

**CLINICAL PRACTICE GUIDELINE**

**REPORT OF THE  
RECOMMENDATIONS**

**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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# 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.  
University of Washington



**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 Health Care Policy and Research (AHCPR). This methodology was selected because it is an effective, scientific, and well-tested 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.

## PREFACE

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- Identification and referral of children at risk or suspected of having a disability by primary referral sources (including physicians and other health care providers).
- 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 that 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 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.

## LIST OF COMMON ABBREVIATIONS

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



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**HEARING LOSS**

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**YOUNG CHILDREN (AGE 0-3 YEARS)**

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This *Clinical Practice Guideline: Report of the Recommendations* presents the full text of all the recommendations plus an abbreviated description of the methodology and evidence used to develop the recommendations.

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*.

An abbreviated version of the background information and guideline recommendations can be found in the *Clinical Practice Guideline: Quick Reference Guide*.

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## CHAPTER I: INTRODUCTION

**PURPOSE OF THIS CLINICAL PRACTICE GUIDELINE**

This *Report of the Recommendations* guideline 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 is intended to provide parents, professionals, and others with recommendations about “best practice” based on consensus opinion of the 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 recommendations suggest “best practices,” not policy or regulation***

*The recommendations in this guideline are not intended to be regulations for the Early Intervention Program administered by the State of New York.*

*The guideline is intended as a set of recommendations that provide guidance about “best practices.” **The guideline is not a required standard of practice**, and it should not be interpreted as policy or regulation. The guideline document is a tool that can be used to help providers and families make informed decisions within the context of the administrative system in which the care is being delivered.*

*Practitioners and families are encouraged to use the information provided in this guideline, recognizing that **the care provided should always be tailored to the individual**. Not all of the recommendations will be appropriate for use in all circumstances. The decisions to adopt any particular recommendation must be made by the practitioner and the family in light of available resources and circumstances presented by 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, a hearing loss is classified as a communication disorder.

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

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




**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 as a result of having a diagnosed condition with a high probability of resulting in developmental delay.

**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, who 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(s) 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. It is beyond the scope of this guideline to address professional practice issues.
<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).



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

## THE IMPORTANCE OF USING SCIENTIFIC EVIDENCE TO HELP SHAPE PRACTICE

Every professional discipline today is being called upon to document effectiveness. Professionals are increasingly asked to document that the

approach used is effective in bringing about the desired outcomes. Those providing, receiving, or paying for services often want to know if there are other approaches or modifications of existing approaches that might produce better outcomes or similar outcomes at less cost. The difficulty in answering these questions is that many times the effectiveness of the methods used in current professional practice has not been studied extensively or rigorously.

Guidelines based on a review and evaluation of the scientific literature can help professionals, parents, and others learn what scientific evidence exists about the effectiveness of specific clinical methods. This approach provides parents and professionals from a variety of disciplines with the information to make recommendations based on scientific evidence rather than on opinion. When adequate scientific evidence can be found and systematically evaluated, it provides a balanced and objective approach for making informed decisions about intervention and assessment options.

Another strength of the evidence-based approach is that when evidence is sought but not found, it provides strong support for developing research agendas.

### *Limitations of the evidence-based approach*

In general, the most significant limitation to using an evidence-based approach is that there may be a lack of adequate evidence specific to the topic of interest. For this guideline, many articles were found that related to the guideline topic, but few articles met the panel's minimum criteria for study quality.

Approximately 6,500 abstracts were screened for this guideline, and from these, over 500 articles were reviewed to determine if they met the criteria for evidence. For many areas of interest (particularly regarding intervention methods), a limited number of studies were found that met the minimum criteria.

The panel recognized that there are numerous articles in the scientific literature that did not meet criteria for adequate evidence about efficacy, yet still contain valuable information. This would include articles that are case reports and case series (sometimes using pre- and posttest designs), as well as articles that primarily discuss theory or opinion. Although such articles often provide valuable insights that may be useful in clinical practice, these articles cannot provide adequate evidence about the efficacy of specific clinical assessment or intervention methods.

**OVERVIEW OF THE METHODS USED TO EVALUATE THE EVIDENCE**

This clinical practice guideline for young children with hearing loss is part of a series of clinical practice guidelines being developed by the New York State Department of Health (NYSDOH) for assessment and intervention for young children with developmental disabilities. To develop these guidelines, the NYSDOH has chosen to use a methodology similar to that used by the Agency for Healthcare Research and Quality (AHRQ), formerly the Agency for Health Care Policy and Research (AHCPR), a part of the United States Public Health Service.

A multidisciplinary panel of topic experts, generalist providers (both clinicians and educators), and parents of children with hearing loss developed this guideline. The panel participated in a series of meetings to review the available research and develop guideline recommendations. The panel's final meeting was in 2001.

*Scope of the guideline*

The scope of this clinical practice guideline is to provide general background information and specific recommendations related to identification, assessment, and intervention approaches for young children (birth to age three) with hearing loss. While the term hearing loss can be broadly used to include a wide variety of conditions resulting in hearing loss, the guideline panel chose to limit the primary focus of the guideline to permanent bilateral (both ears) sensorineural hearing loss.

After determining the general scope of the guideline, the guideline panel determined the specific assessment and intervention topics and methods to be addressed, and which of those topics and methods were most appropriate for the focus of the literature search and review of evidence process.

Not all of the topics included in the guideline were appropriate for the review of evidence process. Some topics or methods were determined to be important to address with recommendations, but a specific literature search and evaluation of the evidence was not undertaken. In general, a literature search and review of the evidence was not conducted when:

- The topic or method was not a primary focus of this guideline (such as specific medical interventions for otitis media)

- There was a large literature for a topic that is generally not specific to children with hearing loss and/or generally not considered controversial (such as general health surveillance)
- The topic was generally not the subject of scientific study (such as the importance of multidisciplinary team collaboration)

### *Using the evidence to develop guideline recommendations*

Studies meeting the criteria for adequate evidence received an in-depth review, and relevant information about study design, subject characteristics, and results was systematically abstracted onto evidence tables. The guideline panel critically evaluated each of the articles that met the criteria for review. Based on the information in the article, the panel developed conclusions about the strengths and limitations of the study and the degree of applicability of the evidence to the guideline topic. The panel then used the information from these articles as the basis for developing guideline recommendations.

Standard decision-making rules were used to develop guideline recommendations. When scientific evidence was available, it was given the most weight. When adequate scientific evidence was not found, or when the topic was not a focus of the evidence review, the recommendations were developed based on the expert opinion of the panel. In all instances (evidence-based and expert opinion), the recommendations are the consensus of the panel.

## STRENGTH OF EVIDENCE RATINGS

Each guideline recommendation has been given a “strength of evidence” rating, which is designated by the letter [A], [B], [C], [D1], or [D2] in brackets immediately after the recommendation. The strength of evidence rating indicates the amount, general quality, and clinical applicability (to the guideline topic) of scientific evidence the panel used as the basis for that specific guideline recommendation.

- [A] = **Strong evidence** is defined as evidence from two or more studies that met criteria for adequate evidence about efficacy and had high quality and applicability to the topic, with the evidence consistently and strongly supporting the recommendation.
- [B] = **Moderate evidence** is defined as evidence from at least one study that met criteria for adequate evidence about efficacy and had high quality and applicability to the topic, and where the evidence supports the recommendation.

- [C] = **Limited evidence** is defined as evidence from at least one study that met criteria for adequate evidence about efficacy and had moderate quality or applicability to the topic, and where the evidence supports the recommendation.
- [D] = **Consensus panel opinion** (either [D1] or [D2] below):
- [D1] = **Consensus panel opinion** based on information not meeting criteria for adequate evidence about efficacy, on topics where a systematic review of the literature was conducted
- [D2] = **Consensus panel opinion** on topics where a systematic literature review was not conducted

The methodology for determining adequate evidence is summarized in Appendix A.

The strength of evidence rating indicates the type of information used as the basis for the recommendation. The strength of evidence rating does not reflect the importance of the recommendation or its direction (whether it is a recommendation for, or against, use). For example:

- If there was strong evidence that an intervention is effective, then a recommendation for use of the method would have an [A] evidence rating.
- If there was strong evidence that an intervention is not effective, then a recommendation against use of the method would also have an [A] evidence rating.

## **USING SCIENTIFIC EVIDENCE AS THE BASIS FOR CLINICAL DECISIONS**

### *Considerations about using scientific evidence*

In developing evidence-based clinical practice guidelines, the process of reviewing the scientific literature to find evidence-based answers to specific clinical questions is challenging. Many of the specific clinical issues of interest have not been studied in well-designed studies to determine if the method is effective. Even when well-designed studies have been conducted on a particular clinical topic, the study findings themselves seldom present totally straightforward and unambiguous answers to the clinical questions of interest.

Careful analysis of the studies and considerable judgment are always needed when using the findings of research studies to help in making informed clinical decisions and developing clinical practice guidelines.

In developing practice guidelines for most clinical topics, it is unusual to find studies that evaluate exactly the clinical situations and types of subjects that are of interest. Therefore, it is almost always necessary to generalize to some extent in terms of the subject characteristics (such as age), the clinical setting, or the type of assessment or intervention method used. The research reviewed for this guideline was no exception.

In using research evidence to help make clinical decisions, the two primary considerations are the quality of the evidence and its clinical applicability to the question of interest.

- The **quality of the study** is primarily related to the study design and controls for bias. The higher the quality of the study, the more confidence we can have that the findings of the study are valid. Confidence in the study findings became even greater when multiple well-designed studies conducted by independent researchers find similar results.
- The **clinical applicability of a study** is the extent to which the study's results would also be expected to occur in the particular clinical situation of interest to us. The applicability of a study's findings is considered to be higher when the subject characteristics, clinical methods, and clinical setting are similar between the study and clinical situation of interest.

The overall usefulness of a study's findings to clinical decision making relates both to our confidence in the results (based on the quality and amount of scientific evidence) and the similarity of the study's subjects, clinical methods, and setting to the question of interest (that is, its applicability).

### *Criteria for studies used in developing this guideline*

For this guideline, the panel chose to:

- Adhere to relatively rigorous criteria for selecting studies as providing high-quality evidence about efficacy
- Distinguish between high quality/applicability and intermediate quality/applicability for intervention studies

Findings from studies meeting the criteria for evidence were used as the primary basis for developing the evidence-based guideline recommendations. In many cases, the panel also used information from other articles and studies not



meeting the criteria for evidence. However, information from these sources was not considered evidence and was not given as much weight in making guideline recommendations.

*Considerations about applicability of studies*

Of particular concern for this guideline was finding high-quality scientific studies that focused on children under 3 years of age. For some topics, studies were found that evaluated only children within the guideline's target population (children from birth to 3 years of age); but for other topics the only studies found evaluated groups that included somewhat older children (over 3 years of age).

As noted above, having a study with children over 3 years of age does not affect the quality of the study or bias the results, but it may make the study's findings somewhat less applicable to the guideline topic. The panel took this into account when making guideline recommendations, and generally gave more weight to findings from high-quality studies that focused on children under 3 years of age. However, when there were few good studies found that focused on children in the target age group, then the panel thought it important to generalize from evidence found in good studies of somewhat older children.

*Judging the quality and applicability of the evidence when making guideline recommendations*

Due to the considerations above, the panel needed to use significant judgment in evaluating the quality and applicability of the scientific evidence when using it as the basis for the evidence-based recommendations. Similar limitations and considerations apply to all evidence-based practice guidelines. The strength of evidence ratings are a reflection of both the amount and quality of the scientific evidence found and its applicability to the guideline topic.

## **PEER REVIEW, GUIDELINE VERSIONS, AND PERIODIC REVISION**

*The peer review process*

The draft guideline was sent to a variety of topic experts, generalist providers and parents for peer review. Comments on the draft document were solicited, and the panel reviewed these comments before making final revisions in the guideline. Review comments were received from 68 external reviewers.

### *Guideline versions*

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

The three versions of the Clinical Practice Guideline are:

- *Clinical Practice Guideline: The Guideline Technical Report*  
Includes the full text of the recommendations and related background information, plus a full report of the research process and the evidence that was reviewed.
- *Clinical Practice Guideline: Report of the Recommendations*  
Includes the full text of all the recommendations and related background information, plus a summary report of the research process and the evidence that was reviewed.
- *Clinical Practice Guideline: The Quick Reference Guide*  
Provides a summary of guideline recommendations and background information.

### *Periodic review and revision of the guideline*

It is intended that this NYSDOH Clinical Practice Guideline on hearing loss in children from birth to age 3 be a dynamic document that is updated periodically as new scientific information becomes available. This guideline reflects the state of knowledge at the time of development. However, given the inevitable evolution of scientific information and technology, it is the intention of the NYSDOH that periodic review, updating, and revision will be incorporated into an ongoing guideline development process.

**CHAPTER II: BACKGROUND  
INFORMATION**

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, a hearing loss is classified as one of the communication disorders.

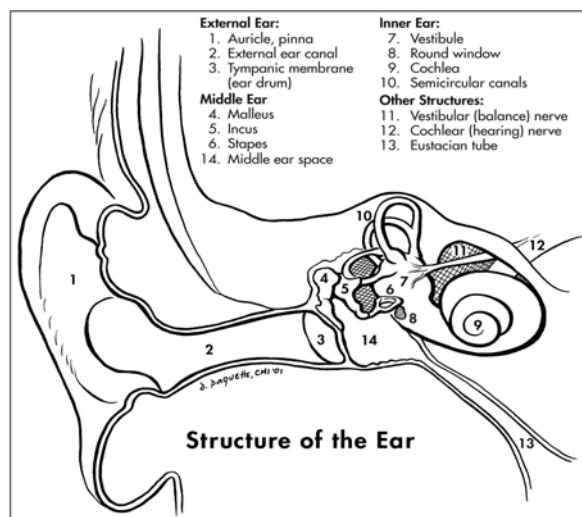
### **HOW DO WE HEAR?**

For hearing to occur, sound waves are 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, a snail-shaped structure containing thousands of hair cells. These hair cells respond to sound and convert the mechanical vibrations into electrical signals. The electrical signals then travel as nerve impulses through the auditory nerve to the brain, where they are interpreted.

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**Figure 1: Structure of the Ear**

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Hearing loss can occur due to a problem with any part of the auditory system. This includes problems with the ear canal, the tympanic membrane (eardrum),

the little bones of the middle ear (malleus, incus, and stapes), the middle ear space, or the inner ear (cochlea).

### **WHAT IS NORMAL HEARING?**

Sounds are produced by 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*, which is measured in cycles per second, called Hertz (Hz). The frequency of the vibration is related to the perception of pitch.
- *Intensity*, which 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 (250 Hz–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 (1989) has defined the sound pressure level at which individuals can normally detect sound as 0 dB 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.

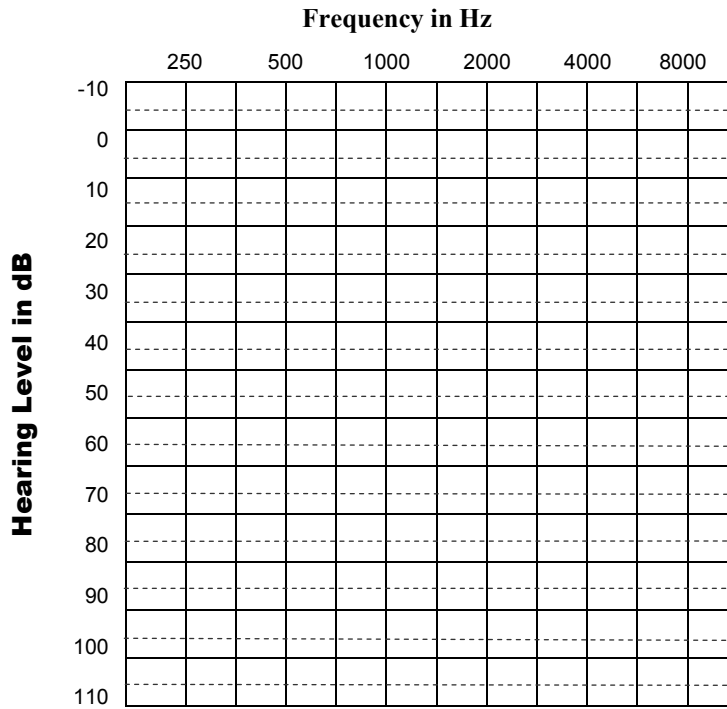
Children with normal hearing can detect sound within the range of minus 10 to plus 15 dB HL.

### **WHAT IS HEARING LOSS?**

If a child cannot detect sounds within the normal range, the child is considered to have a hearing loss. The amount of hearing loss is measured in terms of the specific detection level (in decibels HL) at each frequency tested. These values are plotted on a graph called an audiogram (Figure 2, page 16). The horizontal axis on the graph shows the frequencies of the sounds in Hertz, and the vertical axis depicts the hearing level in decibels.

**Figure 2: Audiogram**

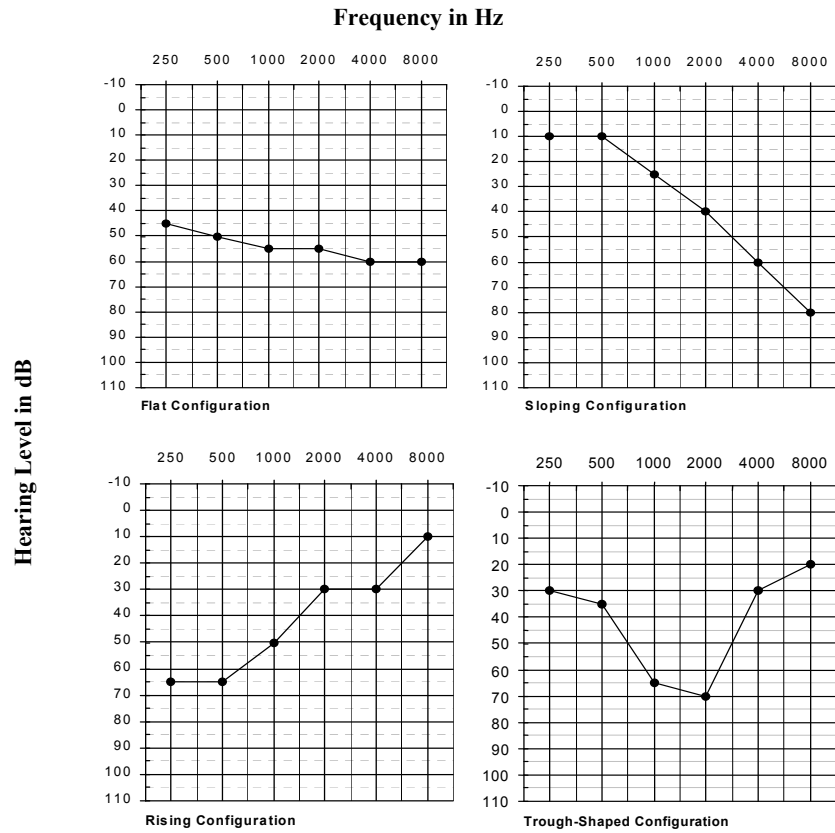
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An audiogram shows the configuration of the hearing loss (the frequencies at which the hearing loss is demonstrated). Configuration of the hearing loss refers broadly to the general shape of hearing thresholds as plotted on the audiogram (Figure 3, page 17). A typical audiogram shows the hearing level for each ear for both air-conducted and bone-conducted signals at the tested frequencies.

Figure 3: Examples of Hearing Loss Configurations



There are four general configurations of hearing loss:

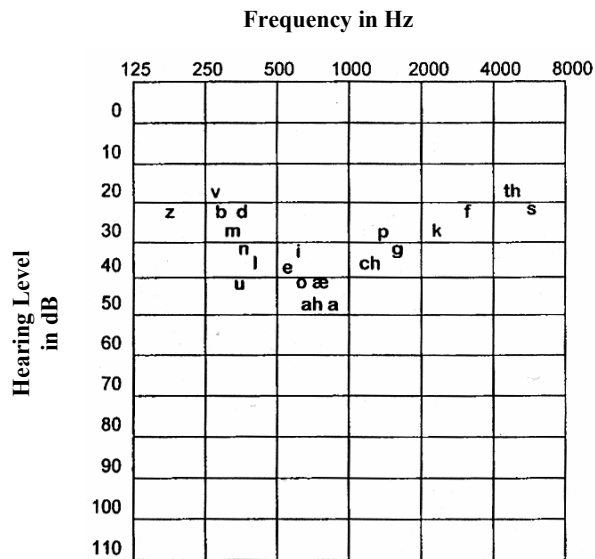
1. *Flat*--thresholds essentially equal across test frequencies;
2. *Sloping*--better (lower) thresholds in low-frequency regions and poorer (higher) thresholds in high-frequency regions;
3. *Rising*--poorer thresholds in low-frequency regions and better thresholds in higher-frequency regions; and

4. *Trough-shaped* (“cookie-bite” or “U” shaped)--greatest hearing loss in the mid-frequency range with better thresholds in low- and high-frequency regions.

*Degrees of hearing loss*

In addition to the audiogram that depicts a child’s hearing level at various frequencies, 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 4). 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 4: Example of Speech Sounds Audiogram**



*Adapted from: Stach 1998*



For children, the definition of hearing loss is more stringent than that used for adults. Adults who heard normally and then acquired hearing loss later 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 develop spoken language in a typical manner.

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

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

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:

- **Conductive hearing loss**--Results from problems in the outer and/or middle ear, creating a diminished efficiency with which the sound is conducted to the inner ear.
  - 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.
  - The bone conduction thresholds are also impaired
  - The hearing loss can range from borderline to profound
  - Some frequencies may show a greater loss than do others
- **Neural hearing loss**--Results when neural impulses are not able to reach the brain in a normal manner. Neural hearing loss may be the result of problems in the auditory nerve, the brainstem, or the central auditory pathway.
- **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 (OME). The conductive hearing loss compounds the sensory hearing loss, increasing the child's overall 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. Hearing sensitivity and physiologic tests (Table 1, page 23), such as otoacoustic emissions (OAE) and auditory brainstem response (ABR), are normal in children with a central auditory disorder.

The term *sensorineural* hearing loss is still widely used as a general term for permanent hearing loss that may involve either or both the sensory or neural pathways. Until recently, it was difficult to differentiate among auditory disorders using existing audiologic tests. Today, some assessment methods allow the differentiation of sensory hearing loss (inner ear) from other auditory disorders that affect the auditory nerve, auditory brainstem, or higher auditory areas of the brain.

