auditory brainstem response (ABR) is a useful technique in assessing hearing loss in difficult-to-test young children who can't be tested behaviorally (Fjermedal 1989).
2. Auditory brainstem response (ABR) is a sensitive tool for identifying both conductive and sensorineural hearing loss and can provide some diagnostic information about the type of loss through the use of algorithms (Hyde 1990/Hyde 1991, Sorensen 1988).
3. The timing of wave V of the auditory brainstem response (ABR) is increased in latency with conductive hearing loss, compared with the timing of wave V seen for sensorineural hearing loss (Hyde 1990/Hyde 1991).
4. Using results from both bone- and air-conducted auditory brainstem response (ABR) provides information that helps differentiate between conductive and sensorineural hearing loss (Hyde 1990/Hyde 1991).

5. Using auditory brainstem response (ABR) and follow-up behavioral hearing tests in an assessment battery can help identify bilateral sensorineural hearing loss in children and is particularly useful for children who have mental retardation/developmental delays (Kawarai 1999).

Evoked otoacoustic emissions (EOAE)

6. The use of evoked otoacoustic emissions (EOAE) for detecting hearing loss in infants and young children has excellent sensitivity but moderate specificity. However, the test has a relatively high false positive rate when used with older children (Richardson 1995).
7. For typically developing children, the presence of strong ototacoustic emissions suggests normal hearing. However, the absence of emissions does not necessarily confirm a hearing loss. Confounding factors such as middle ear pathology and environmental noise may explain the absence of emissions (Richardson 1995).
8. When using TEOAE to screen for hearing loss in young children, a bandwidth signal-to-noise ratio of ≥ 3 dB has a higher specificity than other screening cutoff criteria when all tests are adjusted for a sensitivity of 100% (Richardson 1995).

Tympanometry

9. Tympanometry is a test of middle ear function and may be a useful tool in helping to identify children with mild hearing loss associated with otitis media with effusion (Rosenfeld 1998).
10. For children who have otitis media with effusion (OME), tympanograms are better at identifying hearing loss in younger children (3 to 5 years) than in older children (6 to 10 years) (Kazanas 1994).
11. Young children with a Type B (flat) tympanogram need a hearing test because this is an indicator of possible hearing loss (Kazanas 1994, MRC 1999).

Behavioral screening tests

12. Although a high number of false positives occur when a nonaudiologist performs screening tests using behavioral measures, such as a distraction test, it is still better than not performing a screening test (Johnson 1990).
13. Screening only children who are in the neonatal intensive care unit (NICU) or those considered at high risk may result in failing to identify many children with hearing loss (Johnson 1990).

Language development milestones

14. The absence of canonical babbling before 11 months of age is a clinical clue for severe hearing impairment (Eilers 1994).
15. When given information and feedback about how to recognize canonical babbling, parents can perform effective surveillance for severe hearing loss (Eilers 1994).

Parent questionnaires

16. Parental concerns are particularly important in identifying children with hearing loss. The presence of parental concern increases the likelihood that the child may have a hearing problem (Anteunis 1999).
17. Parent survey alone is not a reliable tool for identifying all children with acute otitis media, otitis media with effusion, or mild hearing loss, and should not be used as the only screening/surveillance method used for identifying hearing loss (Anteunis 1999, Hammond 1997, Newton 1999).
18. Global questions such as “Can your child hear?” or questions that may be emotionally charged such as “Does your child have normal hearing?” may not gather as much useful information as more specific age-appropriate and behaviorally related questions such as “Does your child turn to look at you when you speak softly or quietly?” (Anteunis 1999, Newton 1999).

Intervention: Approaches for Children With Hearing Loss

Hearing aids

1. Early referral for hearing testing and hearing aid fitting is correlated with better levels of expressive spoken language for children with mild to severe hearing loss (Ramkalawan 1992).
2. For children with moderate hearing loss who are fitted with hearing aids, the highest correlation with better language outcomes is the age of referral (Ramkalawan 1992).

Cochlear implants

3. Children who receive cochlear implants at 2 to 3 years of age appear to have similar expressive and receptive language scores when compared with children who had implants between 3 and 5 years of age. Both groups show improvement in speech production and language acquisition over time (although the use of other interventions after implantation may influence outcomes) (Brackett 1998).
4. Children receiving cochlear implantation at a mean age of 50 months can significantly improve their language development rate as measured at 12

months postimplantation (although timing of the intervention, the use of additional interventions, and demographics such as age of onset of hearing loss may influence outcomes) (Miyamoto 1997/Robbins 1997).