Because of the availability of new assessment methods, new auditory disorders such as *auditory neuropathy* (also called auditory dys-synchrony) are being identified. The disorder is characterized by the presence of normal OAE, abnormal or absent ABR, and poor speech understanding that is inconsistent with the behavioral audiogram (which may vary from normal hearing to profound hearing loss). Although not yet clearly understood, the disorder is thought to affect the transmission of information between the inner hair cells of the cochlea and the auditory nerve, or may be attributable to a disorder of the auditory nerve itself. Currently, treatment options have not been well-defined (Joint Committee on Infant Hearing [JCIH 2000]).

### *Causes of hearing loss*

Although there are many causes of conductive hearing loss, the most common cause in infants and young children is fluid in the middle ear or otitis media with effusion (OME). OME is usually 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. OME may persist within the middle ear space without any signs (such as fever or discomfort) for weeks or months.

Conductive hearing loss is the most common consequence of OME. Some young children have frequent episodes of middle ear infection. Chronic otitis media may result in rupturing of the tympanic membrane (eardrum). The repeated rupturing and healing of the tympanic membrane can lead to scar tissue on the eardrum resulting in conductive 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 49; Chapter IV, page 164).

Approximately 90% of all children who are deaf are born to hearing parents (Carney 1998), and only approximately 10% of children who are deaf are born into families with one or more parents with hearing loss.

### **HOW COMMON IS CHILDHOOD HEARING LOSS?**

Approximately 1 in every 1,000 infants is born with early-onset, severe-to-profound sensorineural hearing loss (Calderon 1997, Carney, 1998, NIH 1993, Northern 1991). Milder degrees of hearing loss may be as prevalent as 6 in every 1,000 young children (Carney 1998, Matkin 1984).

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 (Dalzell 2000).

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 surveyed between birth and 18 years of age had a severe or profound hearing loss (Holden-Pitt 1998).

### **WHAT ARE THE RISK INDICATORS FOR CHILDHOOD HEARING LOSS?**

On the basis of recent epidemiological studies, the Joint Committee on Infant Hearing (JCIH 2000) has identified certain risk indicators associated with infant and childhood hearing loss (Table 3, page 49). 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 identifying children with risk indicators for possible hearing loss and then formally testing only those infants with one or more of these indicators. However, using this approach, many infants and young children with hearing loss were not detected until they were older. Sometimes, parental concerns about the child's hearing led to audiologic testing. Sometimes, health care professionals or early childhood professionals noticed behaviors that heightened suspicion that the infant or young child might have a hearing loss. Often, suspicion did not arise until the child demonstrated delays or disorders in the acquisition 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 screening of all babies for hearing loss. Screening programs identify newborns that might have a hearing problem. Those who do not pass the newborn screening test are referred for further audiological follow-up.

Although many babies who are referred for further assessment will turn out to have normal hearing at the follow-up testing, implementation of universal newborn screening procedures results in increased early detection of those infants who do have congenital or early-onset hearing losses.

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

**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, in general, 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 moderately 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.

**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.

**Table 1: Components of a Comprehensive Hearing Assessment**

- *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 giving social praise.

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

**Table 2: Potential Impact of Childhood Hearing Loss**

<b>Hearing Loss/dB Range</b>	<b>Effect on Hearing and Speech</b>
<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

**Table 2: Potential Impact of Childhood Hearing Loss**

Hearing Loss/dB Range	Effect on Hearing and Speech
<i>Profound/&gt; 90 dB HL</i>	<p>hearing as the primary route to develop spoken language if they are provided with hearing aids, good early intervention, and continued special training.</p> <p>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.</p>

*(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). 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 (Bachmann 1998, Buttross 1995, Calderon 1997, Carney 1998).

Although the degree, type, and configuration of the hearing loss can all influence the impact of the hearing loss on a child’s development, the age at which the loss is acquired is also important. Some children are born with hearing loss, whereas 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.

## 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. There are many different types of hearing aids, which vary considerably in style, circuitry, signal processing, number of channels, and memory. There is a wide range in cost, flexibility, ease of use, and durability. Other assistive devices include tactile aids and FM 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 to stimulate the auditory nerve.

A primary focus of early intervention for children with hearing loss is to promote their communicative competence (Carney 1998, JCIH 2000). Different communication approaches vary in the degree to which they rely on audition and/or vision along an auditory-visual continuum.

- **Auditory approaches:** *Auditory-Verbal* approaches emphasize that hearing is essential for developing spoken language. *Auditory-Oral* approaches also emphasize the role of hearing with the goal of developing spoken language but may add supplementary visual information from spoken language.
- **Combination approaches using vision to support English:** *Cued Speech* supplements spoken language visually through the use of eight handshapes to represent the consonants of speech and four different hand locations near the face and neck to represent the vowels. *Total Communication (TC)* approaches use signs, speech, hearing, and gestures to convey the message using English grammar. *Simultaneous Communication (SimCom)* is the simultaneous use of signs that systematically represent English and speech.
- **Visual approaches using American Sign Language (ASL):** ASL is the language used in the Deaf community. ASL is a complete language (totally different from English) that has no written or spoken form. *Bilingual* approaches use ASL as the primary language, and the child learns English as a second language. *Bilingual-Bicultural (Bi-Bi)* approaches use ASL as the primary language with English as a second language and also incorporate instruction in Deaf culture.



Regardless of the communication approach that is chosen, parental involvement in the communication intervention is an important determinant of its success in promoting the communicative abilities of the child (Reamy 1999).

### **CONSIDERATIONS FOR CHILDREN WITH COEXISTING 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. However, many of the guideline recommendations for identifying, assessing, and developing intervention strategies generally apply to all children with hearing loss, regardless of other associated conditions. As is emphasized throughout the guideline, the specific approach for any child should be individualized to the needs of the child and family.

#### *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.

#### *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. To be diagnosed with autism, young children must show three core areas of impairment: social interactions, communication, and behavior (NYSDOH 1999, Autism/PDD).

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 the intensive behavioral 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 a hearing loss, the child should be evaluated for this problem.

### **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 otolaryngology (ear, nose, and throat). Otolaryngologists must complete specialty training after medical school. Otolaryngologists specialize in the diagnosis and medical management of disorders of the ears, nose, throat, and head and neck.

**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 with voice, speech, language, or swallowing disorders, including individuals with a 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 awareness/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**

## IDENTIFICATION AND ASSESSMENT OF YOUNG CHILDREN WITH HEARING LOSS

Hearing is the process that occurs when stimuli (sounds) are received through the ear and transmitted to the brain. Hearing loss is defined as a diminished ability to detect, recognize, discriminate, perceive, and/or comprehend auditory information. Some types of hearing loss may be correctable with medical intervention such as surgery. Other types of hearing loss may be improved only by the use of assistive technology such as hearing aids.

Because hearing plays an important role in many aspects of a child's early development, identification of hearing loss in young children is especially important. Childhood hearing loss, however, is usually difficult to detect by observation alone (Anteunis 1999, Johnson 1990).

### *Evaluating the accuracy of identification and assessment methods*

In this guideline, an identification 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, identification and assessment methods include both standardized and nonstandardized tests (often based on history, direct observations, and/or physical findings), as well as the use of sophisticated technology (such as otoacoustic emissions).

An ideal identification or assessment method would be inexpensive, simple to administer, and highly accurate in differentiating children with a particular condition from those who do not have the condition. Routine general screening, as is usually performed for most infants and young children, can be effective for identifying some hearing problems, but there is no effective observational screening method that accurately identifies all young children with hearing loss.

The accuracy of a particular identification or assessment method can be defined by determining its sensitivity and specificity (Appendix A, Table A-3, page 173).

- The **sensitivity** of a test (or method) is the percentage of all persons with the condition who have a positive test correctly identifying the condition (the true positive rate). A method with a high sensitivity does a good job identifying persons who have the condition. The higher the sensitivity of a method, the lower the false negative rate.
- The **specificity** of a test (or method) is the percentage of all persons who do not have the condition who have negative test results (the true negative rate). A method with a high specificity does a good job identifying persons

who do not have the condition. The higher the specificity of a method, the lower the false positive rate.

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*Topics included in this chapter*

- General Approach for Identification and Assessment
  - Identifying and Assessing Infants and Young Children With Hearing Loss
  - Assessment for Amplification
  - Medical Assessment of Young Children With Hearing Loss
  - Developmental Assessment for Young Children With Hearing Loss
  - Considerations for Working With the Family
- 

**GENERAL APPROACH FOR IDENTIFICATION AND ASSESSMENT**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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In identifying and assessing young children with suspected or confirmed hearing loss, there are some general principles that can be applied. Many of these general principles are not unique to young children with hearing loss but may be applied within a larger general model for assessment and intervention for all young children with developmental disabilities.

This section provides general recommendations related to identifying and assessing young children with hearing loss.

*Basis for the recommendations in this section*

The recommendations in this section about the general approach for identification and assessment of young children with hearing loss are based primarily on consensus panel opinion. Most of the recommendations in the general approach section address topics for which no literature meeting the criteria for evidence was found or for which the literature was not specifically reviewed as a focus of this guideline. In the panel's opinion, these recommendations reflect appropriate practices for identifying and assessing children with hearing loss and are generally consistent with the current knowledge in this field. Some of the recommendations are based on information

from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence.

**Recommendations (General Considerations for Identification and Assessment)**

*Importance of understanding about hearing loss*

1. It is important for health care professionals and early childhood professionals to understand the typical risk factors and clinical clues (Table 3, page 49; Table 5, page 51) of possible hearing loss in young children in order to:
  - Facilitate recognition of potential hearing problems
  - Make appropriate observations about the child’s development
  - Give accurate information in language that the parents and family understand
  - Assist in making appropriate referrals
  - Facilitate appropriate intervention strategies [D2]

*Importance of early identification and intervention*

2. 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 may promote better long-term functional outcomes.

*[C](Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B)*

*Identifying initial concerns about possible hearing loss*

3. It is important to recognize that there are several ways children with hearing loss are first identified. These may include identification as the result of:
  - A newborn hearing screening program or direct screening of hearing
  - Knowledge of risk factors such as family history or hereditary hearing loss concerns, prematurity, or perinatal problems (Table 3, page 49)
  - A parent’s or professional’s concern about the child’s hearing or some other aspect of the child’s development
  - A health care provider’s or other professional’s concern about possible hearing loss at the time of a periodic health exam or when the child is being evaluated for some other health or developmental concern [D2]



*The assessment process*

4. It is important that assessment be viewed as an ongoing process that follows the child over time rather than as a single event. [D2]
5. It is important to recognize that any screening or assessment test gives information only at one point in time. [D2]
6. When assessing young children, it is important for those assessing the child to understand the whole child and to take into consideration any factors that may have an impact on the child's performance during the assessment process, including the child's overall health status and current environmental influences. [D2]
7. It is important for the assessment materials and strategies to be developmentally appropriate for the child. [D2]
8. It is recommended that the setting in which the assessment is performed be appropriate to the developmental stage of the child and be comfortable for both parent and child. The following are important environmental considerations:
  - The child's schedule
  - Providing an enjoyable, engaging, and positive experience
  - A nondistracting, quiet environment
  - Having a parent or caregiver present
  - Accommodations for the family's cultural values, including language [D2]


*The importance of family involvement*

9. It is important to recognize that the parents are the primary caregivers for the child and for them to be involved in the assessment process, not just as team members, but as the primary decision makers for their child. [D2]
10. It is important to recognize that assessment is a joint process between parents and professionals in which parents' feedback during interviews and the parents' assessment of their relationship with their child are used. [D2]

*Considering the cultural and family context*

11. A child's life is embedded within a cultural and family context. A family's way of living is influenced by many factors, including ethnic and cultural roots and the family's values and beliefs. When working with children and families, it is essential to consider:

- The family’s culture
  - Parent priorities, goals for their child, and parenting styles
  - Family support systems [D2]
12. In evaluating children with hearing loss, it is important to recognize that there may be cultural and familial differences in expectations about such things as play and social interaction, social use of language (pragmatics), and eye contact. Cultural values are also an important consideration as they relate to the development of adaptive or self-help skills and independence. [D2]
13. If spoken English is not the family’s primary language, it is important for professionals to look for ways to communicate effectively with the family and the child, including finding professionals and/or translators/interpreters who speak or sign the primary language of the child and the family. [D2]



**Early Intervention Policy** ❖ The multidisciplinary evaluation must be conducted in the child’s dominant language whenever possible. Parents must have an opportunity to discuss the evaluation results with the evaluator or a designated contact. To the extent feasible and considering the parent’s preference and consent regarding disclosure to the interpreter, the written and oral summary shall be provided in the dominant language of the parents.

*Hearing culture of the family*

14. 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. [D2]

*What professionals need to know about hearing loss*

15. 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
- General information about 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 [D2]

*Important professional characteristics*

16. It is recommended that all 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 technology. It is important that professionals assessing young children:
- Have a solid understanding of typical newborn and early child development
  - Have a solid understanding of atypical patterns of development
  - Be able to recognize the clinical clues of possible hearing loss in young children (Table 5, page 51)
  - Understand the importance of observation and also the limitations of observation
  - Understand the importance of being sensitive to the parents and know how to work within their comfort zone
  - Have well-developed active listening skills
  - Be familiar with using the assessment tools so that the focus can be on the infant/child and his or her caregiver(s), not on the assessment tool
  - Understand the importance of the multidisciplinary approach [D2]

**IDENTIFYING AND ASSESSING INFANTS AND YOUNG CHILDREN WITH HEARING LOSS**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section provides general recommendations related to identifying and assessing young children with hearing loss. Topics include:

- Newborn Hearing Screening
- Risk Factors, Clinical Clues, and Developmental Surveillance
- Screening for Hearing Loss in Infants and Young Children

*Identification and Assessment*

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 49) 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 voice or sound (Table 5, page 51) or because of lack of progress in the child’s communication milestones (Table 4, page 50). Sometimes, hearing loss is not suspected until a delay in speech and language development is recognized.

*Procedures used to identify and assess hearing loss*

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

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

Physiologic tests do not measure how well or what a child is able to hear; they are tests of the integrity of the various parts of the auditory system and help to indicate where an auditory problem may be located. Because physiologic tests do not require voluntary responses from the child, they are frequently considered “objective” measures of auditory function. Physiologic tests include:

- Acoustic responses recorded from sensory hair cells in the inner ear (otoacoustic emissions)
- Electrophysiologic responses (micro-volt electrical activity from the auditory nerve and brainstem, such as the auditory brainstem response)
- Middle ear function measurement (tympanometry)
- Acoustic middle ear muscle reflex measurement

Behavioral measures are considered the only means of determining the child's functional use of hearing. Hearing means the ability to detect, discriminate, identify, and comprehend sounds. Behavioral tests are used to determine what and how well a child hears (threshold sensitivity) at various frequencies important for the detection of speech sounds. Plotting the child's responses results in a graph referred to as an audiogram (Figure 2, page 16). The audiogram is a "picture" of what the child hears (detects, discriminates, identifies, and comprehends).

In addition, behavioral hearing tests are used to determine how well children are developing their abilities to discriminate, identify, and comprehend sounds in their environment and, in particular, spoken language (speech detection, reception, and recognition abilities). Specific behavioral tests to measure hearing differ depending on the developmental age of the child.

Because there is a demonstrated relationship between some physiologic measures and behavioral threshold sensitivity, some physiologic tests are considered to be surrogates for a hearing test. Using physiologic tests as a proxy for determining the child's hearing ability is important when the child is too young (neonates and very young infants) or is unable to provide reliable behavioral responses. In some cases, however, there may be a discrepancy between the physiologic test result and the behavioral test result. Therefore, a battery of tests that includes both physiologic and behavioral measures is needed for a comprehensive assessment of hearing in infants and young children.

*Basis for the recommendations in this section*

The recommendations about identifying and assessing young children with hearing loss are based on a combination of conclusions drawn from the articles meeting the criteria for evidence and consensus panel opinion. The consensus recommendations address topics for which no literature meeting the criteria for evidence was found or for which the literature was not specifically reviewed as a focus of this guideline. Some of the recommendations are based on information

from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence.

### **Newborn 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. 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).

Children who do not pass the 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. A full audiologic assessment requires multiple tests of auditory function. Because clinical decision making is required, trained and experienced professionals are needed to administer and interpret the audiologic test results. Audiologic assessment is also used to plan audiologic follow-up, provide information for the medical diagnosis, and serve as the basis for early intervention strategies and options.

#### *Universal newborn hearing screening programs*

Much work has been accomplished developing programs that screen hearing in newborns. Universal newborn hearing screening programs are now in place in the majority of states. These programs are designed to identify newborns at risk for specifically defined hearing loss that interferes with development.

Universal newborn hearing screening programs include all newborns, not only those in the neonatal intensive care unit (NICU). The Joint Committee on Infant Hearing Year 2000 Position Statement (JCIH 2000) has broadly defined the targeted hearing loss for newborn hearing screening programs as a hearing loss that:

- Is permanent (bilateral or unilateral and either sensory or conductive)
- Averages 30 to 40 dB or more in the frequency region important for speech recognition (approximately 500 HZ through 4,000 Hz)

The two types of technology currently being used in most newborn hearing screening programs are otoacoustic emissions (OAE) and the auditory brainstem response (ABR), which are described in greater detail in this chapter (page 59). Both of these screening technologies involve noninvasive recordings of physiologic responses (acoustic responses of the inner ear for OAE and neural

activity in the auditory nerve and brainstem for the ABR). Both technologies are now available in portable, automated devices that can be used to determine a pass/refer outcome for each infant and therefore can be used for screening purposes.

During newborn screening, common middle and external ear conditions in the newborn period may influence the screening result. For example, debris in the external ear canal as a result of the birthing process can cause an infant with normal hearing not to pass the hearing screening (a false positive result). Although the ear usually clears rapidly (usually at 48 hours after birth), many babies in a hospital well-baby population go home before the ear has a chance to naturally clear. Often when the hearing screening includes placement of an ear tip in the ear canal, debris will be removed when the ear tip is removed. When the infant is retested after the debris is no longer present, the infant often passes screening (Maxon 1995, Doyle 1997). The same is true for the presence of transient fluid within the middle ear. Particularly in NICU infants, hearing screening may occur when there is fluid in the middle ear. This may result in a “refer” outcome, particularly when OAE technology is used to screen hearing (Doyle 1997).

Results from the New York State Universal Newborn Hearing Screening Demonstration Project (Prieve, et al., 2000) showed that when hearing screening was performed prior to discharge, more than 70% of infants who failed the hearing screening returned for follow-up as outpatients. Of the infants who did not receive newborn hearing screening prior to discharge, only 31% returned to have the screening after discharge.

***New York State Newborn Hearing Screening Program Note:*** *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.*

*New York State Newborn Hearing Screening regulations are provided in Appendix E.*

### **Recommendations (Newborn Hearing Screening)**

#### *Importance of newborn hearing screening*

1. It is recommended that all newborns (both well baby and NICU babies) have their hearing screened using a physiologic test before being discharged from the hospital. Early identification of hearing loss is important because

of the role of hearing and communication in the overall early development of the child.

[B] (Apostolopolous 1999, Kennedy 1999/Wessex 1998, Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B)

2. For those who do not have access to hospital screening or are not born in a hospital, it is recommended that hearing be screened by one month of age. [D1]

*Components of a newborn hearing screening program*

3. It is recommended that a newborn hearing screening program include the following components:
  - Infant hearing screening with an objective physiologic test before discharge from the birthing facility
  - Communication of screening results to parents
  - Provision of written educational materials
  - Follow-up for repeat infant hearing screening or provision of referrals to obtain follow-up screening on an outpatient basis for infants who do not pass inpatient hearing screening
  - Referral of infants who do not pass screening for appropriate evaluation and early intervention services
  - Documenting screening results and developing data systems to follow up on infants who do not pass newborn screening
  - Establishing quality assurance programs to evaluate the effectiveness of newborn screening and to ensure that all infants are screened for hearing loss [D2]

*General considerations for newborn hearing screening*

4. It is recommended that newborn hearing screening be conducted:
  - In a quiet test environment (which may mean moving the infant to a quiet room off of the nursery or testing within an enclosure such as a nonfunctioning isolette)
  - When the infant is asleep
  - When the infant is not attached to monitoring devices [D1]
5. To reduce the likelihood of a false positive result, it is recommended that for infants who do not pass the screening, rescreening occur immediately after the ear tip is cleaned if debris from the canal is observed on the ear tip of the screening device



***New York State Newborn Hearing Screening Program Note:*** *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.*

6. It is recommended that hearing screening for infants in the NICU be performed as part of the interdisciplinary discharge plan. This is important because if an infant had an earlier screen, the infant's hearing status may have changed by the time of discharge. [D2]
7. It is important to recognize that some babies who are very premature or who have had a neurological injury may show improvement in physiologic test results with maturation (referred to as a maturation effect).

*[C] (Chen 1996)*

*Considerations for specific screening technologies*

8. It is important to recognize that:
  - Otoacoustic emissions (OAE) and auditory brainstem response (ABR) can be equally effective in identifying babies with moderate to profound sensorineural hearing loss
  - ABR tends to be more effective than OAE in identifying moderate hearing loss at 1 kHz
  - OAE and ABR have a low sensitivity for identifying mild hearing loss
  - Babies can pass screening with either OAE or ABR or both and still have sensorineural hearing loss

*[B] (Norton 2000)*

9. It is important to recognize that in order to detect certain conditions of the auditory nerve or brainstem, the use of ABR technology is necessary. [D2]

*Informing parents about newborn hearing screening*

10. It is important to provide the parents with written information about newborn hearing screening, communication hearing milestones, and the importance of follow-up. [D2]
11. It is important for the parents to understand that:
  - The purpose of screening is to identify children who may need further testing from children who are unlikely to have a hearing loss
  - A screening is not an assessment of hearing, and if a child does not pass a hearing screening, an audiologic evaluation is needed to determine if there is a hearing loss [D2]

*Informing parents about hearing screening results*

12. It is important that the parents be informed about their infant's hearing screening results before the infant is discharged from the birthing facility. [D2]

*Infants who pass newborn hearing screening*

13. Even if an infant passes a newborn hearing screening, it is recommended that parents and the health care provider continue to monitor the child's attainment of communication milestones as part of 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 the screening may not have a hearing loss
  - A hearing loss can develop after birth (delayed onset or progressive undetected hearing loss)  
*[B] (Norton 2000)*
14. If a child passes the newborn hearing screening but has risk factors for hearing loss (Table 3, page 49), it is important to consider the need for periodic audiologic monitoring of the child's hearing. [D2]

*Infants who do not pass newborn hearing screening*

15. In conveying 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. [D2]
16. For newborns who do not pass the initial screening test, it is important to make every effort to rescreen the child before hospital discharge to minimize the referral rate of children with false positive results and also because of the low return rate for follow-up or postdischarge hearing screening. [D1]
17. Appropriate follow-up testing in the hospital might include:
  - Repeating the test using the same technology as the initial test
  - Using ABR if the initial test was an OAE or using an OAE if the initial test was an ABR [D2]

18. If an infant does not pass a physiologic newborn hearing screening (either an OAE, ABR, or both) before hospital discharge, it is important for the parents and professionals to recognize that:
- It is very important for the child to have follow-up physiologic testing, and that an appointment for the follow-up test be made and documented in the infant’s medical record
  - The follow-up testing might be another physiologic screening test or a more comprehensive audiologic evaluation [D2]

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

*Documentation and tracking*

19. It is important to document the results of hearing screening in each infant’s medical record and also in the discharge summary. [D2]
20. Because of the large numbers of infants screened at many birthing facilities, it is important to develop and maintain a data tracking system to ensure that:
- All newborns are screened for hearing loss
  - There is efficient follow-up of infants who do not pass the initial screening or who do not receive inpatient screening [D2]

**Risk Factors, Clinical Clues, and Developmental Surveillance**

Even with the advent of statewide programs in most states, including New York, to screen all newborns for their hearing status, identification of hearing loss will not occur until after the newborn period for some infants and young children. There are several reasons why some infants with hearing loss will not be identified during the newborn period, including:

- A universal newborn hearing screening program is not available
- Screening procedures are not 100% accurate in identifying all newborns with hearing loss, particularly if the loss is:
  - Mild in degree (25-40 dB HL) or of an unusual configuration
  - Related to an auditory nerve or brainstem disorder and OAEs were used to screen hearing

- Related to a central (cortical) auditory disorder which current screening technology is not able to detect
- Not all hearing loss is present at birth:
  - Some hearing loss has a delayed onset or is acquired later in childhood
  - Some hearing loss is fluctuating and/or progressive

If there are no indications of a current hearing problem as a result of the 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 with hearing loss are identified because they have specific *risk factors* for having or developing a hearing problem, or because they have certain *clinical clues* that are observed by parents or by early childhood or health care professionals.

### *Risk factors*

A *risk factor* is something that increases the possibility that the child will have a hearing loss. The Joint Committee on Infant Hearing (JCIH 2000) has identified several risk factors as being associated with infant and childhood hearing loss (Table 3, page 49).

Before the adoption of universal newborn hearing screening programs, identification of risk factors was the primary indicator used to trigger the need for screening very young children for hearing loss. However, screening only those newborns who are considered at risk identifies only approximately 50% of infants with hearing loss (Cone-Wesson 2000, Fortnum 1997, JCIH 2000, Norton 2000A, Vohr 2000). Therefore, hearing screening on the basis of risk factors alone is not adequate to assure appropriate identification of newborns with a hearing loss (Friedland 1996).

The recognition of a risk factor provides only 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, health care professional, or early childhood professional notices behaviors or signs that heighten concern about the child's hearing status. Indicators that heighten concerns about a possible hearing loss are referred to in this guideline as *clinical clues*. For example, the parents may notice that their infant does not pay attention to sound or may have an inconsistent response to sound.

Many of the clinical clues for hearing loss are related to delays in speech and language development. Normal language milestones (Table 4, page 50) are specific communication behaviors grouped according to the age range when they usually first appear in typically developing children. Although there is some normal variation, they usually develop during the approximate age range specified.

In general, the age at which a behavior or the absence of a behavior starts to become a concern corresponds to the upper limit of the range when this behavior usually first appears in typically developing children. 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 51).

#### *Developmental surveillance for hearing loss*

Developmental surveillance is a term used to describe the approach practiced by health care providers for the early detection of a variety of developmental problems. It is a flexible, continuous process in which knowledgeable professionals monitor a child’s developmental status during the early childhood years. Surveillance for hearing loss in infants and young children is usually conducted as a component of general developmental surveillance beginning at birth. The process of general developmental surveillance includes eliciting and attending to the parents’ concerns, obtaining a relevant developmental history, and observation.

In states that have implemented newborn hearing screening programs, surveillance for hearing loss may begin with an objective test of auditory function. When a newborn screening test is not performed, surveillance for hearing loss becomes part of the broader and more general health and developmental surveillance. Similarly, when a newborn passes a newborn hearing screening, ongoing monitoring for hearing problems then becomes part of a more general surveillance for health and developmental problems. For most young children (from birth to 3 years of age), ongoing surveillance for hearing loss does not include any objective tests of auditory function unless there is a reason to suspect a possible hearing loss. Some children with significant risk factors receive audiologic monitoring.

Surveillance for hearing problems usually includes:

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

### **Recommendations (Risk Factors, Clinical Clues, and Developmental Surveillance)**

#### *Importance of identifying risk factors and clinical clues for hearing loss*

1. It is important to recognize that risk factors and clinical clues 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 known risk factors.

*[B] (Eilers 1994, Smith 1992, Watkin 1991)*

#### *Importance of general surveillance for hearing loss*

2. It is important to recognize that both episodic and permanent mild to moderate hearing loss may be difficult for the parents, health care providers, and other professionals to detect. Detection of hearing loss may be difficult 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 [D2]

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

1. Admission to a neonatal intensive care unit (NICU) 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*

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**Table 4: Communication Developmental Milestones**

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**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," "mamama")
- 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

**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")



**Table 4: Communication Developmental Milestones**

- 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 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

**Table 5: Clinical Clues of Possible Hearing Loss**

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- Does not spontaneously produce single words to convey meaning
- Limited comprehension vocabulary (understands fewer than 50 words or phrases without gesture or context clues)
- Limited production vocabulary (speaks fewer 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 fewer than 50 words)
- 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)*

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*The importance of listening to parental concerns*

3. It is important that health care providers ask questions at each health care visit to elicit information about indicators of possible hearing loss (such as speech/language development) or risk factors for possible hearing loss (such as ear infections). It is important to ask concrete questions such as the following:
  - 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?

- Do you get a response when you address your child directly? Does your child respond to sound as you would expect?
- Does your child understand you when you speak softly and are out of visual range (that is, without seeing your face and/or use of gestures)?
- Has your child had 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?

[B] (Anteunis 1999, Hammond 1997, Newton 1999)

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


[B] (Anteunis 1999, Hammond 1997, Newton 1999)

5. 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 the parents to identify children with milder losses. Mild to moderate loss may be especially difficult to detect by observation.

[B] (Anteunis 1999)

*Follow-up for risk factors for hearing loss*

6. If a child has risk factors (Table 3) for hearing loss, it is important to consider the need for periodic audiologic monitoring of the child’s hearing. [D2]
7. If there are indications that a child is at significant risk for a hearing loss, it is important for the physician to communicate this information to the parents and make a referral for an appropriate hearing assessment. [D2]
8. It is recommended that all children with an identified speech/language delay receive an audiologic assessment. [D2]



**Early Intervention Policy** ❖ Health care services, including medical evaluations and tests that are routinely needed by all children and not related to the determination of a child’s eligibility for the Early Intervention Program (EIP), are not reimbursable under the EIP 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.

### *Identification and follow-up of otitis media with effusion*

9. It may be difficult to accurately detect acute otitis media (AOM) or otitis media with effusion (OME) in some children. Therefore, it is important that routine health and developmental surveillance include specific methods for identifying these conditions. [D2]
10. It is recommended that all children with repeated episodes of otitis media with effusion (OME) have audiologic evaluations to determine if there is any fluctuating hearing loss associated with the OME and to rule out sensorineural hearing loss. [D2]
11. It is important to remember that persistent OME is a fluctuating, dynamic process. Therefore, regular medical evaluation and multiple audiologic evaluations may be needed. [D2]
12. It is important to conduct an audiologic evaluation in young children with recurrent persistent OME, and it is important not to put off a hearing test just because of fluid in the ear. This is important because:
  - Delayed testing due to OME is one of the reasons for late identification of sensorineural hearing loss
  - Up to 50% of children with recurrent, persistent OME have a conductive hearing loss

*[C] (MRC 1999)*
13. It is important to consider the impact of fluctuating hearing loss due to OME on a child's communication (speech/language) development. Persistent fluctuating loss may delay language or affect development of language skills. [D2]
14. When persistent OME is treated by myringotomy and the placement of ventilating tubes, it is important to perform another hearing test after placement of the tubes. There may still be a hearing loss because either the effusion has not cleared or there is an undiagnosed sensorineural hearing loss. [D2]

### *Infants treated with extracorporeal membrane oxygenation*

15. It is important to recognize that although the use of extracorporeal membrane oxygenation (ECMO) for premature newborns is a risk factor for hearing loss, there can be numerous reasons for ECMO, and studies have not yet separated the use of ECMO from the underlying etiology of hearing loss. It is important to conduct audiologic follow-up of ECMO-treated infants regardless of their ABR findings in the NICU.

*[B] (Desai 1997)*

### **Screening for Hearing Loss in Infants and Young Children**

In addition to the newborn hearing screening programs recently implemented in most states, screening to identify possible hearing loss in infants and 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 a concern about the child's hearing.

Hearing screening as used in this context is intended to provide a relatively quick and preliminary "yes" or "no" decision that a child either may have or does not appear to have a hearing loss. The technology used to conduct the screening leads to either a "pass" or a "refer" result, and clinical decision making is not required.

Although the same basic technology is used for both hearing screening and for more comprehensive audiologic assessment, the devices used for hearing screening are much more portable than those used for comprehensive audiologic assessment. They provide only a "pass/refer" outcome and can be operated by technicians with less training and experience. As technology improves and new objective physiologic screening devices become more widely available for use by primary care providers and other professionals, general hearing screening programs to identify hearing loss in young children beyond the newborn period will likely increase.

The tests used to conduct a hearing screening may include physiologic procedures such as otoacoustic emissions (OAE), auditory brainstem response (ABR), and/or tympanometry. For some older infants and children, hearing screening might involve conditioned behavioral response procedures such as visual reinforcement audiometry or conditioned play audiometry depending on the child's age. When the procedures are being used for screening rather than for audiologic assessment, a limited range of sounds is presented, usually at a few fixed intensities (for example, only 20 or 25 dB) and only at a few frequencies most important to speech.

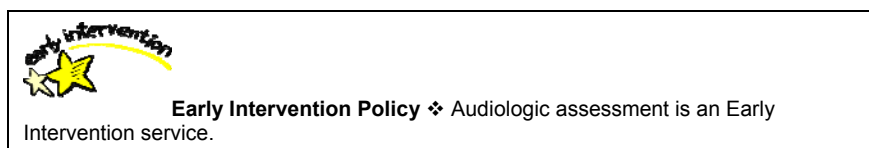
When a hearing screening determines that a young child may have a hearing loss, the child is then referred for more comprehensive audiologic assessment to confirm the hearing loss and to determine the type, degree, and configuration of the loss.

Audiologic assessment tests and procedures are described beginning on page 58.

**Recommendations (Screening for Hearing Loss)**

*General considerations for hearing screening*

1. It is important to recognize that 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. A hearing screening does not confirm that a child does or does not have a hearing loss. [D2]
2. 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 possibility of a hearing loss
  - The child’s developmental age
  - The technology available in the testing facility [D2]
3. 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. [D2]



*Physiologic measures to identify infants and young children with hearing loss*

4. It is important to recognize that there are objective physiologic hearing screening devices available that can test otoacoustic emissions (OAE) or electrophysiologic screening technologies, such as the auditory brainstem response (ABR), that can be used for conducting hearing screening in infants and young children. [D2]
5. It is important to recognize that for some automated screening test equipment, the manufacturers set the test parameters, and these may differ from one product to another. Therefore, using different equipment may result in different screening results. [D1]
6. It is important to recognize that the test environment can be an important contributor to successful test completion. Test settings where there is noise in the environment (or electrical interference with the ABR) can result in less accurate screening results. Specifically for both OAE and ABR, noise will reduce the ability to detect a response because the signal to noise ratio

is not as good, and thus the effect of the environment may influence the pass/refer result.

*[C] (Stevens 1990)*

7. When evaluating the efficacy of any physiologic screening measure, it is important to recognize that the sensitivity and specificity of the measure are dependent on the criteria used for defining hearing loss, the criteria used for pass/refer, and the technical procedures involved in the test.

*[B] (Hyde 1990/Hyde 1991, Richardson 1995)*

8. It is likely that there will be rapid advances in both ABR and OAE technologies, and therefore it is important for professionals involved in screening hearing in young children to stay current with advances in the field. [D2]
9. It is important to recognize that portable screening devices that make use of otoacoustic emissions (OAE) and electrophysiologic technologies can be used for screening programs by health care providers as part of routine developmental surveillance. [D2]

*Using behavioral approaches to screen for hearing loss*

10. It is important to recognize that for infants and young children:
  - The use of unconditioned behavioral response approaches (presenting a sound and observing changes in the infant's behavior such as eye shift or cessation of sucking) does not provide sufficient information to be considered a reliable screening method
  - For older infants and children capable of behavioral audiometry testing using visual reinforcement audiometry (VRA) or conditioned play audiometry (CPA), a simplified version of the test might be used for screening purposes (for example, presenting sounds at only 20 or 25 dB HL and only at a few frequencies most important to speech) [D1]

*Inappropriate methods for screening for hearing loss*

11. It is recommended that behavioral observation audiometry (an unconditioned response procedure such as clapping hands or ringing a bell) not be used for screening hearing in infants and young children. Behavioral observation audiometry is unreliable and has a low sensitivity and specificity (too many false negative and false positive findings).

*[C] (Johnson 1990)*


12. Parent report alone is an insufficient method of determining whether or not a hearing loss exists. A parent's concern 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.

[B] (Anteunis 1999, Hammond 1997, Newton 1999)

*Follow-up after screening for hearing loss*

13. 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 determine its type, degree, and configuration. [D1]



**Early Intervention Policy** ❖ Children with suspected hearing loss must be referred to the Early Intervention Program (EIP) for a multidisciplinary evaluation, including an audiologic evaluation to determine whether the child is eligible for the EIP. Hearing loss is a diagnosed condition with a high probability of resulting in developmental delay.

**Audiologic Assessment**

In this guideline, an audiologic assessment 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. An audiologic assessment is intended to further evaluate infants and young children when:

- The child does not pass a hearing screening test (such as through a newborn hearing screening program)
- There is increased suspicion of hearing loss and there are no means of conducting a direct physiologic or behavioral screen of hearing available
- There is sufficient concern about the possibility of a hearing loss (such as 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

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 overall goals of the audiologic assessment include:

- Confirming whether or not a hearing loss is present
- Determining the type, configuration, and severity of the hearing loss
- Providing information useful in the medical examination, whenever possible, of the cause of the hearing loss
- Determining if intervention is needed and aiding in planning intervention strategies and options
- Establishing a baseline for measuring progress and evaluating intervention outcomes

#### *Audiologic assessment methods*

As described at the beginning of this section, 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 (primarily the outer hair cells of the inner ear) as part of the normal hearing process. Hair cells that are functioning properly emit acoustic energy that can be detected and recorded by placing a small probe at the opening of the child's ear canal. The probe contains a microphone attached to a soft ear tip. The microphone delivers test signals into the ear canal that evoke an acoustic response from the hair cells. This response is detected and recorded by a second microphone in the probe. These responses are called evoked otoacoustic emissions (EOAE or, more commonly, OAE).

- When clicks are used as stimuli to evoke the emission, the resultant responses are called transient evoked otoacoustic emissions (TEOAE)
- When two tones of slightly different frequencies are presented simultaneously to evoke the emission, the response is called a distortion product otoacoustic emission (DPOAE)

A possible hearing loss is indicated if there are no OAE detected and recorded. An OAE response is generally not detectable when hearing loss is greater than approximately 30 dB (mild hearing loss). OAE responses are frequency-specific and provide information about the function of sensory hair cells in the mid- and high-frequency regions important for hearing speech.

Because test signals pass through the outer ear canal and the middle ear to the inner ear, and the response must pass back through the middle ear to be detected and recorded, any debris or wax in the ear canal or fluid in the middle ear may prevent the stimulus from being received or the response from being recorded.

***Auditory Brainstem Response (ABR) or Brainstem Auditory Evoked Response (BAER).*** The ABR is a recording of electrophysiologic responses from the auditory nerve and the brainstem. Electrophysiologic responses are elicited by presenting very short repetitive test stimuli (sounds such as clicks or brief tones) through an earphone (air-conduction ABR) or a bone oscillator placed on the skull, usually behind the ear (bone-conduction ABR). Small disc electrodes pasted on the scalp record the responses.

The responses to the test stimuli are averaged by a computer and displayed as waveforms. Three waves (I, III, and V) of the ABR are usually examined to determine the integrity of the auditory pathways. The intensity levels of the test stimuli are lowered in order to determine the lowest intensity level at which the ABR wave V can be recorded reliably. The threshold of ABR wave V has been found to have good correspondence to the hearing threshold as determined using behavioral testing methods.

The click-ABR threshold provides an overall estimate of degree of hearing loss (across the speech range, but primarily for high-frequency regions). When brief tones (tone bursts) are used to elicit the ABR, the response is more frequency-specific and provides information about low- and high-frequency regions important for speech.

***Steady State Evoked Potentials (SSEP).*** Auditory Steady State Evoked Potentials are a variation of ABR. The SSEP technique is a new frequency-specific electrophysiologic response procedure that shows great promise for the objective estimate of hearing sensitivity in infants and young children. Unlike the ABR, the response is elicited (evoked) by steady-state tones (rather than clicks or brief tones) from children while they are in natural or sedated sleep. 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. Variations of the SSEP technique allow hearing thresholds to be estimated for multiple test frequencies (such as 500, 1,000, 2,000 and 4,000 Hz) and in both

ears simultaneously. Hearing thresholds obtained from an SSEP are generally in good agreement with behavioral thresholds in both children with normal hearing as well as in children with hearing loss. While not yet widely available, the technique can be automated for hearing screening and in-depth audiologic assessment purposes.

**Tympanometry.** Tympanometry measures the function of the middle ear system. A probe attached to a soft, plastic ear tip is placed in the ear canal opening. The air pressure is varied in the ear canal from positive to negative pressure while simultaneously recording the sound pressure level of a low-frequency tone. If the eardrum and middle ear system are functioning normally, the sound will be conducted easily through the middle ear. If a middle ear disorder is present (such as fluid behind the ear drum) the sound will be impeded from passing through the middle ear system.

The tympanogram is a pattern that graphically represents the condition of the middle ear. Traditionally, tympanogram patterns have been labeled according to a classification scheme developed to provide general information about middle ear function:

- Type A: normal
- Type B: (flat) consistent with middle ear fluid or eardrum perforation
- Type C: indicative of negative pressure in the middle ear (such as when the child has a cold or the beginning of otitis media)
- Type A<sub>s</sub>: indicative of stiffness of the eardrum or middle ear system
- Type A<sub>d</sub>: possible disruption of middle ear bones

**Acoustic Middle Ear Muscle Reflexes (MEMR).** 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 auditory pathway (cochlea, auditory nerve, and brainstem). The intensity level at which MEMR are recorded also provides information about both hearing status and middle ear function. MEMR are recorded following tympanometry using the same probe tip. MEMR are recorded in both ears, on the same side as the stimulus is presented (ipsilateral MEMR), and by recording with the probe in one ear and stimulating the opposite ear (contralateral MEMR).

### **Behavioral Audiometric Test Procedures**

Behavioral audiometry involves the use of specific test techniques to obtain voluntary response behaviors made to the presentation of calibrated sounds. 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 tests are used to:

- Determine whether or not a child has a hearing loss
- Determine the degree, configuration, and type of the hearing loss if hearing loss does exist
- 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

Behavioral audiometric test methods are selected to be appropriate for the developmental age of the infant and young child. The tests can be divided into two general categories: unconditioned and conditioned response procedures.

### *Unconditioned behavioral response procedures*

- *Behavioral Observation Audiometry (BOA)*. BOA is an unconditioned test method that uses trained personnel to judge whether or not an infant has responded to a sound by observing the infant's motor responses during or after the presentation of the sound. Sounds used traditionally in BOA are mother's voice, environmental sounds, audiometric test signals, and music. Behaviors considered to be responses include eye widening and searching, a decrease or change in sucking activity, limb movements, awakening from light sleep, or a general startle (Moro reflex). The following are limitations when BOA is used for audiometric testing (Wilson 1984):
  - Use of biased personnel who are aware of when the sound is present
  - Numerous behaviors the infant displays used as response indicators
  - Usually ear-specific responses are not obtained because test signals are presented through a loudspeaker in the test room
  - The probability of obtaining a response is dependent on the state of the infant (awake or asleep, quiet or noisy), the nature of the test stimulus (mother's voice versus a band of noise), the level of background noise in the test setting, and agreement among examiners whether or not a response has occurred
  - Infants habituate quickly to test signals

- Infants with normal hearing show wide variability response in making the detection of hearing loss difficult

#### *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. The child is taught (conditioned) to respond to sound. Test sounds used in conditioned test procedures include pure-tones, frequency-modulated tones, and narrow bands of noise, environmental sounds, or speech. Infants younger than 5 to 6 months developmental age are usually not responsive to conditioned test methods.

- *Visual Reinforcement Audiometry (VRA)*. VRA is used to determine threshold sensitivity in infants beginning at approximately 6 months of age (developmental age). A head-turn response 90 degrees to one side is made to the presentation of an audiometric test stimulus. The infant is rewarded through use of a visual reinforcer. Most infants and young children between 5-6 months and approximately 24 months of age can be tested with VRA. Successful VRA testing occurs when:
  - Visual reinforcers, such as lighted and animated toys, appeal to the child
  - Visual reinforcers are kept out of the child's view except during periods of reinforcement at which time they are activated and illuminated
  - More than one reinforcer is available to maintain interest over repeated presentations of the test sounds

An audiogram can be obtained using air-conducted and bone-conducted test signals. The degree, configuration, and type of hearing loss can be determined reliably using the VRA procedure. VRA allows for ear-specific and frequency-specific behavioral audiometric testing. VRA threshold levels obtained from infants and young children are similar to threshold levels obtained from older children and adults. More than one test session is usually needed to obtain a complete audiogram.