5. Children who receive cochlear implants at a young age have more improvement in speech perception and speech intelligibility during the first 24 months postimplantation (Nikolopoulos 1999).
6. Children who receive cochlear implants can improve in recognition of speech sound units (phonemes) when using both oral and total communication regardless of the intervention program (Svirsky 1999).
7. By 12 months postimplantation, children who receive cochlear implants can achieve phoneme recognition skills equal to hearing aid users with hearing losses of 90 to 100 dB HL and better scores than hearing aid users with hearing losses of 101 to 110 dB HL, even if phoneme recognition scores were below those of hearing aid users prior to implantation (Svirsky 1999).
8. By one year after receiving cochlear implants, children who received the implant before the age of 5 years tend to:
 - Use fewer gestures
 - Use more vocal communication exchanges (Tait 1994).
9. Children who receive cochlear implantation have greater improvement in vocal and auditory communication than do children who use hearing aids as measured one year after implantation (Tait 1994).
10. Children who receive cochlear implants have significantly higher receptive language scores over time than do pair-matched children who use hearing aids. This seems to occur even when the implantation group has worse pure-tone audiometric thresholds and statistically significant lower receptive language development curves than does the control group prior to implantation. However, individual maturation and duration of deafness may influence outcomes (Truy 1998).

Communication interventions: Effects of early intervention on communication, language, and general development

11. Early intervention can improve outcomes in children with identified hearing impairments, regardless of the degree of hearing loss, mode of communication, cognitive ability, or socio-economic status (Yoshinaga-Itano 1998B).
12. Early, systematic intervention may result in:
 - Better child outcomes such as more advanced social, communication, and preacademic skills

- A reduction of maternal stress related to health and attitude towards the child (Greenberg 1983/Greenberg 1984).
13. Early diagnosis, early intervention, and family involvement are important factors in achieving better language outcomes, regardless of the age of onset, degree of hearing loss, or type of intervention (Moeller 2000).
 14. Children who are identified with hearing loss by the age of 6 months who receive intervention within 2 to 3 months of diagnosis have better receptive language outcomes than do children who are identified and receive intervention after the age of 18 months. However, it is not clear whether the delay is due to receiving more total intervention or beginning the intervention at an earlier age (Yoshinaga-Itano 1998A).
 15. For children with severe and profound hearing loss, the age of enrollment in a generic early intervention program has a significant effect on receptive language when measured at 3 to 5 years of age. However, this effect does not appear to be long-term (Musselman 1988).
 16. By the age of approximately 2 years, children with hearing loss that is diagnosed by 6 months of age and who begin early intervention at approximately 8 months of age may have:
 - Language abilities close to appropriate norms
 - Language quotients close to their cognitive quotients (Yoshinaga-Itano 1998, Yoshinaga-Itano 1998B).
 17. Children with hearing loss who participate in an early intervention program beginning at 8 to 9 months of age, compared with children who begin intervention at 20 to 21 months of age, have higher scores on measures of:
 - Expressive and receptive language
 - Vocabulary and vowel production
 - Personal and general development
 - Situational and conceptual comprehension (Yoshinaga-Itano 1998, Yoshinaga-Itano 1998A).

Intervention programs and approaches

18. Valuable aspects of early intervention programs (according to parent interviews) include:
 - Modeling communication and play techniques
 - Information about the deaf community
 - Visits or opportunities to meet deaf adults
 - Access to professionals experienced with young children who are deaf and hard of hearing
 - Access to parent counselors and support groups
 - Sign-language training (Greenberg 1983/Greenberg 1984).
19. Auditory training is a valuable aspect of a total communication program (according to parent interviews) (Greenberg 1983/Greenberg 1984).
20. It is helpful to include fathers and siblings in intervention programs to develop the child's communication skills (Greenberg 1983/Greenberg 1984).
21. Cochlear implants can result in significant gains in language development, as measured at 6 months after intervention, regardless of the communication approach used (only auditory/oral or a total communication program). However, because the age of implantation and the timing of the pre/post intervention vary, the efficacy of the technology in relation to language development is difficult to assess (Robbins 1999).
22. When assessed at 6 to 13 years of age, children who received early intervention services such as the home-based SKI-HI model (which has a strong emphasis on parent training and involvement):
 - Perform better in expressive language, speech, child and family communication, hearing aid use, and in some areas of academic achievement and social adjustment
 - Show no significant differences in outcome measures between children receiving intervention <30 months or >30 months (Watkins 1987).
23. It appears that a deaf-mentor program using a bilingual-bicultural (Bi-Bi) approach results in greater gains in expressive and receptive language when compared with the SKI-HI program that uses parent advisors to teach sign language or spoken English. However, it is unclear whether the better outcome is due to an increase in the intervention level or the addition of a deaf mentor (Watkins 1998).

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REFERENCE

This reference list is limited for the purpose of this *Quick Reference Guide*. The complete Bibliography can be found in the *Report of the Recommendations* or the *Technical Report* versions of this guideline. First author in **bold** indicates that the article met the criteria for evidence for this guideline.