#### *Other behavioral test procedures*

- *Conditioned Orienting Reflex (COR) Audiometry*. COR audiometry involves the use of a conditioned response procedure (similar to VRA). COR is usually performed in a test booth with signals delivered through loudspeakers. Unlike VRA, the response made by the infant is a head turn to either the right or left side, depending upon the location of the

loudspeaker through which the sound was presented. The infant is rewarded for turning in the correct direction through use of a visual reinforcer display usually located on top of each loudspeaker. In COR, the infant must perform two tasks: 1) detect the presence of the test signal, and 2) turn toward the correct loudspeaker. Although the signals are presented from loudspeakers to the right and left of the infant, it is not possible to accurately determine hearing thresholds in each ear using COR as it is traditionally practiced. Moreover, threshold estimates may be higher than (not as accurate as) those obtained with VRA in which the infant turns in one direction only, and hearing in each ear is determined using earphones.

- *Conditioned Play Audiometry (CPA)*. CPA is used to determine threshold sensitivity in young children beginning at approximately 2 years of age (developmental age), although some children continue to need VRA procedures up to 36 months. 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. This includes speech sounds (syllables), words, phrases, and sentences. Several test procedures are used for speech audiometry in infants and young children. In infants, the conditioned head-turn response can be used to estimate a speech detection threshold for words or for individual syllables. Young children's speech identification ability is determined at a listening level that is comfortable for the child, well above threshold. Usually, young children are asked to identify body parts (for example, "Where's your nose?") or familiar objects ("ball," "spoon") by pointing to or picking up the object. Older children may be asked to repeat the stimulus words or point to pictures in order to obtain a speech identification score (percent of words or simple sentences identified correctly). This is sometimes referred to as a "speech discrimination score" or "word recognition score." Speech audiometry can be completed in each ear through earphones or through a loudspeaker. The limitation of speech audiometry is that tests of speech identification require that the stimulus items be within the child's receptive vocabulary. Speech audiometry test results can be useful in determining intervention goals, in monitoring auditory skill development, and in examining the functional benefit of the child's hearing aids or other assistive technology.

**Table 6: Methods for Audiologic Assessment**

<b>Physiologic Tests (used at any age)</b>	<b>Description</b>
<i>Otoacoustic Emissions (OAE)</i>	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.
<i>Auditory Brainstem Response (ABR) Audiometry (or Brainstem Auditory Evoked Response [BAER])</i>	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.
<i>Tympanometry</i>	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.
<i>Acoustic Middle Ear Muscle Reflexes (MEMR)</i>	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.
<b>Behavioral Tests</b>	
<i>Behavioral Observation Audiometry (BOA) (Birth-4 months)</i>	Observation of unconditioned responses (such as an eye shift or a general startle) to noisemakers, speech, or calibrated sounds.
<i>Visual Reinforcement Audiometry (VRA) (5-6 to approximately 24 months)</i>	Child is rewarded with an animated or lighted toy for response (head turn) made contingently upon the presentation of calibrated audiometric test signals.
<i>Conditioned Orienting Reflex (COR) Audiometry (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.
<i>Conditioned Play Audiometry (CPA) (approximately 2-5 years)</i>	Child is taught to respond to calibrated audiometric test signals; the behavioral response is a play task.
<i>Speech Audiometry (beginning at 5-6 months)</i>	Assesses the child's ability to detect, discriminate, identify, and comprehend speech.
<i>Adapted from: Gravel 1999</i>	

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

	<b>Advantages</b>	<b>Limitations</b>
<b>Physiologic Tests</b>	<ul style="list-style-type: none"> <li>▪ A behavioral response from the child is not needed.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Examines function of only one portion of the auditory pathway; not tests of hearing.</li> </ul>
<i>Otoacoustic Emissions (OAE)</i>	<ul style="list-style-type: none"> <li>▪ Differentiates cochlear from neural function; sensitive to hearing losses &gt;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.</li> </ul>	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>
<i>Auditory Brainstem Response (ABR) Audiometry</i>	<ul style="list-style-type: none"> <li>▪ 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).</li> </ul>	<ul style="list-style-type: none"> <li>▪ 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).</li> </ul>
<i>Tympanometry</i>	<ul style="list-style-type: none"> <li>▪ Can detect middle ear problems such as fluid in the middle ear.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Does not test hearing, but rather integrity of middle ear.</li> </ul>
<i>Acoustic Middle Ear Muscle Reflexes (MEMR)</i>	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>	<ul style="list-style-type: none"> <li>▪ May not detect mild or moderate hearing loss.</li> </ul>

*Adapted from: Gravel 1999*



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

	<b>Advantages</b>	<b>Limitations</b>
<b>Behavioral Tests</b>	<ul style="list-style-type: none"> <li>▪ Can be used to test hearing.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Require the child’s cooperation, attention, and motivation.</li> </ul>
<i>Behavioral Observation Audiometry (BOA)</i>	<ul style="list-style-type: none"> <li>▪ Provides general information about overall hearing function.</li> </ul>	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>
<i>Visual Reinforcement Audiometry (VRA)</i>	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Requires developmental level of at least 5-6 months or older (must be able to sit, maintain head control, and turn head).</li> </ul>
<i>Conditioned Orienting Reflex Audiometry (COR)</i>	<ul style="list-style-type: none"> <li>▪ Child responds reliably at softer levels (threshold levels) and for longer periods compared to BOA.</li> </ul>	<ul style="list-style-type: none"> <li>▪ 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.</li> </ul>
<i>Conditioned Play Audiometry (CPA)</i>	<ul style="list-style-type: none"> <li>▪ Can detect mild and unilateral hearing loss if earphones are used.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Requires cooperation of child and cognitive skills at approximately 2 years or older.</li> </ul>

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

	<b>Advantages</b>	<b>Limitations</b>
<i>Speech Audiometry</i>	<ul style="list-style-type: none"> <li>▪ Particularly useful for planning intervention and monitoring the development of the child’s abilities to understand speech.</li> <li>▪ The stimulus used is usually appealing to infants.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Determining a speech threshold alone is not a sufficient test of hearing; may miss sloping or rising configurations of hearing loss.</li> </ul>

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

**Recommendations (Audiologic Assessment)**


*General considerations for the audiologic assessment*

1. When hearing loss is suspected in a young child as a result of a hearing screening or due to other concerns about the child’s hearing status, it is recommended that an audiologic assessment be conducted as soon as possible to confirm the existence of the loss and to determine the type, degree, and configuration of the hearing loss, because this will influence intervention strategies. [D2]
2. It is recommended that an audiologic assessment be conducted if:
  - The child fails an objective physiologic hearing screening, or
  - The child has an identified speech/language delay or disorder, or
  - There is significant concern that a child may have a hearing loss (such as multiple clinical clues or known risk factors plus clinical clues), or
  - There is a history of prolonged recurrent OME [D2]
3. 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 [D2]

4. It is recommended that children who have an identified speech/language delay or disorder receive an audiologic assessment rather than a hearing screening. [D2]

*Components of the audiologic assessment*

5. It is recommended that a comprehensive assessment of hearing for infants and young children (from birth to 3 years old) include the following as components of an audiometric test battery (Table 6, page 65):
  - Hearing history
  - Physiologic procedures
  - Behavioral audiometry testing (using a developmentally appropriate response procedure), including measures of speech perception [D2]



**Early Intervention Policy** ❖ For children referred to early intervention on the basis of two failed newborn hearing screenings, the evaluator may make arrangements for an audiological evaluation to determine whether a hearing loss exists and a full multidisciplinary evaluation is warranted.

*Inappropriate methods for audiologic assessment of suspected hearing loss*

6. It is recommended that behavioral observation audiometry (an unconditioned response procedure, such as observing the child’s response to noisemakers or music) not be used as the sole measure for the assessment of hearing in infants and children. It is unreliable and has too many false positive and false negative findings. [D1]
7. 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. [D1]

*Otoacoustic emissions (OAE)*

8. 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, it is important to remember that:
  - The specific degree and configuration of hearing loss cannot be determined based on OAE test results alone
  - The absence of emissions is not specific and does not confirm the presence of permanent hearing loss

- Children with auditory neuropathy (auditory dys-synchrony) may have normal OAE but abnormal ABR
- There may be confounding factors, such as middle ear pathology or environmental noise, that influence the results

[C] (Richardson 1995)

### *Auditory brainstem response (ABR)*

9. Physiologic tests that may require sedation (such as the ABR) are recommended for children whose hearing assessment results are unreliable or inconsistent and whose auditory 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. [D2]
10. It is important to recognize that in order to record a threshold ABR, it is essential for the child to be still. Therefore, sedation may be required for many infants and young children. If sedation is needed for audiologic testing:
  - It is important that this be administered in appropriate facilities and by professionals who are fully trained in handling any adverse responses, including paradoxical reactions to sedation
  - It is important to recognize that for the majority of children, sedation using chloral hydrate may be preferable because it does not depress respiration or interfere with test results [D2]

### *Interpreting the results of the ABR*

11. It is important to recognize that there are several reasons why a child who is later found to have sensorineural hearing loss may have a false-negative (normal) click ABR (either air- or bone-conduction). These reasons include:
  - The child may have a progressive or late-onset hearing loss (hereditary condition, congenital infection, extreme prematurity) or an acquired hearing loss (from head trauma, meningitis, ototoxic medications, etc.)
  - Comparison with the wrong developmental normative values
  - Cutoff level (criteria for normal response) is set too high
  - The child may have an unusual configuration of hearing loss (a click has a very broad spectrum of frequencies, which is useful for neurological testing of the auditory neural pathway, but not for predicting the audiogram)

[B] (Yang 1993)

12. It is important to recognize that there are several reasons why a child who has normal hearing may have a false-positive (abnormal) ABR (either air- or bone-conduction) that suggests sensorineural hearing loss. These reasons include:
- The infant may have significant brain immaturity or brain disorganization due to either extreme prematurity (less than 28 weeks) or perinatal insult (asphyxia, hyperbilirubinemia)
  - The child may have auditory neuropathy (auditory dys-synchrony)
  - There may be conductive hearing loss due to middle ear effusion or external ear canal debris (if only air conduction ABR was performed)
  - Comparison with the wrong normative values
  - Technical problems performing the test, including electrical interference, noise in the environment, excessive movement by the baby, inexperience with testing procedures
  - Cutoff level (criteria for normal response) is set too low
- [B] (Yang 1993)

*Bone-conduction versus air-conduction ABR*

13. For an audiologic evaluation, it is important to do both air-conduction and bone-conduction ABR. In interpreting the results, it is important to recognize that:
- Bone-conduction ABR will be abnormal if there is a sensorineural hearing loss or mixed hearing loss, but not if there is only conductive hearing loss
  - Air-conduction ABR will be abnormal with all types of hearing loss
- [B] (Yang 1993)
- When interpreting the results of the ABR, it is important to understand that the Wave V latency of the ABR is increased with conductive hearing loss as compared to sensorineural hearing loss. Using both bone-conduction ABR as well as air-conduction ABR adds even more information in helping to differentiate between conductive and sensorineural hearing loss.
- [A] (Hyde 1990/Hyde1991, Yang 1993)
14. In doing bone-conduction ABR, it is important to recognize that the results can be affected by:
- The pressure of the bone oscillator against the skull; calibration depends on achieving the standard pressure

- The developmental age (i.e., when the skull bones become fully ossified/articulated)

[B] (Yang 1993)

### *Tympanometry and acoustic reflexes*

15. When considering the results of tympanometry to assess middle ear function, it is important to recognize that:
    - Tympanometry is not a test of hearing
    - Many children with flat tympanograms (Type B) will have a conductive hearing loss associated with the presence of middle ear fluid
    - If a Type B tympanogram (flat) persists for over 3 months, an audiologic assessment is recommended
- [C] (Kazanas 1994, MRC 1999,)
16. It is recommended that tympanometry be used in conjunction with measurement of middle ear muscle reflexes. [D2]

### *Behavioral audiometry*

17. It is recommended that VRA be included as one component of a test battery for assessment of suspected hearing loss or for ongoing monitoring for infants who are at increased risk for hearing loss and are at least 6 months of age. [D2]
18. It is important to understand that to perform VRA successfully, the baby needs to have the developmental ability to respond to conditioned test procedures, including the ability to sit, maintain head control, and turn his or her head. Therefore, it is recommended that VRA be performed only on infants that are at a developmental age of at least 6 months. [D2]
19. It is important to recognize that VRA is a different procedure than 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 correct [D1]
20. 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. These 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. [D2]

21. 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. [D2]

*Speech audiometry*

22. It is recommended that 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 (spondees)
  - Speech recognition abilities for common words and sentences that are within the child's vocabulary or at the child's language level [D2]
23. It is important to remember that there are speech audiometry procedures available that have been developed for use with infants and young children. [D2]
24. It is important to recognize that the results of the speech audiometry assessment 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 [D2]

**ASSESSMENT FOR AMPLIFICATION**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section presents recommendations about assessment for the purpose of providing amplification for infants and young children with hearing loss.

*Basis for the recommendations in this section*

The recommendations about the assessment for amplification of young children with hearing loss are based primarily on consensus panel opinion. The literature

for this topic was not specifically reviewed as a focus of this guideline. In the panel's opinion, these recommendations reflect appropriate practices for conducting the assessment for amplification in children with hearing loss and are consistent with current knowledge in this field. Some of the recommendations are based on information from the Joint Committee on Infant Hearing (JCIH) 2000 position paper, which was considered by the panel in the absence of specific studies meeting the criteria for evidence.

Initially, the audiologic assessment is used to confirm the existence of a hearing loss, to characterize the hearing loss, and to make appropriate medical referrals. That assessment includes a battery of behavioral and physiologic tests as described earlier (page 65). It is important to initiate hearing aid fitting as soon as the hearing loss is confirmed in order to provide timely amplification to the infant. The primary purpose of amplification is to allow the infant or young child to hear speech.

Following the confirmation of a hearing loss, the purpose of the audiologic assessment is to obtain information that will result in optimal selection and fitting of the hearing aid. Individualizing the selection of the amplification device to meet the needs of the child is best achieved when information about hearing thresholds is available for each ear across the range of frequencies important for speech (ideally, from 250 Hz to 6,000 Hz). However, the hearing aid selection process may begin when information is available only for fewer thresholds, minimally at 500 Hz and 2,000 Hz in each ear. With very young infants, the initial amplification selection is often based on auditory brainstem response (ABR) thresholds; later, more threshold information is obtained through behavioral audiologic assessment.

Obtaining thresholds in each ear is particularly important for the selection of an appropriate amplification device because the child's hearing may be different in each ear (i.e., an asymmetrical hearing loss). When performing the audiologic assessment (by ABR or by behavioral methods) it is best to use insert-type earphones rather than conventional earphones. The hearing thresholds obtained using insert earphones are more useful for the prescriptive hearing aid fitting process.

An optimal audiologic assessment includes (when possible):

- Unaided sound field testing (through a loudspeaker) at specific frequencies and for speech
- An estimation of unaided speech perception abilities in each ear (using insert earphones)



- An assessment of unaided functional communication abilities (to provide a performance baseline)
- The child’s responses to speech sounds at high intensity levels (to determine level of discomfort for various loud sounds)

The entire process of fitting and evaluating a hearing aid for a child is described extensively in the “Intervention” chapter (page 140).

**Recommendations (Assessment for Amplification)**

1. It is recommended that provision of amplification be based on physiologic measures alone (i.e., frequency-specific ABR using insert earphones) if behavioral audiologic assessment cannot be performed accurately because of the infant’s age or developmental level. [D2]
2. If the initial selection of the amplification device is based on physiologic (ABR) measures alone, then it is recommended that a behavioral audiologic assessment be completed as soon as possible to corroborate the ABR findings and to obtain hearing thresholds across a broader range of speech frequencies. [D2]
3. It is recommended that behavioral audiologic assessment for the selection of amplification include:
  - Assessment of hearing thresholds for both ears using insert earphones
  - Measurement of hearing thresholds over the entire range of speech frequencies from 250-6,000 Hz
  - Examination of the child’s functional use of hearing without an amplification device (unaided abilities) using sound field testing at specific frequencies and for speech
  - Assessment of speech perception abilities in each ear using insert earphones when possible
  - Estimation of the child’s loudness discomfort levels (LDL) for specific frequencies and speech sounds when possible
  - Documentation of current communication abilities to provide a performance baseline [D2]
4. It is recommended that children who use amplification devices receive ongoing audiologic monitoring at least every 3 months. [D2]

**MEDICAL ASSESSMENT OF YOUNG CHILDREN WITH HEARING LOSS**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section presents recommendations for the medical assessment of young children with hearing loss.

*Basis for the recommendations in this section*

The recommendations about the medical assessment of young children with hearing loss are based primarily on consensus panel opinion. While there is a wide range of literature specific to the medical assessment of young children, that literature was not reviewed as a focus of this guideline. In the panel’s opinion, these recommendations reflect appropriate practices for conducting the medical assessment for children with hearing loss and are generally consistent with current knowledge in this field. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence.

There are several purposes for a medical evaluation for infants and young children with hearing loss (JCIH 2000):

- To determine the etiology of hearing loss
- To identify related physical and/or health conditions that might require medical attention, treatment, or observation
- To provide recommendations for medical treatment and/or referral for other services
- To provide medical clearance for amplification devices
- To provide information that may assist in determining the intervention strategy best suited to the child

Components of the medical evaluation for infants and young children with hearing loss 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 structural 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 who have a sensorineural hearing loss, otitis media with effusion (OME) produces an additional conductive hearing loss. Therefore, in the overall medical management of children with sensorineural hearing loss, diagnosis and intervention for OME often plays an important role (Brookhouser 1999).

### **Recommendations (Medical Assessment)**

#### *Referral for medical assessment*

1. 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. [D2]

#### *Referral for an otologic evaluation*

2. It is recommended that:
  - Any child with a confirmed persistent conductive, sensorineural, or mixed hearing loss be referred for an otologic evaluation
  - Any child with evidence of middle ear dysfunction on medical exam, which does not resolve after 3 months of conventional medical treatment, be referred for an otologic evaluation [D2]
3. The purposes of an otologic evaluation for young children are to:
  - Determine the specific cause of the hearing loss
  - Establish the specific diagnosis
  - Identify and treat potentially reversible middle ear disease or persistent middle ear dysfunction that may result in permanent hearing loss and/or other serious medical conditions (such as cholesteatoma or intracranial infections) if untreated
  - Identify other associated medical conditions
  - Provide information that will help guide intervention strategies
  - Provide medical clearance for the use of amplification devices [D2]

#### *Components of the otologic evaluation*

4. It is recommended that the otologic evaluation include:
  - Clinical and developmental history of the child and family, particularly looking for the presence of risk indicators that require monitoring for delayed onset and/or progressive hearing loss

- Physical examination of the ears, nose, and throat, and a focused neurological evaluation
  - Specific laboratory and diagnostic tests, when indicated, including at a minimum a urinalysis to rule out kidney problems, a blood test for syphilis, and an electrocardiogram
  - When indicated, imaging studies such as CT or MRI to evaluate the anatomical structure of the ear and central auditory pathways [D2]
5. When a child is either diagnosed with or suspected of having a specific syndrome related to hearing loss and/or when hereditary hearing loss is a possibility, it is important to offer families the option of genetic counseling and testing. [D2]

### *Other considerations for an otologic evaluation*

6. It is recommended that middle ear status be monitored regularly in infants and young children with sensorineural hearing loss. This is important because the presence of OME can further compromise hearing. [D2]
7. It is important to consider the need for ongoing otologic monitoring and periodic otologic reevaluation for all children with hearing loss. This is especially important for children with progressive hearing loss. [D2]

### *Other medical evaluations*

8. It is recommended that all children with sensorineural or mixed hearing loss receive an ophthalmologic evaluation at regular intervals to rule out concomitant late-onset vision disorders. [D2]
9. Because hearing loss is often a component of other conditions that may be associated with developmental delays or other disabilities, it is recommended that primary health care professionals monitor developmental milestones in all children with hearing loss and, if necessary, refer them for medical evaluation of other developmental problems. [D2]

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**DEVELOPMENTAL ASSESSMENT FOR YOUNG CHILDREN WITH HEARING LOSS**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section presents recommendations for the developmental assessment of young children with hearing loss, including considerations for how assessments might have to be changed to test children with hearing loss. Topics include:

- General Approach to Developmental Assessment
- Assessment of Communication
- Assessment of Other Developmental Domains

*Basis for the recommendations in this section*

The recommendations about the developmental assessment of young children with hearing loss are based primarily on consensus panel opinion. While some literature was reviewed related to this topic specific to the communication assessment, an exhaustive review of the literature was not conducted. The primary focus on the literature review for this chapter was the identification and assessment of hearing loss. In the panel's opinion, these recommendations reflect appropriate practices for conducting the developmental assessment for children with hearing loss and are generally consistent with current knowledge in this field. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence.

**General Approach to Developmental Assessment**

The primary focus of assessment and intervention strategies for many children with hearing loss is specific to their hearing and communication needs.

However, consideration of other possible developmental problems is also an important component of assessing children with hearing loss because 30% to 40% of children with hearing loss also have additional disabilities that may affect other areas of development (JCIH 2000).


There are five developmental domains (cognitive, sensory/motor, communication, social/emotional, and adaptive/self-help) that overlap and interrelate to support the child's overall development. Therefore, it is important

to identify any coexisting developmental delays in a child with hearing loss. For example, a child's cognitive delay, visual impairment, vestibular dysfunction, or other sensory problem 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.

**Recommendations (General Approach to Developmental Assessment)**

*Importance of the developmental assessment*

1. For all young children with hearing loss, there is a need for ongoing developmental monitoring and periodic age-appropriate assessment of developmental progress in all developmental domains. This includes evaluation of cognition, communication, physical (sensory/motor), social/emotional, and adaptive/self-help skills. It is recommended that a formal developmental assessment be performed at least annually. [D2]



**Early Intervention Policy** ❖ A multidisciplinary evaluation must assess all five areas of development (cognitive, communication, physical, social/emotional, and adaptive development). The multidisciplinary evaluation is provided at no cost to parents. Ongoing assessment of a child's progress should be performed as part of early intervention service delivery.

A parent interview must be included as part of the multidisciplinary evaluation. Families may also participate in an optional family assessment.

2. Developmental assessments are important because they will 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 the assignment of appropriate interventions
  - A baseline against which progress and effects of intervention can be measured over time [D2]

*General considerations*

3. When assessing development in young children with hearing loss, it is important for those assessing the child to take into consideration any factors that may have an impact on the child's performance during the developmental assessment, such as the child's:
  - Hearing status
  - Health status
  - Vision status
  - Sensory dysfunction such as tactile sensitivity, poor motor coordination, and balance problems [D2]

*Considerations for children who use amplification or other sensory aids*

4. For children who use an amplification device, it is recommended that before assessing the child's abilities, the evaluator perform a listening check of the child's amplification device or cochlear implant to ensure that it is working properly. [D2]
5. For children with cochlear implants, it is important to determine if it is necessary to take precautions to assure that the device is not damaged as the result of environmental static electricity (also referred to as electrostatic discharge) from the mats, carpeting, or other assessment equipment. [D2]
6. For the child to perform optimally, it is also important to use any prescribed vision aids for the child and make appropriate accommodations (such as using trunk support) for any motor limitations. [D2]

*Considering the language and culture of the child and family*


7. It is important to respect and take into consideration the family's culture when assessing young children with hearing loss. [D2]
8. It is important to conduct the assessment in the dominant language of the child and family whenever possible. [D2]



**Early Intervention Policy** ❖ The multidisciplinary evaluation must be performed using nondiscriminatory procedures as defined in program regulations (see Appendix D) and be conducted in the child's dominant language whenever feasible.

*Conducting the developmental assessment*

9. It is important that the developmental assessment be viewed as an ongoing process that evolves with the child over time and not as a single event. [D2]
10. When assessing young children with hearing loss, it is important that qualitative differences be recognized. A good developmental assessment includes qualitative evaluation, quantitative measures, and observation. It is important that the assessment not be limited to measuring and assessing only quantitative differences. For example, in addition to looking at a child's developmental level, it is also important to look at how the child completes each task. [D2]
11. It is important that the developmental assessment of young children with hearing loss include:
  - Multiple settings as appropriate (the home, day care setting, school, and typical social environments)
  - Multiple stimuli (pictures, objects, and sounds)
  - Multiple examiners (parents, teachers, and therapists) [D2]



**Early Intervention Policy** ❖ The multidisciplinary evaluation team can use a combination of standardized instruments and procedures and informed clinical opinion to determine a child's eligibility for services.

The multidisciplinary evaluation team must include at least two qualified personnel of different disciplines.

12. It is important that the developmental assessment:
  - Be individualized for each child
  - Use age-appropriate testing and scoring methods
  - Consider the child's individual abilities and needs, including specific discrepancies in functioning across and within developmental domains
  - Make use of parents' observations of their child
  - Include observational data obtained in the child's natural environment when feasible [D2]
13. It is recommended that assessment be an ongoing process that occurs in more than one session and in more than one setting, as appropriate, because:
  - 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
- A child’s performance can vary from day to day [D2]



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

14. Developmental assessments can be performed by a multidisciplinary team in a number of settings. In order to assure quality and consistency, it is recommended that each member of the team participating in the developmental assessment:
- Have experience and expertise in assessing young children with hearing loss
  - Use normed and standardized instruments as well as observational information and note whether any testing modifications were used
  - Use procedures that are reproducible by other professionals [D2]

*Components of the developmental assessment*

15. It is recommended that the developmental assessment for a young child with hearing loss provide information about the child’s function in all developmental domains. Important components of the developmental assessment include:
- Observation of the child during informal and structured play and observation of parent-child interactions
  - Parent report and interview to elicit concerns, a history of the child’s early development, and information about the child’s current level of functioning



**Early Intervention Policy** ❖ Under the NYS Early Intervention Program, the multidisciplinary evaluation must include a parent interview. The interview may be a formal interview schedule or an informal discussion with the parent about the child’s development.

- Assessment of the family’s resources, priorities, and concerns
- Medical history

- Standardized tests, where appropriate, of:
  - Cognitive ability
  - Communication
  - Motor skills
  - Sensory processing abilities
  - Adaptive/self-help skills
  - Social/emotional functioning [D2]

### *Assessing developmental milestones*

16. When assessing children with hearing loss, it is important to recognize that they will vary as to when specific developmental milestones are attained. [D2]
17. It is important to follow up on questionable atypical findings from the developmental assessment of any young child. This might include adding elements to the developmental assessment and/or referring the child to other professionals for more detailed evaluation and specific diagnosis. [D2]

### *Considerations when deciding on assessment strategies, materials, and settings*

18. It is important to recognize that no child is “untestable.” Some tests, however, may not be appropriate for some children. It is important to use appropriate testing materials and strategies for each child. [D2]
19. It is recommended that the setting in which the assessment is performed:
  - Be appropriate to the child’s developmental stage
  - Be comfortable for both parent and child [D2]
20. It is recommended that assessment materials and strategies be developmentally appropriate for the child. [D2]
21. When selecting assessment materials and procedures, it is recommended that the child’s sensory capacities and communication approach be considered to the extent possible. If a young child has significant hearing loss and/or has a communication approach that involves cues or signs:
  - Adaptations of materials, setting, or testing/response procedures may be necessary if the assessment results are to accurately reflect the child’s development
  - The input of the parents and others who know the child well can be extremely important in determining the most appropriate materials, procedures, and adaptations to be used [D2]

22. It is important to recognize that standardized developmental tests are usually not normed for children with hearing loss. Standardized developmental 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. [D2]

*Using the findings of the developmental assessment*

23. It is important that the findings of the developmental assessment be used in developing any intervention plans for the child. The developmental assessment also provides useful objective reference points for monitoring the progress of the child and assessing the outcomes of interventions. [D2]

*Including parents in the assessment process*

24. It is recommended that a parent or other primary caregiver be present for the formal assessment whenever possible and that there be an opportunity for other family members to participate in the process. [D2]
25. It is important to include information from a parent report of the child's performance in the child's natural setting. [D2]

*Communicating findings to parents and other professionals*

26. It is recommended that a timely explanation of the assessment results be provided to the family with translation into the child's and family's dominant language when possible. It is useful to discuss:
- Important terms and concepts used
  - The results and implications of the assessment
  - Performance in relation to developmental norms
  - Factors that may contribute to the results [D2]
27. It is important for all professionals involved in the assessment process to communicate with each other about their findings and recommendations. [D2]
28. It is recommended that reports from professionals who assess children with hearing loss include:
- Results presented in language that is understandable to the family and other professionals 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 [D2]



**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. The multidisciplinary evaluation team must also prepare a formal report and evaluation summary and submit the report to the Early Intervention Official.

29. It is important for professionals to consider how the assessment process and results will impact the family. [D2]

### **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* incorporates both verbal and nonverbal aspects of communication. Language is a rule-governed communication system that is composed of sounds, words, phrases, and/or gestures. These elements are combined in various ways to communicate between and among individuals. 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 or hearing is a prerequisite for learning the sounds of a language.

For children with hearing loss, communication is one of the major areas of concern. 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 and training to develop functional listening skills and speech. Some children with significant hearing loss will have

a communication approach that supplements spoken language with a visual communication system (such as cues or signs), while others may use a communication approach that is completely visual.

Some of the tests used to assess communication abilities in young children are described in Appendix C, along with adaptations for children with hearing loss. The findings of the communication assessment are used in developing intervention plans for the child and provide useful objective reference points for monitoring the child's progress.

### **Recommendations (Assessment of Communication)**

#### *Importance of assessing communication*

1. It is important to recognize that an essential goal for all children with hearing loss is to develop communication skills to the fullest potential. [D2]

#### *Timing of the communication assessment*

2. It is important to recognize that:
  - Communication abilities begin at birth and develop over time
  - Communication can be assessed in infants [D2]
3. If the initial assessment of communication development is completed before a hearing loss is identified, it is recommended that a more in-depth assessment of communication be conducted after the results of an audiologic evaluation are known. [D2]
4. Ongoing monitoring and assessment of communication skills is important because communication skills are dynamic and may change over time, especially if the child does not receive amplification initially. [D2]

#### *Components of the communication assessment*

5. When assessing communication skills in infants from birth to 6 months, it is recommended that the assessment focus on:
  - Attainment of communication milestones (Table 4, page 50)
  - Types of cries, babbling, laughing, smiling [D2]
6. When assessing communication milestones, it is important to recognize that delayed development of canonical babbling (no canonical babbling by 11 months of age) is a significant clinical clue for hearing loss.

[C] (Eilers 1994)

7. It is recommended that all children older than 6 months of age 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 [D2]
8. It is important to recognize that there are various stages in auditory skill development, including:
  - Detection (awareness of sound)
  - Discrimination (ability to discriminate between two sounds)
  - Identification (ability to recognize a sound)
  - Comprehension (ability to understand what sound means) [D2]
9. It is important for professionals to recognize that most language assessment instruments have been normed (developed and tested) on children who are able to hear normally (Appendix C). These language assessment tests:
  - Can help to determine whether or not the child is experiencing a delay in communication development
  - May need to be adapted to assess language abilities in children with hearing loss, particularly children whose communication either totally or partially depends on visual information, such as cues or signs [D2]

### *Considerations for children using amplification*

10. If a child has hearing aids, it is recommended that the communication assessment be completed with the child using the selected amplification system. [D2]
11. Depending on the degree of the child's hearing loss, it may be important to include an initial and ongoing assessment of the child's functional listening skills both with and without hearing aids, and with different amounts of background noise. [D2]

*Professional characteristics*

12. It is recommended that the professional assessing the communication development of a young child with hearing loss have:
  - 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 if that is the language used by the family) [D2]
13. 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. [D2]

**Assessment of Other Developmental Domains**

Although the primary focus of assessment and intervention for many children with hearing loss is specific to their hearing loss and communication development needs, consideration of other possible developmental problems is also an important component of evaluating children with hearing loss. As many as 30% to 40% of the children with hearing loss demonstrate additional disabilities (JCIH 2000).

Other domains to be evaluated in children with hearing loss include:

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

**Social** – The social domain includes the ability to interact and relate to other people, including parents and peers.

**Motor** – The motor domain includes the skills that allow an individual to manipulate, move around in, and explore the world. Assessment of motor development includes assessment of control of movement and posture, tone, and strength. Gross motor development refers to the ability to move the large muscle groups of the body, while fine motor development refers to the use of the hands and fingers. Motor development depends on how sensory input is processed in the brain to result in a purposeful movement.

**Adaptive/self-help** – The adaptive/self-help domain includes functional skills that allow the child to function more independently, such as feeding, dressing, and toileting.

**Recommendations (Assessment of Other Developmental Domains)**

*Cognitive assessment*

1. It is important to assess cognitive abilities and learning style in children with hearing loss because the child's cognitive ability affects the child's function in other areas of development and has implications for intervention decisions. [D2]
2. It is important to recognize that depending on the etiology of a child's hearing loss, a cognitive delay or impairment may be contributing to any communication delay exhibited by the child. [D2]
3. In assessing the cognitive abilities of a child with hearing loss, 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 assessment materials and procedures, if necessary, for the child's hearing loss and/or communication approach [D2]
4. It is recommended that the assessment of cognition in young children with hearing loss include some type of performance-based (language free) measures, such as:
  - A test that allows language items to be separated from items related to cognition
  - Play-based assessments [D2]

*Social assessment*

5. It is important to assess social interactions and relationships in children with hearing loss because the ability to communicate with family members and peers impacts social development of a child's interactions and relationships. [D2]
6. 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. [D2]
7. In young children with hearing loss who also have dysmorphic facial features (due to craniofacial conditions including external ear abnormalities) or other physical stigmata from coexisting disorders, it is important to consider the possible impact of the child's physical appearance on social interactions. [D2]



*Motor assessment*

8. Because young children with hearing loss may have associated vestibular dysfunction, it is particularly important to assess balance during the motor assessment. [D2]
9. When performing a motor assessment of a child with hearing loss, it is important to be aware of the location and type of amplification device or sensory aid worn by the child. During some parts of the assessment (such as assessing asymmetry in tone and posture), it is recommended that the device be removed. [D2]

*Adaptive/self-help assessment*

10. It is important to assess adaptive abilities and self-help skills in children with hearing loss because an inability to communicate may impact a child's performance of self-help skills. [D2]

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**CONSIDERATIONS FOR WORKING WITH THE FAMILY**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section presents recommendations for working with the family. Topics include:

- Informing the Family About the Diagnosis of Hearing Loss
- Assessing the Resources, Priorities, and Concerns of the Family

*Basis for the recommendations in this section*

The recommendations in this section on considerations for working with the family are based primarily on consensus panel opinion. These recommendations address topics for which scientific literature was not specifically reviewed as a focus of this guideline. Many of the recommendations are based on findings from review articles that were specific to issues related to family assessment, but a comprehensive literature review to identify scientific studies was not performed for this topic. In the panel's opinion, these recommendations are generally consistent with scientific knowledge in this field.

### **Informing the Family About the Diagnosis of 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 may have tremendous impact and will leave a lasting impression on a family.

Parents do not respond uniformly to learning that their child has a hearing loss. There are many factors that may influence how a family responds when information about a diagnosis is communicated. Examples include:

- Characteristics of the child's condition
- Certainty of the diagnosis and prognosis
- Preexisting family factors (such as previous knowledge and beliefs about the condition, family circumstances, and family stressors)
- The quality of the information provided

Other factors that may influence how parents respond to information about the diagnosis relate to the setting and the manner in which the diagnosis is communicated.

### **Recommendations (Informing the Family About the Diagnosis)**

#### *Addressing a family's initial concerns*

1. It is important to understand that 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 initial concerns/questions are often:
  - What caused the hearing loss/why does the child have hearing loss?
  - How certain is the diagnosis?
  - Are there any other problems with the child or other concerns associated with the hearing loss that the family needs to consider?
  - What are the potential treatments/interventions? [D2]
2. It is important to recognize that when parents are first told that their child may have a hearing loss, they may experience a variety of feelings. Parents may:
  - Express disbelief
  - Be upset or 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 [D2]

3. The first professional who informs a family about hearing loss has tremendous impact and will leave a lasting impression on a family. It is important that professionals informing the family about a new diagnosis of hearing loss:
  - Have expertise in communicating test results and informing a family about a new diagnosis of hearing loss
  - Listen to parent concerns upon receiving a diagnosis of hearing loss
  - Provide objective, unbiased information about options
  - Do not overload parents with information in one session but provide opportunities for follow-up discussions, support, and referrals
  - Form a partnership with parents from the point of identification and throughout the process of establishing interventions for the child
  - Respect the family's decisions about the child's care [D2]

*Providing parents with information*

4. It is important to provide parents with fair and balanced information about hearing loss and to assist them in establishing a plan and setting goals for the next steps after confirmation of a hearing loss. It is important to:
  - Repeat information as needed, provide it in writing, and provide opportunities for follow-up
  - Provide parents with the opportunity to ask questions related to hearing loss and interventions (medical and developmental)
  - Have referral information available, including information about parent support groups, social support, and counseling options
  - Inform parents who have no prior experience with hearing loss that it may take time to adjust to parenting a child with hearing loss [D2]
5. When informing parents about their child's hearing loss, it is important to help them understand the concrete, practical implications of hearing loss (for example, whether a child can hear speech/sounds). [D2]
6. It is important to recognize that the child's primary health care provider has an important role to play in informing parents about the medical concerns that may be associated with hearing loss and is an important member of the assessment and intervention team. [D2]
7. It is important for parents to receive information about possible genetic causes of hearing loss. It is important to offer a referral to a specialist in genetics to investigate the possibility of hereditary hearing loss and/or associated genetic conditions. [D2]

### *Responding to the needs of the family*

8. It is important that professionals listen to the reactions of family members after delivering news about a child's condition so that appropriate support and information can be provided. It is important to understand that not all families will have the same reaction. [D2]
9. It is important that parents have opportunities to ask questions and talk with a health care professional (who is not hurried or rushed) after learning that their child has or is suspected of having a hearing loss. [D2]
10. It is important to recognize that:
  - Parents may react differently to an uncertain prognosis about their child's developmental potential (for example, some parents find uncertainty stressful, and for others, uncertainty provides hope)
  - The physician wanting to prepare the parent for the worst may be inadvertently eliminating hope and/or setting up an adversarial relationship [D2]
11. It is important to understand that adjusting to the diagnosis may take time, and as family members go through various phases of understanding and acceptance, their need for information and support may increase. [D2]

### *Factors that may influence a family's reaction to the diagnosis of a hearing loss*

12. It is important to recognize that not all families will have the same need for information and assistance. It is important to be sensitive to the needs of the individual family. [D2]
13. It is important to recognize that when informed about their child's hearing loss, parents from "hearing families" may react very differently and may need more support than do deaf parents who may view deafness from a cultural perspective. However, the reaction of the parents or their need for support cannot be assumed based on the hearing status of the parents. [D2]
14. It is important to recognize that a variety of factors may influence a family's reaction to the child's diagnosis of a hearing loss. These may include:
  - Individual parent readiness to accept the diagnosis; hearing status of the parents; the family's beliefs and values; feelings of guilt or blaming; and parents' age, education, and socioeconomic level
  - Parental confusion about hearing loss, what hearing loss means, and implications for development
  - The service system/intervention options that are available and parents' previous experience with other children with hearing loss

- Who communicates the diagnosis and how the information is shared with parents and the amount of information with which the parents feel comfortable (some parents will experience information overload and some parents want all available information immediately)
- The degree of the child's hearing loss and whether the child has other coexisting disabilities (such as Down syndrome or cerebral palsy) or the potential for other problems
- The reaction of the immediate family to the confirmation of hearing loss and available support systems [D2]

### **Assessing the Resources, Priorities, and Concerns of the Family**

An assessment of the family's resources, priorities, and concerns is an important component of planning interventions that will benefit the child and family. Intervention services are most effective if they are matched to the strengths and needs of the individual family, as well as to the strengths and needs of the child.

#### *Family interaction patterns*

There are various factors that may influence family interaction patterns. Some of these factors are generally relevant to all children and families regardless of a child's disability or risk status (Guralnick 1997). For example:

- The style of the parent-child interaction (for example, encouraging, affectively warm, appropriately structured, nonintrusive, discourse-based, and developmentally sensitive patterns of caregiver-child interactions).
- The extent to which the family provides the child with diverse and appropriate experiences within the surrounding cultural, social, and physical environment (for example, the frequency and quality of contacts with different adults, the variety of experiences, and the stimulation value of the general environment).
- The way in which the family ensures the child's health and safety (for example, obtaining immunizations and routine and specialized health care, providing adequate nutrition and a safe home environment).

For a child with established disabilities, there are factors that may interfere with a family's ability to establish patterns of interaction that optimally facilitate and support the child's development (Guralnick 1997). Some of these factors may include:

- Lack of information about the child's health and development
- Preconceived notions/beliefs about the condition

- Interpersonal and family stress
- Lack of resources or support
- Language or cultural considerations
- Threats to confidence in parenting skills

Not all families are the same. The extent to which stressors actually affect the family depends on the magnitude of the stressors and the characteristics of the family. Families with adequate coping resources tend to be less likely to regard potential stressors as stressful (Knussen 1992).

While the availability of strong social support may be an important factor in a family's inventory of coping resources, nonsupportive behavior from family, friends, or service providers may be "more than the loss of a protective factor and might actually become a risk factor" (Patterson 1997). Some of the behaviors reported most often by parents as nonsupportive include:

- Comparisons with other children
- Focusing only on what is "wrong" with the child
- Questions about why a child cannot achieve developmental milestones
- Assuming lower expectations than a child's potential
- Offering unsolicited and inappropriate advice
- Blaming parents for the cause of the condition
- Criticizing parental caregiving
- Pitying remarks concerning 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 be able to develop intervention plans that are meaningful and relevant to the family. Methods for a family assessment include:

- Informal discussions with families using sensitive and focused interviewing techniques
- Questionnaires and other assessment tools to help families identify, clarify, and communicate their goals and needs to relevant professionals


While some parents may find a family assessment helpful, others may be uncomfortable about participating in a family assessment. They may interpret

the assessment as a message that something is “wrong” with their family functioning and find it intrusive. Conducting a family assessment requires skill and practice. Many professional assessments of family needs are weakly correlated with parents’ assessment of their needs. In family-oriented assessment, the task for professionals is to objectively and sensitively help parents to articulate the needs and goals of the family (Krauss 1997).

**Recommendations (Assessing the Concerns, Priorities, and Resources of the Family)**

*Importance of the family assessment*

1. 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 and goals/objectives. [D2]



**Early Intervention Policy** ❖ A family assessment should be offered as part of the multidisciplinary evaluation for the Early Intervention Program. The family assessment is optional for parents.

*Considerations in conducting the family assessment*

2. It is important that professionals who are completing the family assessment:
  - Understand and be familiar with children and families with hearing loss (including mild/moderate as well as severe/profound hearing losses)
  - Have access to individuals with training and expertise in audiology, speech and language, communication development, and education options
  - Have access to individuals with experience in the different communication approaches (page 118) [D2]

*Components of a family assessment*

3. 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 about hearing loss and deafness and their experiences with individuals who are deaf and hard of hearing (some parents will themselves have a hearing loss)

- The family's natural style of communication (e.g., does the family use more gestural or verbal communication?) [D2]
4. It is recommended that assessment of the family's resources, priorities, and concerns include discussion of factors such as:
    - The family's knowledge and need for information about both hearing loss and various interventions such as amplification and the various communication approaches
    - The family's future expectations for the child, both short- and long-term
    - Family constellation (including siblings and extended family), demographics, education, and specific circumstances
    - Family goals, values, and linguistic and cultural background
    - The family's stressors and tolerance for stress, as well as the family's coping mechanisms and styles
    - The family's current support systems and resources (including extended family members and their attitudes)
    - Family interaction patterns, parenting style, and problem-solving styles of parents
    - Issues related to nonsupportive behaviors of family members, friends, and community [D2]
  5. In assessing the family's resources, priorities, and concerns, it is important to recognize the role of the family's cultural and ethnic background. Cultural 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 and ease in using different types of information
    - The family's comfort with openly expressing needs [D2]

### *Family assessment approaches*

6. 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. [D2]



7. Family assessment involves respecting differences in family styles and goals. It is important that professionals conducting family assessments:
  - Establish a collaborative parent-professional relationship
  - Listen effectively and nonjudgmentally to family-identified needs
  - Maintain confidentiality
  - Provide an appropriate setting and sufficient time to allow family members to express their needs and concerns
  - Respect cultural differences [D2]
8. It is recommended that information gathered in the family assessment be used to help families:
  - Establish and articulate needs
  - Develop realistic priorities that are acceptable to the family
  - Become aware of available services for the child and sources of social supports for the family
  - Obtain specific information about expected progress and any special problems likely to be encountered [D2]
9. 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. [D2]



## CHAPTER IV: INTERVENTION

**INTERVENTION METHODS FOR YOUNG CHILDREN WITH HEARING LOSS**

Interventions for most infants and young children with hearing loss primarily 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 a hearing loss

Interventions focused on developing the child’s 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 and various combination approaches. Parents must often make an initial decision about a communication approach soon after their child has been diagnosed with hearing loss.

Parents must also make a decision about options for improving their child’s access to sound. The assistive devices most commonly used to amplify sound are hearing aids. 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.