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SUBJECT INDEX

SUBJECT INDEX

Acoustic Middle Ear Muscle Reflexes (MEMR) 41, 44, 46

American Deaf Community 96

Amplification 50, 97

Assessment

- Acoustic Middle Ear Muscle Reflexes (MEMR) 41, 44, 46
- amplification 50
- audiologic 39
- Auditory Brainstem Response (ABR) 27, 41, 44, 46
- behavioral audiometry 26, 42, 44, 47, 48
- clinical clues 31, 36
- communication 56
- communication developmental milestones 34
- developmental 53, 59
- developmental surveillance 32
- Evoked Otoacoustic Emissions (EOAE) (see otoacoustic emissions)
- family assessment 62
- general approach 24
- medical 51
- Newborn Hearing Screening Program Regulations 159
- Otoacoustic Emissions (OAE) 27, 40, 44, 45, 48
- parental concerns 38
- physiologic tests/procedures 26, 27, 40, 44, 48
- risk factors 31, 33
- screening, newborn 26, 28
- screening, young children 26, 30
- Steady State Evoked Potentials (SSEP) 41
- Tympanometry 41, 44, 46

Audiogram 10

Audiologic assessment 39

Auditory Brainstem Response (ABR).....	27, 41, 44, 46
Behavioral audiometry	26, 42, 44, 47, 48
Brainstem Auditory Evoked Response (BAER)	<i>(see auditory brainstem response)</i>
Clinical clues	31, 36
Cochlear implants.....	106
Communication approaches.....	80
American Sign Language (ASL)	80, 82, 88, 96
auditory-oral.....	81, 85
auditory-verbal	81, 84
bilingual.....	82, 88
bilingual-bicultural	82, 88
cued speech	81, 86
Simultaneous Communication (SimCom)	82, 86
Total Communication (TC).....	82, 86
Communication assessment.....	56
Communication developmental milestones	34
Communication interventions.....	80
Conditioned Orienting Reflex (COR)	43, 44, 47
Conditioned Play Audiometry (CPA).....	43, 45, 47
Developmental assessment	53, 59
Developmental surveillance.....	32
Ear, anatomy	9
Electrophysiologic tests	<i>(see physiologic tests/procedures)</i>
Evoked Otoacoustic Emissions (EOAE)	<i>(see otoacoustic emissions)</i>
Extracorporeal Membrane Oxygenation (ECMO).....	39
Family assessment.....	60, 62
Family support.....	75
FM systems	98
Hearing aids	97
Hearing loss	
cause	10, 13, 112
conductive	13, 112

INDEX

defined	3, 8, 10
impact	17
levels of severity	3, 10
prevalance.....	14
sensorineural	14, 113
types.....	13, 112
Intervention	
amplification devices.....	97
auditory skill development.....	90
cochlear implants	106
common approaches	19
communication approaches.....	80
evaluating efficacy.....	69
evaluating options.....	70, 77
family support.....	75
FM systems	98
general considerations	68
hearing aids	97
medical/surgical.....	106, 112
parent education.....	75
questions when selecting.....	78
role of professionals.....	79
Simultaneous Communication (SimCom)	82, 86
speech development/training.....	88, 92, 93
tactile aids.....	105
Total Communication (TC).....	82, 86
visual supports	86
Listening/speech skills	89, 92, 94
Medical assessment.....	51
Methodology, guideline	4
Otitis media.....	51
Otoacoustic Emissions (OAE).....	40, 44, 45, 48

Parent education	75
Parental concerns.....	38
Physiologic tests/procedures.....	26, 27, 40, 44, 45, 48
Acoustic Middle Ear Muscle Reflexes (MEMR)	41, 44, 46
Auditory Brainstem Response (ABR)	27, 41, 44, 46
Otoacoustic Emissions (OAE).....	27, 40, 44, 45, 48
speech audiometry	45
Steady State Evoked Potentials (SSEP)	41
Tympanometry	41, 44, 46
Risk factors	31, 33
Screening, newborn.....	27, 28
Screening, young children	26, 30
Speech audiometry	43
Speech development/training.....	89, 92, 93
Steady State Evoked Potentials (SSEP).....	41
Tactile aids.....	105
Tympanometry.....	41, 44, 46
Visual Reinforcement Audiometry (VRA).....	43

GUIDELINE VERSIONS

There are three versions of each clinical practice guideline published by the Department of Health. All versions of the guideline contain the same basic recommendations specific to the assessment and intervention methods evaluated by the guideline panel, but with different levels of detail describing the methods and the evidence that supports the recommendations.

The three versions are

THE CLINICAL PRACTICE GUIDELINE:

Quick Reference Guide

- summary of major recommendations
- summary of background information

Report of the Recommendations

- full text of all the recommendations
- background information
- summary of the supporting evidence

The Guideline Technical Report

- full text of all the recommendations
- background information
- full report of the research process and the evidence reviewed

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