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*Topics included in this chapter*

- General Approach and Parent Participation
  - Communication Interventions
  - Amplification Devices
  - Medical and Surgical Interventions
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**GENERAL APPROACH AND PARENT PARTICIPATION**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section presents recommendations about general considerations for planning and implementing interventions for young children with hearing loss, and recommendations about parent participation and family support. Topics include:

- General Considerations for Planning and Implementing Interventions
- Parent Participation, Parent Education, and Family Support

*Basis for the recommendations in this section*

The recommendations in this section are based on a combination of conclusions drawn from the articles meeting the criteria for evidence and consensus panel opinion. The consensus recommendations generally address topics for which a specific literature search was not conducted as a focus of this guideline. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence. In the panel's opinion, the recommendations reflect appropriate practices for providing intervention for infants and young children with hearing loss, and are generally consistent with the current knowledge in this field.

**General Considerations for Planning and Implementing Interventions**

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 104). These general principles are not necessarily unique to interventions for infants and young children with hearing loss, but for the most part are similar to the general considerations involved in planning and implementing early intervention services for young children with any developmental disability.

For example, when planning intervention goals and implementing intervention strategies, recognition of individual differences is an important consideration regardless of a child's diagnosis. Decisions regarding intervention for a particular child need to be linked closely with that child's assessment results so the intervention can be individualized to the child's strengths and needs. The

family’s strengths, resources, needs, priorities, and goals should also be taken into account.

The importance of early identification and appropriate intervention as soon as possible for young children with developmental disabilities is a philosophy underlying any early intervention program. However, this principle appears to be particularly true for young children with hearing loss.

There is increasing evidence that infants acquire information about their native language at a very early age. For example, in hearing infants, exposure to a particular language during the first 6 months of life alters not only infants’ listening preferences but also their actual perception of speech sounds (Kuhl 2000). Therefore, for young children with hearing loss, early identification and early intervention is especially important (Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B).

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

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<i>Recognition of individual differences</i>	Individualizing the program to meet the specific needs of the child and family
<i>Developmental</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*

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**Recommendations (General Considerations for Interventions)**

*Importance of early identification and intervention*

1. It is important to recognize that early identification and early intervention can result in better outcomes regardless of the degree of the child’s hearing loss.  
*[C](Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B)*
2. It is recommended that intervention begin as soon as possible after confirmation of the hearing loss regardless of age of identification or the type of hearing loss (congenital, progressive, late onset, or acquired).  
*[C](Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B)*



**Early Intervention Policy** ❖ All services in the IFSP must be agreed to by the parent and the EIO. The IFSP must include a statement of the services needed and the major outcomes expected for the child and family.

3. When possible, it is recommended that intervention begin within the first year, 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.  
*[C](Moeller 2000, Yoshinaga-Itano 1998, 1998A, and 1998B)*
4. It is important to recognize that without early intervention, even children with mild hearing loss can have speech and language delay.  
*[C](Ramkalawan 1992)*

*General considerations for selecting interventions*

5. 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 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.  
*[C](Robbins 1999, Svirsky 1999, Truy 1998, Watkins 1987)*

6. When making decisions about intervention approaches, it is recommended that parents seek guidance from qualified professionals with expertise in working with young children with hearing loss. [D2]
7. It is important to recognize that parents are the primary decision makers. The role of the professional is to provide information and other resources, to support the parents in their decision making. [D2]

### *Factors that may influence intervention outcomes*

8. It is important for both parents and professionals to recognize that many factors may influence outcomes (regardless of the intervention approach). Factors that have been demonstrated to influence intervention outcomes for young children with hearing loss include:
  - Age at time 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 and accessibility of intervention services and support

*[C](Greenberg 1983/Greenberg 1984, Miyamoto 1999, Moeller 2000, Nikolopoulos 1999, Ramkalawan 1992, Watkins 1987, Watkins 1998)*
9. In addition to factors related to the initiation and delivery of intervention services, it is important to recognize that there may be other factors that may influence intervention outcomes. For example:
  - Characteristics, degree, and stability of hearing loss
  - Presence of additional disabilities, coexisting medical conditions, or underlying genetic disorders that may impact the child's ability to participate in interventions
  - Environmental issues (such as socio-economic factors and physical/acoustical environment) [D2]

### *Important components of intervention programs*


10. Regardless of the intervention approach, important components of effective intervention programs include:
  - Family education and participation
  - Family support
  - Language development



- Auditory skill training
  - Speech-language therapy
  - Opportunities for the family to interact with deaf or hard of hearing adults and children
  - Professionals who have expertise with the selected intervention approach and with young children with hearing loss
  - Ongoing monitoring and periodic assessment of the child's progress [D2]
11. It is important to provide children with hearing loss with the opportunity for early peer social interaction. [D2]

*Individualizing interventions based on information from the assessment*

12. It is recommended that the use of any intervention be based on an assessment of the specific strengths and needs of the child and family. In assessing the strengths and needs of the child and family, it is important to recognize that:
- Young children with hearing loss differ in terms of their individual strengths and needs, as well as in their responses to specific intervention methods or techniques
  - Family strengths, understanding of hearing loss, need for support, and preferences for intervention options differ [D2]



**Early Intervention Policy** ❖ For children referred to the Early Intervention Program (EIP) in New York State, an Individualized Family Service Plan (IFSP) must be in place for children within 45 days of referral to the Early Intervention Official (EIO). The type, intensity, frequency, and duration of early intervention services are determined through the IFSP process.

In the process of developing the child and family's IFSP, services available through both the EIP 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 by their families.

*Importance of family participation*

13. It is important to recognize that the most positive outcomes generally result from early intervention aligned with a high level of parent participation.
- [C](Greenberg 1983/Greenberg 1984, Moeller 2000)

14. Regardless of the age at which the hearing loss is identified, it is still important to provide prompt intervention, including a high level of family participation, since this is important for improving language development. [C](Greenberg 1983/Greenberg 1984, Moeller 2000)

*Factors when considering intervention options*

15. In making a decision about implementing a specific intervention for a child with hearing loss, it is important that parents and professionals consider:
- The best available scientific evidence about the effectiveness of the intervention and alternatives
  - The developmental needs and skills of the child
  - The potential benefits as well as limitations, risks, or harms [D2]
16. When considering intervention options, it is important to take into account a variety of factors relating to the individual child and family. For example:
- The child's chronological age and developmental level
  - The type and severity of the child's hearing loss
  - Other developmental status
  - Coexisting problems, including vision, sensory function, motor coordination, and balance
  - Priorities, resources, and concerns of the family
  - Family stressors
  - Other therapies the child is receiving
  - The family's ability to participate in the chosen intervention
  - Language used by the child and the family
  - Community resources, such as child care [D2]
17. When selecting intervention strategies, goals, and desired outcomes for a young child with hearing loss, it is important that these:
- Be developed in conjunction with the participation of the parents
  - Be acceptable to the family
  - Take into consideration the ability of the family to participate in the intervention [D2]
18. For children whose hearing loss is associated with structural craniofacial abnormalities (such as ear atresias) or coexisting disabilities, it may be important to provide additional support to the family because of the potential impact of these conditions on:

- Decisions about communication and amplification approaches
  - Social interactions [D2]
19. For children with significant cognitive delays, it is important to take the cognitive delay into account when selecting intervention strategies. [D2]
  20. 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 primary health care provider (referred to as the child's "medical home") in order to assure appropriate medical involvement, health care supervision, and coordination of care. [D2]

*Considering the cultural context of the child and family*

21. 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 primary language when planning for and providing interventions for young children with hearing loss. [D2]
22. When selecting the language to be used in the intervention, important considerations include:
  - The parents' preference and the native language used in the home
  - Use of a language that will:
    - Facilitate and encourage interaction and communication between child and parent(s) at home
    - Allow the child to develop a firm foundation in a first language before introducing a second language to the child [D2]
23. It is recommended that direct interventions with the child be conducted by a professional who is fluent in the primary language of the child. [D2]
24. Because parent participation is such an integral 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 familiar with its culture. [D2]


*Using a translator and/or cultural informant*

25. If a professional fluent in the child and or family's primary language is not available, it is recommended that a specially trained translator interpret for the professional providing the intervention. [D2]

26. 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. [D2]

*Determining the intervention setting*

27. It is recommended that intervention be provided in settings that are matched to whatever best meets the needs of the child and family. [D2]




**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.

Early Intervention services can be delivered in a wide variety of home- and community-based settings. Services can be provided to an individual child, to a child and parent or other family member or caregiver, to parents and children in groups, and to groups of eligible children. (These groups can also include typically developing peers.) Family support groups are also available.

28. Regardless of the intervention setting, it is important for parents to have opportunities for interaction with parents of children with hearing loss. [D2]

*Ongoing monitoring and appropriate modification of the intervention*

29. 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. [D2]



**Early Intervention Policy** ❖ The Individualized Family Service Plan (IFSP) must be reviewed 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 parents and the Early Intervention Official (EIO) agree that a change is needed to better meet the needs of the child and family.

30. 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 speech-language skills) rather than specific, isolated physical findings (such as hearing thresholds). [D2]

31. It is recommended that parents be informed that the types of intervention and frequency of intervention may change over time. It is important for parents to understand 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, or increasing or decreasing the frequency or intensity of an intervention. [D2]

*Collaboration, coordination, and integration*

32. When planning a comprehensive intervention program for a child with hearing loss, it is recommended that if multiple intervention components are used, careful consideration be given to integrating the intervention components to make sure they are compatible and complementary. [D2]
33. 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. [D2]
34. 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. [D2]

*Professional experience*

35. It is recommended that regardless of the communication approach that is selected, professionals working with young children with hearing loss have experience and expertise regarding:
  - 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 [D2]

**Parent Participation, Parent Education, and Family Support**

Family participation in an early intervention program has been shown to be a significant factor in predicting child outcomes (Reamy 1992). A high level of

family participation may be the single most important factor in predicting positive linguistic outcomes (Moeller 2000).

Important components of family participation include:

- Participation in parent education programs
- Becoming effective/fluent users of the child's mode of communication and effective communication partners
- Actively participating in sessions
- Attending team meetings
- Learning how to advocate

An important aspect of promoting parent participation is ensuring that the family receives appropriate support and education specific to the needs of the child and family. Approximately 90% of children with severe-to-profound sensorineural hearing loss have parents with normal hearing (Carney 1998). 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. Providing support and education to parents and other family members is often a major component of the intervention.

Many of the recommendations in this section refer to family-focused (or family-oriented) interventions that include the parent/family as well as the child. Family-focused interventions include parent participation, parent education, and support systems for families. Family-focused interventions take into consideration the family's cultural context (values and beliefs), and the family's needs and goals.

### **Recommendations (Parent Participation, Parent Education, and Family Support)**


#### *Importance of family-focused interventions*

1. It is critical to recognize that parents are the primary decision makers for their children. The role of the professional is to provide information and other resources to support parents in their decision making. [D2]
2. It is important to recognize that the most positive outcomes for children with hearing loss generally result from interventions that begin early and include parent education and a high level of parent participation.

*[C](Greenberg 1983/Greenberg 1984, Moeller 2000, Watkins 1998, Yoshinaga-Itano 1998)*

3. Because of the importance of parent participation, it is recommended that regardless of the intervention setting, intervention for young children be family-focused (directed at the family as well as the child).

*[C](Greenberg 1983/Greenberg 1984, Watkins 1987, Watkins 1998)*



**Early Intervention Policy** ❖ Providers of early intervention services are required to make reasonable efforts to ensure that early intervention services delivered to eligible infants and toddlers are family centered, and that parents are included in all aspects of their child's services and in decision making about early intervention services.

*Including parents and family in intervention planning and implementation*

4. Because of the importance of parent participation in the intervention planning and implementation process, it is important to:
- Set achievable expectations
  - Take into account the other demands and priorities of the family
  - Provide opportunities for family members to express their hopes, goals, concerns, and needs regarding their participation
  - Allow time for parents to process information and to ask questions
  - Make information about interventions accessible to parents
- [C](Greenberg 1983/Greenberg 1984, Watkins 1987, Watkins 1998)*
5. It is important to involve siblings and other family members and caregivers, as well as parents, in the family-oriented interventions.

*[C](Greenberg 1983/Greenberg 1984, Watkins 1987)*

*Parent education*

6. Parent education is a critical component of providing family-focused interventions. It is recommended that 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 support and 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 [D2]

*Family support*

7. It is important for parents to have opportunities to:
  - Discuss their feelings about the diagnosis of the child’s hearing loss and their perception of the impact on the family
  - Receive support from peers and professionals
  - Receive professional counseling and support  
*[C](Greenberg 1983/Greenberg 1984, Moeller 2000, Watkins 1987, Watkins 1998)*
8. In some families, whether the parents are hearing or deaf, significant emotional and physical stress may be present, and professionals should take a proactive approach when assisting these families. [D2]

*Informing parents about interventions*

9. It is important to provide parents with information about:
  - What is known about the types and effectiveness of the various intervention options
  - The types of professionals who may be providing interventions and what each intervention involves [D2]



**Early Intervention Policy** ❖ Under the NYS Early Intervention Program, 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.

10. It is important that parents be given objective and comprehensive information regarding:
  - 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
- Effective advocacy
- Costs associated with the various options [D2]

*Selecting interventions*

11. It is important to recognize that parents may seek out and receive information about a variety of intervention approaches from multiple sources. 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. [D2]
12. It is important to recognize that regardless of the specific interventions being considered for a particular child, the decision-making process is generally the same. Tables 10 and 11 list suggested questions to ask when considering intervention options. [D2]

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**Table 10: Questions When Considering Intervention Approaches**

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- 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  
(Continued from previous page)*

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**Table 11: Questions When Selecting Intervention Service Providers**

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- 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 (and their families) with hearing loss?
- What experience do the teachers and/or therapists have working with children (and their families) 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.*

*(Continued from previous page)*

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*Role of the professionals working with the parents*

13. The role of the professional is to provide information and other resources to support the parents in their decision making. [D2]
14. To be helpful in supporting 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 [D2]
15. 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. [D2]
16. It is recommended that professionals provide education and support to parents that will help them to foster their child's development in all developmental domains. Education and support methods could include:
  - Providing parents with verbal, written, and/or videotaped information
  - Providing parents with information about other resources (books, articles, Web sites, support groups, etc.)
  - Providing parents with opportunities for hands-on training and supervision
  - Helping parents identify opportunities for participation in group information and support meetings
  - Enabling parents' participation in their child's intervention sessions
  - Offering opportunities for parents to talk to other parents and professionals who have had experience with the intervention and communication approaches being considered
  - Identifying opportunities for parents to visit various programs that serve children with hearing loss so that they can observe, when appropriate, the interventions being considered for their child
  - Communicating with adults and children who are deaf and hard of hearing [D2]

**COMMUNICATION INTERVENTIONS**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section includes recommendations for planning, selecting, and implementing communication interventions for young children with hearing loss. Topics include:

- Communication Approaches for Young Children With Hearing Loss
- Techniques to Facilitate Listening and Speech
- The American Deaf Community

*Basis for the recommendations in this section*

The recommendations about communication interventions for young children with hearing loss are based on a combination of conclusions drawn from the articles meeting the criteria for evidence and consensus panel opinion. The consensus recommendations address topics for which no literature meeting the criteria for evidence was found or for which the literature was not specifically reviewed as a focus of this guideline. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence. In the panel's opinion, these recommendations reflect appropriate practices for providing communication interventions for infants and young children with hearing loss and are generally consistent with the current knowledge in this field.

**Communication Approaches for Young Children With Hearing Loss**

A primary focus of early intervention for all children with hearing loss is to promote their communicative competence (JCIH 2000, Moeller 2000). As shown in Figure 5, 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 approaches used to communicate (convey information) range on a continuum from auditory (spoken) to visual (signs and cues), and combinations that include both auditory and visual approaches.

**Figure 5: Communication Approaches Model**

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

*The primary language*

The primary language shown in the top row of Figure 5 is the basic language that the child and family will use for communicating. Usually, it is the first language the child with a hearing loss will learn.

Most of the communication approaches are based on spoken English (or some other spoken language such as Spanish or French) as the primary language. Even if some type of signing or visual communication system is used, the signs or cues are usually used to support the primary language of the family, and they follow the grammar of the spoken language.

A few of the 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 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 different from English), with its own vocabulary, grammar, and syntax, although it has no written or spoken form (Reamy 1999). Approaches that use ASL as the primary language teach English as a second language.

*The auditory-visual language continuum*

The second row of Figure 5 depicts the auditory-visual language continuum. At one end of the auditory-visual language continuum are approaches that emphasize 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 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 as the primary language.

### *Specific communication approaches*

The specific communication approaches are shown in the bottom row of Figure 5. These various communication approaches are separated by dotted lines to indicate that there is not always a hard and fast distinction between the individual approaches. For example, the definition for a specific approach may vary somewhat depending on geographic location or professional discipline. Communication approaches are generally described as follows:

- *Auditory-Verbal* approach emphasizes that hearing is essential for developing spoken language. By using hearing (audition) as the primary way of acquiring language, this approach attempts to replicate the language learning process experienced by children who have normal hearing.
- *Auditory-Oral* approach also emphasizes the role of hearing with the goal of developing spoken language. However, this approach may add supplementary visual information from spoken language, such as lip reading (now referred to as “speech reading” because it involves watching the whole face, not only the lips).
- *Cued Speech* supplements spoken language visually through the use of eight handshapes to represent the consonants of speech, and four different hand locations near the face and neck to 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. Specific TC systems that convey specific English syntax are sometimes referred to as manually coded English (MCE) systems. Examples of MCE systems are Signed English, Signing Exact English, and Seeing Essential English (Gallinore 1996).
- *Simultaneous Communication (SimCom)* is sometimes considered a component of Total Communication. It is broadly defined as 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 in addition, 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 the signs.

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

#### *Decisions about communication approaches*

Because of the desire to provide intervention as soon as possible, parents are often involved in decision making about communication approaches as soon as their child has been diagnosed with hearing loss. There are many considerations that can enter into this decision, including factors relating to the child (such as the degree of hearing loss), the family, and the community.

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.

Regardless of the communication approach that the parents choose, family involvement in and commitment to the chosen communication intervention are important determinants in the success of promoting and developing the communicative abilities of the child.

#### **Recommendations (Communication Approaches)**

##### *General considerations for selecting a communication approach*

1. It is important to recognize that many children with hearing loss have sufficient residual hearing to develop spoken language as their primary form of communication. Most children with mild or moderate hearing loss will probably receive an auditory communication approach. [D2]
2. It is important to recognize that there are various communication approaches that parents of children with more significant hearing loss may choose in order to facilitate their child's communicative competence:
  - These communication approaches vary in their position on the auditory-visual continuum, as shown in Figure 5

- There is no one approach that has been shown to be best for all children with hearing loss and their families
  - For achieving specific goals (such as speech production), there is evidence that some approaches are more effective than others  
*[C](Greenberg 1983/Greenberg 1984, Robbins 1999, Watkins 1987, Watkins 1998)*
3. When parents are choosing a communication approach for their child, it is important to consider each option carefully and to consider the benefits and limitations of each approach. [D2]
  4. It is important to recognize that regardless of the communication approach, the most positive language outcomes generally result from providing intervention early.  
*[C](Watkins 1987, Yoshinaga-Itano 1998, 1998A, and 1998B)*
  5. It is recommended that professionals assisting parents in making decisions about communication approaches:
    - Be able to provide unbiased information about all of the basic communication approaches and the role of the parent in each
    - Recognize that the parents will need time to absorb and consider the information [D2]
  6. Regardless of the communication approach parents choose, it is recommended that the intervention program have ongoing parent training and education, and emphasize a high level of family participation in the intervention.  
*[C](Greenberg 1983/Greenberg 1984, Moeller 2000)*
  7. Because of the importance of family participation in the communication intervention, it is recommended that parents take into account factors that affect their family and their child when selecting a communication approach.  
*[C](Greenberg 1983/Greenberg 1984, Moeller 2000)*
  8. When parents select a communication approach, it is important to consider intervention program factors associated with the specific approach. For example, parents may base their decision regarding the communication approach on program factors such as availability, the intensity of services offered, the variety of services offered, setting, class size, or the experience of the teachers with a particular communication approach (Tables 10 and 11). [D2]



9. It is important to recognize that communication approaches are not necessarily mutually exclusive, and a family's choice of a particular communication approach may change over time as the child's and family's communication skills and requirements change. [D2]

*General considerations for providing a language-rich environment*

10. Optimal language development requires a language-rich environment. Regardless of the communication approach that parents select, 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 in children with hearing loss. [D2]
11. For children with hearing loss, it is important to enhance the environment and use strategies to facilitate their ability to communicate. Depending on the communication approach used by the child, it may be necessary to:
  - Provide bright lighting to facilitate speech-reading and reading signs
  - Consider assistive devices, as appropriate, such as doorbell signalers, telephone flashers, vibrating alarm clocks, captioning
  - Control the background noise in the home because it may make it more difficult to use residual hearing effectively
  - Have the child move closer to the speaker
  - Assist with focusing the child's visual attention on the speaker
  - Avoid situations in which the child cannot view the speaker's face [D1]
12. It is important to understand that language delays in children with hearing loss are usually not related to their cognitive potential. [D2]
13. For children with hearing loss, it is important to remember that reading to the child from an early age is an important way to facilitate learning, just as it is for children with normal hearing. [D1]
14. It is important that there be opportunities for multiple communication partners, including peers as well as adults. Communicating with comfort and ease in a variety of settings is socially and emotionally healthy for children with hearing loss. [D2]

*Auditory approaches*

15. 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 auditory access

to speech in a variety of listening situations. This is important because auditory approaches rely on hearing. [D2]

16. 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. [D2]
17. When using an auditory approach for a child with hearing loss, it is important to provide opportunities for the child to:
  - Maximize auditory potential during daily activities when the child is expected to listen and to speak
  - Participate in programs or activities (such as preschool or playgroups) in which they can interact with children with normal hearing and when spoken language is the only language used by the children at all times [D2]
18. If the family chooses to use an auditory-verbal approach, it is important to recognize that this intervention approach:
  - Integrates listening into the development of communication and social skills
  - Utilizes parents as primary facilitators of language in the child's natural settings
  - Has parents fully participate in sessions and become the primary models of spoken language
  - 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, lip reading, gestures, and signs) during therapy sessions
  - Teaches children to monitor their own voices and the voices of others in order to enhance intelligibility of their spoken language [D2]
19. If the family chooses to use an auditory-oral approach, it is important to recognize that this intervention approach:
  - Encourages parent involvement
  - 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 that 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 [D2]

*Using visual communication approaches to support English*

20. If parents select a visual communication approach to support English, such as cued speech, simultaneous communication, or total communication, it is recommended that amplification devices or a cochlear implant be used to allow the child to have optimal auditory access to speech in a variety of listening situations. [D2]
21. If parents select a communication approach that involves use of a visual system to support English, it is recommended that:
  - The child be encouraged to use and integrate the appropriate visual information (which may include signs, cues, speech reading, finger spelling, facial expressions, gestures, or body language) in addition to the auditory information
  - Those communicating with the child be encouraged to use and integrate the appropriate visual communication methods (which may include signs, cues, speech reading, facial expressions, gestures, finger spelling, or body language) in addition to providing auditory information
  - The professionals working with the child ensure a balanced use of visual input and spoken language [D2]
22. If the family chooses to use a visual communication system to support English, it is important to recognize that the intervention strategies include:
  - Ensuring that parents and other family members participate in training sessions to learn and become fluent in the visual communication system
  - Ensuring that parents use and facilitate both spoken and visual language in naturalistic settings
  - Teaching children to monitor their own voices and the voices of others in order to enhance the intelligibility of their spoken language [D2]
23. It is recommended that parents receive specific parent training on how to reinforce visual communication approaches to support English. For example:

- Matching the visual and auditory signals
  - Gaining and sustaining attention of the child (such as making sure the child's attention is directed to sounds and other input in the environment)
  - Drawing attention to the source of the communication (hands and face)
  - Modeling reciprocity (turn-taking and pausing in the communication process) [D2]
24. When visual communication systems are used to support English, it is important to use the system for all conversations when the child with hearing loss is nearby, even if the conversation is not directed at the child, because they otherwise might miss many language learning opportunities. [D2]

*Cued speech, total communication, and simultaneous communication*

25. 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. [D2]
26. If parents choose to use total communication (TC) or simultaneous communication (SimCom), it is important to recognize that:
- It takes time to learn to communicate using sign
  - Parents, family members, and professionals need more than a cursory knowledge of signs in order to convey spoken English fluently in sign [D2]
27. If parents choose to use TC or SimCom, it is important for parents to adopt strategies to enhance visual communication. For example:
- Focusing on the message and using every means possible to communicate
  - Learning and using signs for daily activities, feelings, and values
  - 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 [D2]

**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)
- 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 play groups, day care, or church
- Take pictures of locations and events: barber shop, dentist's office, doctor's office, grandma's house, baby sitter, 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, 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 the incorrect behavior. Draw a happy face on the correct behavior side and a sad face on the incorrect behavior side to help comprehension

**Table 12: Examples of Visual Supports for Communication Development**

- 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)*

28. It is important to recognize that 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 [D2]
29. It is important to recognize that in the bilingual and the Bi-Bi approaches, English is taught as a second language. [D2]
30. If the parents of a child with hearing loss choose an approach in which ASL is considered as the child’s primary language, it is important for them to be fluent in ASL so they can be good language models for the child. [D2]
31. To facilitate more rapid acquisition of the language, vocabulary, and grammar of ASL, it is important for parents who do not already know ASL to:
  - Learn ASL from a native user, a very experienced ASL user, or an ASL interpreter
  - Seek out ASL classes in the community and/or individual instruction in ASL [D2]
32. It is recommended that deaf role models, both adults and other children, be included as a component of programs that use ASL. [D2]
33. It is important that hearing parents who choose to communicate with their deaf children in ASL seek contact with members of the Deaf community. This will facilitate the parents’ learning of ASL as well as provide role models and additional language models for their children. [D2]

34. 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. [D2]
35. It is important to recognize that it may be difficult to find a traditional ASL classroom if a family is located 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 who have 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. [D2]

### **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

The presence of 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 speak so as to be intelligible to others. Speech intelligibility tends to get poorer as the degree of hearing loss increases. That is, children with mild to moderate hearing losses tend to have better speech than do 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 (Tye-Murray 1998).

Addressing the development of auditory skills through a listening skills program and addressing speech development through speech-language therapy are parts of a comprehensive approach to remediate the effects of hearing loss. Specific techniques to facilitate development of listening and speech are often used in various programs that have adopted either an auditory communication approach or an approach that supplements auditory information with some type of visual communication system such as cueing or signing. Children who have learned ASL as a primary language and who are learning English and spoken language

may also receive specific training in the development of listening skills and speech-language therapy when they learn English as a second language.

The techniques to facilitate the development of auditory skills and speech are based on the stages in which children with normal hearing show these skills. The auditory skills and speech skills are presented in Table 13 (below) and Table 14 (page 135), 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**

<b>Child's Listening Stage</b>	<b>Child's Auditory Skills</b>	<b>Parental Role</b>	<b>Professional Role</b>
<i>Detection</i>	<ul style="list-style-type: none"> <li>▪ Is aware of sounds</li> <li>▪ Becomes alert or turns to find nearby sounds if within audible range</li> </ul>	<ul style="list-style-type: none"> <li>▪ Draw the child's attention to sounds (environmental and voice)</li> <li>▪ Use voice to imitate the rate, pitch, and intonation pattern of sounds that differ from one another</li> </ul>	<ul style="list-style-type: none"> <li>▪ Help the parents establish the child's full-time wearing of the amplification or assistive device</li> <li>▪ Introduce and devise child-focused listening goals around environmental sounds and voice</li> </ul>
<i>Discrimination</i>	<ul style="list-style-type: none"> <li>▪ Hears the differences between two or more speech sounds</li> <li>▪ Learns to respond differently to different sounds</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use simple vocal sounds with consonant/vowel combinations during play (such as animal or vehicle sounds, mommy/daddy voices, happy/sad voices)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plan listening goals and activities around simple consonant and vowel sounds associated with age-appropriate toys</li> <li>▪ Encourage imitation skills of simple vocal sounds to establish an auditory perception/production loop</li> </ul>
<i>Vocal imitation</i>	<ul style="list-style-type: none"> <li>▪ Tries to match his or her own vocal production to the vocal sound heard</li> <li>▪ May imitate without understanding age-appropriate toys</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sing songs with simple melodies and vocabulary</li> <li>▪ Match movement with sounds</li> <li>▪ Pause frequently in a conversational style to encourage imitation by the child</li> </ul>	
<i>Identification</i>	<ul style="list-style-type: none"> <li>▪ Associates simple sounds and words with objects,</li> </ul>	<ul style="list-style-type: none"> <li>▪ Tell the child the names of important toys, people, and</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plan goals and activities around different types of</li> </ul>



**Table 13: Stages in Auditory Skill Development**

Child's Listening Stage	Child's Auditory Skills	Parental Role	Professional Role
	activities, and persons <ul style="list-style-type: none"> <li>▪ Shows understanding of auditory information by repeating, pointing, or choosing from a small set of objects or pictures</li> </ul>	actions, frequently repeating the words at meaningful times <ul style="list-style-type: none"> <li>▪ Make simple books with photos or pictures</li> <li>▪ Find toys or pictures that differ in features of speech (such as rhythm, pitch, or intonation)</li> </ul>	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
<i>Comprehension</i>	<ul style="list-style-type: none"> <li>▪ Demonstrates auditory attention and memory</li> <li>▪ Responds correctly to common phrases used in the context of home activities</li> <li>▪ Begins to answer questions instead of repeating them</li> <li>▪ Enjoys singing and listening to children's songs and stories</li> <li>▪ Shows steady increase in receptive language</li> <li>▪ Begins to learn from incidental language</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establish a regular story time</li> <li>▪ Use common phrases in meaningful situations</li> <li>▪ Sing children's songs with repetition and interesting sounds</li> <li>▪ Point out rhyming words, repeat, and listen</li> <li>▪ Ask simple questions frequently during conversation and story time</li> <li>▪ Help child learn to follow directions, show how to "listen and do"</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plan listening goals and activities around conversation skills, auditory comprehension of longer phrases and sentences, listening to stories, and answering questions</li> <li>▪ Include listening for more critical elements in sentences</li> <li>▪ Include activities to increase auditory memory skills</li> <li>▪ Include activities for listening with background noise and at a distance</li> </ul>

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**Recommendations (Techniques to Facilitate Listening and Speech)**

*Facilitating use of residual hearing*

1. It is important to recognize that most children with hearing loss have some amount of residual hearing. [D2]

2. For a child with hearing loss and who has residual hearing (particularly for a child involved in a communication approach that uses auditory information), 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 establish an effective program for maintaining the amplification or assistive device in optimal working condition and for helping the child wear the amplification or assistive device on a full-time basis [D2]
3. To enable children with hearing loss to use their residual hearing, it is important to provide specific training in the development of auditory skills. [D2]
4. It is important to recognize that the majority of children with hearing loss, regardless of age, degree of hearing loss, or communication approach, can benefit from training in auditory skills. [D1]


### *Facilitating development of auditory skills*

5. It is recommended that a listening skills program specifically focus on the development of the child's speech perception abilities through the use of hearing. [D2]
6. It is important for parents and professionals to have knowledge of the stages in auditory skill development (Table 13) and to recognize that different techniques can be used to facilitate listening, depending on the child's listening stage. [D2]

### *Facilitating use of speech*

7. For children with hearing loss, it is important to provide therapy for speech production in order to optimize the intelligibility of their speech. [D1]
8. It is important to use results from a speech evaluation to select the specific sounds to be included in the speech-language therapy goals. [D2]
9. It is recommended that therapy for improving speech production for children with hearing loss follow a developmental approach with a goal of maximizing age-appropriate communication skills. [D1]
10. For children with hearing loss and 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. [D1]

11. It is recommended that speech-language therapy be tied to ongoing evaluation of the child's progress and that modification of strategies be made as needed. [D2]
12. Modification of speech-language therapy strategies might be appropriate when any of the following occur:
  - Target objectives have been achieved
  - Progress is not evident
  - Regression is noted [D2]
13. In addition to ongoing monitoring and assessment, it is important to perform periodic comprehensive evaluations to assess the child's individual progress and to compare progress to age-expected development. [D2]
14. It is recommended that a comprehensive evaluation of the child's speech-language skills be performed at least on an annual basis. [D2]



**Early Intervention Policy** ❖ After the child's initial multidisciplinary evaluation, supplemental evaluations may be conducted when recommended by the IFSP team, agreed upon by the parent and Early Intervention Official, and included in the child's IFSP.

15. It is essential that professionals providing speech-language therapy to children with hearing loss have knowledge of speech-language development (Table 14), and have knowledge and expertise in working with this population because there are many techniques that can be used to optimize speech development in children with hearing loss. [D2]
16. It is recommended that the professional providing the speech-language intervention have knowledge of:
  - The results of the child's hearing aid fitting so that specific speech goals can be developed based on the audibility provided by the hearing aid or cochlear implant
  - The communication approach being used with the child in order to present speech and provide feedback about the child's speech in a way that is consistent with the child's intervention program [D2]

*Techniques to facilitate speech in children with hearing loss*

17. It is important to recognize that there are broad stages of typical speech development, which 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 [D2]
18. It is important to recognize that different techniques can be used to facilitate speech depending on the child's stage of speech development, age, and developmental maturity (Table 14). [D1]
19. 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. [D1]
20. 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. [D2]
21. Before starting each speech session, it is important to perform a routine listening check to ensure that the child's amplification device is working. [D2]
22. To select speech sounds, it is recommended that:
  - The child's aided audiogram be used to select sounds that are audible to the child
  - A developmental speech methodology (such as the Ling methodology) be used as a frame of reference
  - Vowel sounds be among the first sounds selected because a variety of clear vowel sounds constitutes a foundation for the development of natural voice for children with hearing loss
  - Specific speech sounds be chosen as target sounds and playful ways be devised to say the target sound when interacting with the child
  - A variety of sounds be used (such as short or long sounds with different pitch changes at different intensities) [D1]
23. 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 [D1]
24. It is recommended that all speech-language interventions, whether in formal speech-language therapy sessions or informal facilitation of speech sounds:
- Be positive and fun
  - Use sounds and words that are meaningful for the child
  - Gain interest by working at the child’s skill level
  - Allow the child to feel success when using his/her voice [D2]

**Table 14: Stages in Speech Training**

Stage	The Child’s Speech Abilities	Parental Role	Professional Role
<i>Spontaneous Vocalizations</i>	<ul style="list-style-type: none"> <li>▪ Babbles</li> <li>▪ Starts to learn that talking means vocalizing and that talking is pleasurable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Place emphasis on encouraging and reinforcing all the child’s vocalizing – not on correcting the child’s vocalizations</li> <li>▪ When the child vocalizes, respond</li> </ul>	<ul style="list-style-type: none"> <li>▪ Help the parents realize the importance of the child’s abundant vocalizations at early stages of speech development</li> </ul>
<i>On-Demand Vocalizations</i>	<ul style="list-style-type: none"> <li>▪ Can imitate and does so willingly</li> <li>▪ Tries to match his or her own vocal production to the vocal sound heard</li> <li>▪ May imitate without understanding</li> </ul>	<ul style="list-style-type: none"> <li>▪ With the help of a professional, devise playful ways to say the target sounds when interacting with the child</li> </ul>	<ul style="list-style-type: none"> <li>▪ May begin formal speech training, and begin to correct child’s speech</li> <li>▪ Plan speech goals and activities around simple consonant and vowel sounds</li> <li>▪ In selecting sounds, use the child’s aided abilities and a developmental speech methodology as a guide</li> <li>▪ Help child develop and improve breath control for speech</li> </ul>

**Table 14: Stages in Speech Training**

<b>Stage</b>	<b>The Child's Speech Abilities</b>	<b>Parental Role</b>	<b>Professional Role</b>
<i>Expressive Language – Words</i>	<ul style="list-style-type: none"> <li>▪ Associates simple sounds and words with objects, activities, and persons</li> </ul>	<ul style="list-style-type: none"> <li>▪ Listen carefully to the child's vocalizations</li> <li>▪ Provide vocabulary with certain target sounds for practice and development of expressive, meaningful language</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plan speech goals and activities</li> <li>▪ 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</li> </ul>
<i>Expressive Language – Longer Utterances</i>	<ul style="list-style-type: none"> <li>▪ Child begins to use longer utterances</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide opportunities for the child to use certain target sounds in longer utterances</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plan speech goals and activities</li> <li>▪ 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</li> </ul>

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**Table 15: Examples of Activities to Stimulate Speech**

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**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

**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, which 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 that the child can be prompted to use spoken language more
- 

**The American Deaf Community**

In today’s diverse society, the American Deaf Community has become a visible and important segment. Members tend to capitalize the term *Deaf* because they view the Deaf Community as a cultural entity. For communication purposes, the American Deaf Community places a premium of value on American Sign Language (ASL). ASL is a complete language in its own right and is totally independent of English.

At one time, a majority of the American Deaf Community was traditionally educated at residential schools for the Deaf where transmission of cultural values occurred routinely as a part of the educational process. Over the past few decades, however, there has been a movement towards mainstreaming Deaf children into schools with normal hearing. Now, only approximately 20% of school-aged children identified as deaf are attending the residential programs that traditionally have transmitted knowledge of Deaf culture. Despite the decline of state residential school enrollments, the popularity of ASL has continued to grow as evidenced by the large number of classes being held in local communities.

The National Association of the Deaf (NAD), the main consumer organization of the American Deaf Community, has supported early identification of deaf and hard of hearing children and has fully endorsed early intervention efforts guided by the following principles (Rosen 2001):

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

### **Recommendations (American Deaf Community)**

1. 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. [D2]
2. 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. [D2]
3. It is important to remember that ASL is the primary language of the American Deaf Community. However, ASL may not be the only language used by individuals within the Deaf community (some individuals may use other written and/or spoken languages). [D2]



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**AMPLIFICATION DEVICES**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section includes recommendations related to the use of amplification devices (hearing aids) for young children with hearing loss.

*Basis for the recommendations in this section*

The recommendations about amplification devices for young children with hearing loss are based on a combination of conclusions drawn from the articles meeting the criteria for evidence and consensus panel opinion. The consensus recommendations address topics for which no literature meeting the criteria for evidence was found or for which the literature was not specifically reviewed as a focus of this guideline. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence. In the panel's opinion, these recommendations reflect appropriate practices for providing amplification devices to children with hearing loss and are generally consistent with the current knowledge in this field.

Amplification devices are sensory aids that are designed to make speech and other environmental sounds louder so that they are perceptible to individuals who have a hearing loss. Most young children with hearing loss use hearing aids as their primary sensory aid (Carney 1998).

When amplification is provided, many children with hearing loss become able to use auditory information for communication, including development of spoken language. When sounds (particularly speech sounds) are amplified, the goal is to maximize audibility such that all sounds in speech (low and high frequencies) are:

- Above a child's hearing threshold, and
- Within a range that is comfortable and within safe listening levels (Bess 1996).

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 and/or further damage to the inner ear may result. Therefore, the selection and fitting of amplification is an important component of the early intervention

process for infants and young children with hearing loss (Bess 1996). Selecting appropriate amplification is the first step in the intervention process.

### *Types of hearing aids*

Hearing aids vary not only in style but also in many other advanced technology options regarding circuitry, signal processing, number of channels, and memory. The criteria for selecting appropriate hearing aids for infants and young children are more complex than those for adults. Hearing aid options vary in cost, flexibility, ease of use, and durability; all of these are considerations when providing amplification to infants and young children. The most common styles of hearing aids include:

- *Behind-the-ear (BTE)* hearing aids that fit behind the pinna (external part of the ear), with the amplified sound traveling to the ear canal through a custom-fit earmold
- *In-the-ear (ITE)* hearing aids that fit entirely in the concha and ear canal
- *Body-style* hearing aids, which are located in a case worn on the chest and connect to the earmold via a cord
- *Bone-conduction* style hearing aids, which consist of a microphone worn on the head or body connected to a bone-conduction vibrator worn on the head, usually behind the ear
- *FM auditory systems* that include a receiver for the child and a microphone for the speaker

Hearing aids that fit behind the ear (BTE hearing aids) are most often used for infants and young children for several reasons. BTE hearing aids are usually durable, safe, and sufficiently flexible to meet the listening requirements specified by the prescriptive fitting procedure. Furthermore, many BTE hearing aids today provide the option to use the hearing aid with FM auditory systems.

The FM listening option is considered an important feature for infants and children who are using their residual hearing to acquire spoken language because when the FM system is used, the problems of background noise and distance between the child and the speaker are greatly reduced. Infants and young children generally use their hearing aid plus FM system in noisy situations (such as day care, intervention programs, or other group situations) or when distance separating the child and speaker reduces the overall intensity of the speech signal arriving at the child's ear (such as on the playground or at the supermarket). Therefore, while once considered only an educational device (for

use only in the classroom setting), FM systems coupled with the child's own hearing aid are used increasingly in the home and other settings.

Hearing aids that fit within the ear (ITE) are not generally used for infants and toddlers because their rapid growth would require too many changes in the hearing aid casing. Furthermore, ITE hearing aids pose a risk for injury to the ear in active children because the hard case might shatter in the event of a fall or a blow to the head.

Body-style hearing aids are usually used when physical complications make head-worn amplification less appropriate or when a higher gain is required (Marlowe 1994). Bone-conduction style hearing aids are used for certain types of permanent conductive hearing loss that cannot be medically or surgically corrected.

In addition to the basic style of the hearing aid, there are numerous other choices to make when selecting a hearing aid. Circuitry options for hearing aids include analog and digital, as well as digitally programmable options designed to increase flexibility. Signal processing capabilities can range from linear to various nonlinear options designed to enhance soft speech sounds and reduce potential distortions.

Devices can be single channel or multichannel. They can have single or multiple memories to permit the parent to make choices between different electroacoustic characteristics of the hearing aid depending on the listening environment.

#### *Process of hearing aid fitting*

Fitting an infant or young child for hearing aids is a process that includes several steps (Bess 1996). The first step is to make custom earmolds. This is done by:

- Making an impression of the ear and ear canal using a quick setting silicone material and then sending the impression to an earmold laboratory for fabrication of the earmold.
- Making modifications according to the amplification, comfort, and acceptability needs of the child.

Although the process of making earmold impressions may be accomplished easily with young infants and is not uncomfortable, it may be more difficult with older infants and toddlers who are more active and less cooperative. Distraction techniques usually allow sufficient time for the impression to be made (approximately 15 minutes).

### *Challenges of fitting hearing aids in infants and 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 initially fitted to a young child.
- Infants have smaller ears than do older children and adults. A young child's closed ear canal volume (the physical space between the end of the earmold and the eardrum) is one to two times smaller than an adult's. Therefore, the amplified sound from a hearing aid will be different in a child's ear than it will be in an adult's ear.
  - In small ears, a specific hearing aid will produce higher sound pressure levels than in adult-sized ears. These higher sound pressure levels could lead to unsafe levels of sound delivered to the inner ear and to loudness discomfort problems.
  - The resonant frequency of the closed ear canal is higher in infant ears than it is in adult ears.
  - There is a greater possibility that a hearing aid will produce acoustic feedback (ringing or whistling).
- It may be difficult to achieve a comfortable fit of the hearing aid behind the young child's ear. Keeping the hearing aid in position may be difficult, because of the size of the ear.

Infants and young children learning language for the first time through hearing (audition) require:

1. An overall louder signal to detect and differentiate speech sounds accurately, and
2. A greater difference between the loudness of the speech signal and any interfering background noise (signal-to-noise ratio) than do adults to perform optimally on listening tasks (Nozza 2000)

The limited language ability of infants and young children makes it necessary to fit amplification without the benefit of subjective responses or judgments. Therefore, procedures to fit hearing aids that were originally developed for adults or older children are often not applicable for infants and young children. However, many infants are being fit for hearing aids within the first months of life because children are now being diagnosed with hearing loss at an earlier age.

*Amplification selection and fitting approaches*

Recently, new methods have been developed that allow audiologists to fit hearing aids and other amplification devices to infants and young children. These are termed *prescriptive hearing aid selection and fitting procedures* (Seewald 1995). These procedures can:

- Account for individual ear canal and earmold effects
- Base initial fittings on limited amounts of audiologic information
- Avoid the need for subjective judgments by the child
- Select hearing aid characteristics for the child, including:
  - Gain (the amount of amplification at each frequency)
  - Maximum output (the loudest signal produced regardless of the magnitude of the input signal)
- Verify that the amplified sound:
  - Is audible but does not exceed loudness discomfort levels
  - Is within an optimum range for use by the child across the speech frequency range

Prescriptive hearing aid fitting procedures require instrumentation that can measure:

- Electroacoustic characteristics (gain, output, and distortion) of amplification devices (sometimes called a hearing aid test box)
- Individual acoustic characteristics of the child's ear (called real-ear measurements) made by using a tiny probe-microphone that is placed in the child's ear canal

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 (19 NYCRR Part 192, Section 192.13). ([www.dos.state.ny.us/lcns/pdfs/hearlaw.pdf](http://www.dos.state.ny.us/lcns/pdfs/hearlaw.pdf), page 34)

*Validation and follow-up*

The process of providing amplification to infants and young children with hearing loss also includes teaching parents and caregivers how to operate and care for the hearing aid as well as performing periodic ongoing monitoring to

ensure that the hearing aid is functioning and adjusted appropriately for the child's current audiologic status (Elfenbein 2000).

With young children, repeated visits to further individualize the child's amplification are important. Earmolds need to be changed frequently as the child's ears grow. This is particularly true during the first year of life (Seewald 1995). Moreover, as more audiologic information is acquired, adjustments to the amplification (using the prescriptive procedure) are necessary to ensure optimum hearing aid use. Therefore, audiologic, electroacoustic, and real-ear measures are made repeatedly during the early years of life (Gravel 2000).

Validating that the child is benefiting from the amplification is part of an ongoing speech, language, and listening skills program (Harrison 2000).

### **Recommendations (Hearing Aids)**

#### *Importance of providing early amplification*

1. It is important to recognize that:
  - For the majority of children with hearing loss, amplification devices can provide benefit and access to sound and speech
  - No child is too young to use some form of amplification device (it is possible to begin hearing aid use as young as 3 to 4 weeks of age)
  - Consistent and early use of appropriate amplification is critical to the optimal development of spoken language  
*[C](Ramkalawan 1992)*
2. It is recommended that the use of amplification be initiated as soon as possible after the hearing loss is confirmed. Early referral for hearing assessment and hearing aid fitting is correlated with better levels of expressive spoken language (at mean age of 5 years) for children with mild to severe hearing loss.  
*[C](Ramkalawan 1992)*
3. It is recommended that children with hearing loss begin use of amplification devices as soon as possible (ideally within 1 month of confirmation of the hearing loss) when use is appropriate and agreed on by the family. [D2]



**Early Intervention Policy** ❖ Personal amplification devices are considered assistive technology (AT) devices under the NYS Early Intervention Program (EIP).

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

*General considerations for use of amplification*

4. It is recommended that professionals who fit all forms of amplification devices to children, including personal hearing aids, FM systems, and other assistive technologies, have the knowledge, expertise, and equipment necessary for use with current pediatric hearing aid selection and evaluation procedures. [D2]
5. It is recommended that amplification for infants and young children provide them with optimal access to speech in a variety of listening situations. [D2]

*Providing information to parents*

6. When amplification devices are recommended, it is important that parents be provided with information about the types of hearing aids, assistive technologies, and other amplification options and choices available for their child. It is important to give the parents time to understand the issues and information. [D2]
7. It is recommended that the professional take time to explain the steps in the process of obtaining hearing aids. This is important because parents need to have a clear understanding of the process, the timeline, and other considerations (such as the costs) in acquiring the amplification device so that they can make informed decisions regarding amplification options for their child. [D2]
8. It is important that parents be given 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 (during all waking hours)
  - Existence of developmental disabilities or associated health conditions in addition to the hearing loss [D2]
9. It is important for parents to understand that even with amplification devices (hearing aids and FM systems), a child with a hearing loss may not perceive sounds in the same way as a child with normal hearing. For example, when using an amplification device:
- 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 some background noises [D2]
10. It is recommended that parents and caretakers participate in the demonstration and ongoing training in the use of the amplification device. It is important that comprehensive and clear verbal and written information be included as part of the educational and training processes. [D2]
11. It is recommended that parents, professionals, and other caregivers working with a child receive information and training about how to use and care for the amplification devices for the child directly from an individual who is experienced and knowledgeable about the child's specific device. For example, it is important that parents, professionals, and caregivers 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 the unit
  - Basic troubleshooting when the device is not working
  - What to do and who to call if the device is not working [D2]
12. It is recommended that parents be responsible for monitoring the hearing aid daily and for troubleshooting problems. It is important for parents and



caregivers to be taught how to care for and maintain the hearing aid, and to be provided with accessories to do so (such as a battery tester, listening stethoscope, dri-aid kit, air blower, and wax loop). [D2]

13. It is important that parents be informed about techniques for preventing the child from removing or destroying the hearing aids (such as having the child wear a special head bonnet or headband). [D2]
14. It is important to consider the ongoing need for earmolds and spare parts, and to plan for these in advance. It is recommended that this be a shared responsibility between parents and professionals. [D2]
15. It is recommended that the purchase of hearing aid insurance to cover loss or damage be considered. [D2]

*Steps for obtaining amplification devices*

16. It is important to remember that the amplification acquisition process may begin with hearing aids that are loaned to the child for some period of time. These loaner amplification devices are used until the professional makes the final recommendation of a specific hearing aid to the parents. [D2]
17. It is recommended that the steps for obtaining amplification devices 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
  - Selecting and fitting the electroacoustic characteristics of the hearing aids (electroacoustic characteristics means the sound levels produced by the hearing aid, as a function of frequency, as measured by specific test equipment)
  - Evaluating (verifying) the hearing aids 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 for the hearing aids proper functioning
  - Validating that the child is developing functional communication and listening skills through hearing aid use [D2]
18. It is recommended that loaner hearing aids or FM systems be available to infants and children in order to provide:
  - Prompt initiation of hearing aid use

- Opportunity for ongoing hearing aid evaluation prior to recommendation for personal hearing aids or FM systems
- Continued use while hearing aids are being repaired
- Opportunity to try other assistive listening device technology [D2]

### *Considerations about bilateral and unilateral hearing losses*

19. It is recommended that when hearing loss is present in both ears (bilateral hearing loss), a hearing aid be fitted to each ear (binaural amplification) unless there are audiologic or medical contraindications. Audiologic and medical contraindications to binaural hearing aid fitting include:
  - Structural malformations of the outer ear including:
    - Absence of the pinna (external part of the ear)
    - Complete atresia (closure) of one ear canal
  - Asymmetrical hearing loss such as moderate loss in one ear and profound hearing loss in the other [D2]
20. It is important to remember that the use of binaural hearing aid 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 [D2]
21. It is important to remember that children who cannot be fitted with conventional hearing aids or FM systems because of bilateral structural malformations of the outer ears or complete atresia (closure) of both ear canals may benefit from amplification through the use of bone-conduction hearing instruments. A hearing instrument attached to a small oscillator (vibrator) is worn on the head. Sound is conveyed to the inner ear by bone-conduction (vibration of the bones of the skull). [D2]
22. It is recommended that an amplification device be considered for infants and children with unilateral hearing loss (hearing loss in one ear and normal hearing in one ear) unless there are audiologic or medical contraindications. Audiologic and medical contraindications to hearing aid fitting for children with unilateral hearing loss include:
  - Structural malformations of outer ear (such as absence of the pinna)
  - Unilateral atresia (complete closure of one ear canal)
  - Severe or profound unilateral hearing loss. This is because use of a hearing aid on the ear with this degree of hearing loss may:

- Distort sounds relative to the same sounds heard in the normally hearing ear
- Amplify noise that could be distracting or hinder the child’s listening abilities [D2]

*Earmold considerations for the fitting of amplification*

23. It is recommended that custom earmolds be made for the child as soon as the decision has been made to initiate use of amplification. [D2]
24. It is recommended that a professional with experience and knowledge take earmold impressions in infants and young children. The process can be more difficult and challenging with infants and young children than with older children and adults because of the size of the ear canals and the frequent and unexpected movements of young children. [D2]
25. It is recommended that:
  - Earmold impressions for young infants be made using appropriate size tools (for example, a pediatric syringe that will easily deliver the impression material into the child’s ear canal)
  - Earmolds for infants and young children be fabricated from soft, nonallergenic materials to reduce the likelihood of any discomfort associated with wearing the earmolds [D2]
26. It is recommended that earmolds be replaced as needed. The most common sign that an earmold needs to be replaced is the presence of acoustic feedback (whistling) during normal use. [D2]
27. It is important to recognize that earmolds may need to be replaced frequently with infants. In infants under 6 months of age, it may be necessary to replace the earmolds monthly. [D2]

*Audiologic considerations for the fitting of amplification*

28. It is important that amplification devices be provided to the child soon after the hearing loss is confirmed. The fitting of hearing aids can 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 precluded 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 [D2]
29. It is important to remember that the absence of a conventional click evoked ABR does not 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 aids or FM systems. [D2]
  30. 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. [D2]
  31. It is important to remember that 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 to refine the hearing aid fitting and to measure the functional benefit of the amplification device. [D2]
  32. It is important to remember that infant audiologic visits may be needed as frequently as once a month to ensure optimal amplification device fitting because:
    - Behavioral responses are needed to optimize the fitting since generally there is insufficient frequency-specific information from the ABR alone to fully individualize the hearing aid fitting for the child
    - The attention, motivation, and tolerance of an infant may not allow sufficient or complete audiologic information to be collected in a single visit
    - For children who have no recordable ABR, information regarding residual hearing can be obtained only with behavioral measures
    - There may be either a permanent or temporary change in hearing sensitivity that will require adjustment of the hearing aids. For example:
      - Hearing loss may progress in some children, especially in the first months of life, due to genetic or certain neonatal conditions.
      - The presence of otitis media with effusion (fluid in the middle ear) may result in a temporary worsening of hearing sensitivity [D2]

*Hearing aid selection and fitting considerations*

33. 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 aid battery is small and therefore a choking hazard, or could be harmful if swallowed)
  - Volume control cover (to prevent the child from changing the volume) [D2]
34. It is recommended that all hearing aids prescribed for infants and young children offer a range of coupling options to make the hearing aid compatible with other assistive technologies. It is important that a hearing aid have multiple coupling options 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 aid and other equipment such as a microphone, television, or audiotape recorder
  - Telecoil option for listening on the telephone [D2]
35. It is recommended that hearing aids selected for use with infants and young children have flexible electroacoustic characteristics. Flexibility means that the sound levels and frequency response characteristics of the hearing aid can be adjusted easily to meet the auditory needs of the child over time. [D2]
36. It is recommended that the specific electroacoustic characteristics of the hearing aid used in each ear be determined using a prescriptive amplification fitting procedure. This is a method that specifies the amount that the sound input to the hearing aid will be amplified (gain) and the maximum limit (output) that sound will be amplified in the child's ear. [D2]
37. It is important to use a prescriptive amplification fitting procedure to ensure that amplified speech is audible, comfortable, and safe for the child. One current prescriptive fitting procedure specifically designed for use with infants and children is the Desired Sensation Level (DSL) approach (Seewald 1995). [D2]
38. It is recommended that prescriptive amplification fitting targets for gain and output levels of the hearing aid:

- Be determined across the frequency range important for speech perception (250-6,000 Hz)
  - Account for the specific acoustic characteristics of the external ears of the child (by measuring the acoustic characteristics of each ear directly and then using those measures in fitting the hearing aid)
  - Account for the child's growth and developmental changes in the ear canal, particularly in the first year of life [D2]
39. It is recommended that the child's real-ear-to-coupler difference (RECD) be measured each time the child's earmold is changed. (The RECD is a measure to individualize the hearing aid fitting for the child.) [D2]
40. After the initial fitting of the hearing aids, it is recommended that monitoring of amplification be completed at least every two to three months. It is important for long-term monitoring of amplification to include:
- 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 aids for developing communication and listening skills, and determining that progress in these areas is commensurate with the child's age and cognitive abilities [D2]

### *Hearing aid evaluation (verification) considerations*

41. If functional benefit cannot be demonstrated through progress in communication and auditory skill development, it is recommended that a reassessment of the amplification device fitting be completed. [D2]
42. It is important to remember that for children who are not developing auditory or communication skills with conventional hearing aids, an alternative assistive device may need to be considered (for example, an FM system or cochlear implant). [D2]
43. It is important to recognize that responses obtained while the child is wearing the hearing aids (an aided audiogram) should not be used to set or change the electroacoustic characteristics of the hearing aids. This is important because the aided audiogram:
- Depends on obtaining reliable behavioral responses from the child
  - Provides information about only the softest sounds a child can hear

- Provides no information about how the child hears speech
- Indicates responses at only a limited number of frequencies
- May be influenced by background noise in the test booth or internal noise of the hearing aid [D2]

44. It is recommended that the functional benefits of amplification be examined regularly. This can be conducted in both the test booth and the infant's typical listening environment. The purpose of an aided assessment is to demonstrate what speech sounds the child may or may not detect and to monitor the development of auditory milestones, in particular, the perception of speech. [D2]

*Validating the effectiveness of amplification*

45. It is important to recognize that the process of validating the child's effective use of amplification is ongoing. [D2]
46. It is recommended that the perception by parents and by the professionals working with the child regarding the child's ability to use and hear with the amplification device be incorporated into the hearing aid validation process. [D2]
47. It is important that documenting progress in auditory skills be part of the validation process. [D2]

*FM systems*

48. It is recommended that amplification for infants and young children provide them with optimal access to speech in a variety of listening situations. For some children, this is best accomplished through the addition of FM technology to their hearing aid. This may be helpful in environments with particularly high noise levels. [D2]
49. For some children with severe and profound hearing loss, a combination hearing aid with FM system may be recommended as the primary form of amplification. [D2]

*Tactile aids*

50. It is important to remember that a tactile aid, in certain circumstances, may be beneficial for children with profound hearing loss. 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. Candidates for tactile aids include children who are:

- Born with no cochleae (no inner ears, also known as Michel Aplasia)
  - Potential cochlear implant candidates during preimplant evaluation and training
  - Not candidates for cochlear implants because, for example, they are considered medically fragile or because their parents choose not to have cochlear implant surgery [D2]
51. It is recommended that whenever possible, the tactile aid be used in conjunction with a hearing aid. [D2]

### *Frequency transposition hearing aids*

52. If a frequency transposition hearing aid is being considered, it is important to check the child's high-frequency residual hearing. If a behavioral audiogram indicates that sufficient high-frequency residual hearing is present, the transposition of speech may not be necessary. [D2]

### *Considerations for new amplification technology*

53. It is important to consider the potential advantages of new hearing aid technology when selecting hearing aids for infants and young children. When considering whether or not new technology would be beneficial for a particular child, it is important to consider whether:
- Evidence exists that the new technology is beneficial for use with children
  - The electroacoustic characteristics of the hearing aid can be measured
  - The hearing aid can be fit using a prescriptive fitting procedure
  - The new technology provides listening options not available on the child's current hearing aid [D2]



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**MEDICAL AND SURGICAL INTERVENTIONS**

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Evidence Ratings:

[A] = Strong [B] = Moderate [C] = Limited

[D1] = No evidence meeting criteria [D2] = Literature not reviewed

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This section includes recommendations for medical and surgical interventions for young children with hearing loss. Topics include:

- Cochlear Implants
- Other Medical and Surgical Interventions

*Basis for the recommendations in this section*

The recommendations about medical and surgical interventions for young children with hearing loss are based on a combination of conclusions drawn from the articles meeting the criteria for evidence and consensus panel opinion. The primary focus of the literature review for this section was related to cochlear implants. While some literature was reviewed related to other topics in this section, an exhaustive review of the general medical/surgical literature was not conducted. Some of the recommendations are based on information from review articles that were considered by the panel in the absence of specific studies meeting the criteria for evidence. In the panel's opinion, these recommendations reflect appropriate practices for medical/surgical interventions for children with hearing loss and are generally consistent with the current knowledge in this field.

**Cochlear Implants**

A cochlear implant is an electronic device that is implanted surgically, allowing the recipient to receive auditory information by electrical stimulation of the cochlear portion of the ear. At the present time, the device is usually implanted in only one ear, although there are studies underway examining the benefits of bilateral (both ears) implants.

A cochlear implant consists of two components. An internal portion includes a receiver/stimulator and electrode system, which is surgically implanted behind the ear, with the electrode positioned in the cochlear portion of the inner ear. The external components include a microphone, a speech processor, and an antenna. The speech processor may be a body-worn or behind-the-ear device.

A cochlear implant is designed to provide useful 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 provide increased access to sound and to help the child develop or improve oral communication.

### *Indications for cochlear implants*

Not every child with hearing loss is a candidate for a cochlear implant. Indications are evolving over time. 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

Cochlear implant teams (surgeons and audiologists interacting with speech-language pathologists, educators, and others) and parents can make decisions outside the indication guidelines, as appropriate, for an individual child and family. The process of determining candidacy for cochlear implantation involves audiologic testing, electrophysiological testing, family assessments, speech-language assessments, psychological assessments, medical assessments, and radiological assessments.

### *Contraindications*

Contraindications to cochlear implants generally include:

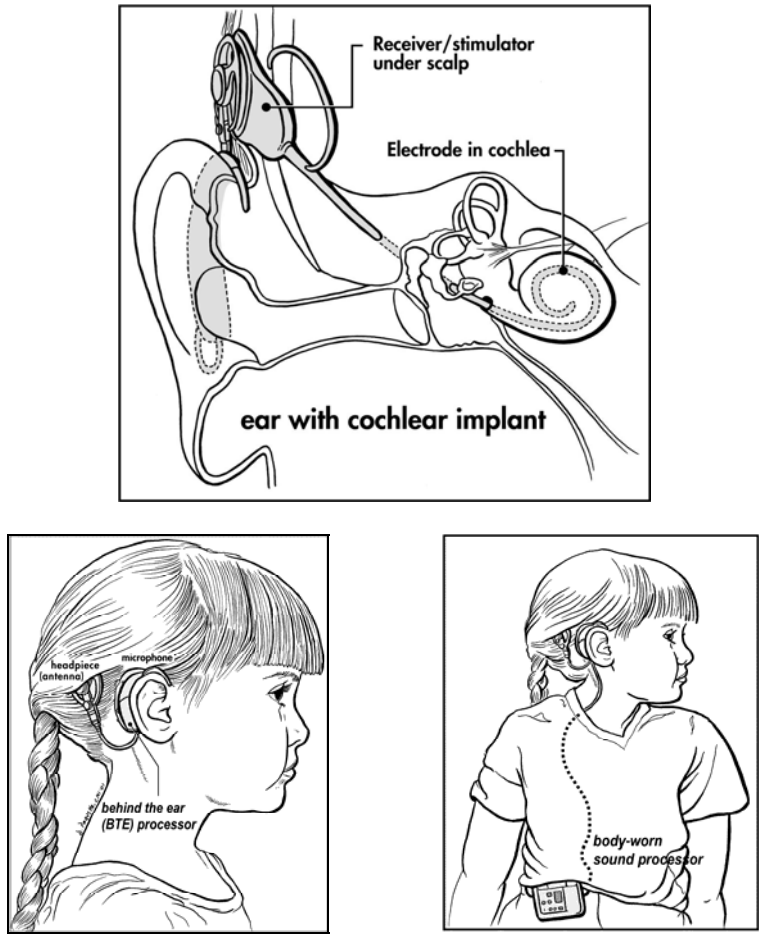
- Absent cochlea or cochlear vestibular nerves
- Active ear infections (may delay implantation)
- Medical contraindications to surgery (e.g., serious medical conditions that prohibit general anesthesia)

- Coexisting conditions or factors that limit the child's ability to tolerate the implant

*How a cochlear implant works*

The microphone receives the sound and transmits an electronic signal to the speech processor (Figure 6). 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. (Brookhouser 1999, Slattery 1999)

Figure 6: Components of Cochlear Implant Systems



*Devices currently approved for use with deaf children*

There are several multichannel cochlear implant devices that are currently available. Several of these have been approved by the FDA, and a few others are currently being used in clinical research trials with young children.

These systems differ in the design of the implanted devices as well as in their speech-processing strategies. Speech-processing strategies are constantly being revised. Without changing the implanted electrodes, changing the external speech processor can result in improved speech recognition.

Parents and the cochlear implant team choose the device to be implanted after discussing the options and features of each device. Some centers implant only one device, and others offer all available devices.

#### *Cochlear implant surgery and programming*

Regardless of the type of device implanted, the surgery usually involves the same steps to insert the electrode array into the cochlea and place the receiver/stimulator. The electrodes may disrupt any residual hearing in the implanted ear. The implant team and parents 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 postoperatively. 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. 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).

#### **Recommendations (Cochlear Implants)**

##### *Indications for cochlear implants*

1. It is recommended that children be considered for cochlear implantation if they demonstrate little benefit from hearing aids, lack progress in the development of auditory skills and speech, and are:

- Age 12 months to 24 months with profound hearing loss, or
- Age 24 months or older with severe to profound hearing loss [D2]



**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. 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.

2. If the family goals do not include the use of spoken language with the child, a cochlear implant is not recommended. [D2]
3. When making a decision about whether or not to perform a cochlear implant, it is important to consider the following factors:
  - Degree of residual hearing
  - Degree of improvement expected with the cochlear implant
  - Parental interest and communication approach used in the home
  - Degree of benefit from a hearing aid trial
  - Availability of appropriate intervention follow-up services to allow the child to get maximal benefit from the cochlear implant
  - Financial considerations [D2]
4. If a young child receives a cochlear implant, it is essential that the communication approach for that child incorporate hearing and spoken language. [D2]

### *Reasons for early implantation*

5. Reasons for early implantation in children (less than 3 years old) with severe to profound hearing loss include:
  - Children who receive early implants may have better outcomes (speech recognition and intelligibility) than children who receive implants at a later age
  - There does not appear to be increased medical risk from early implantation compared with later implantation [D1]
6. For infants who develop profound hearing loss due to meningitis, it is important to do implantation early after the meningitis episode since the

cochlea can ossify (fill with bone) and may prevent optimal electrode insertion. [D2]

*Considerations for determining the indications for cochlear implant*

7. It is recommended that the decision to perform a cochlear implant not be based solely on the results of the behavioral audiogram or electrophysiologic studies. [D2]
8. It is important that children who are candidates for a cochlear implant receive sufficient experience with well-fitting amplification and enroll in a program focused on the development of listening skills (auditory training) to determine whether or not the child will benefit from amplification or other assistive technology. The trial period with amplification may vary depending on a number of factors such as:
  - Age of identification
  - Etiology of hearing loss
  - Amount of residual hearing
  - Progress or lack of progress
  - Recurrent otitis media
  - The amount of time the child actually wears the hearing aid [D1]

*Contraindications and risks*

9. At this time, cochlear implants are not recommended for children with lesser degrees of hearing loss because:
  - It is expected that children with 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 [D2]
10. 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 (particularly for children whose implants have a positioner)
  - Cerebral spinal fluid (CSF) leak

- Electrode migration
- Anesthesia risk [D1]

*What parents need to know/ask*

11. It is essential that there be postimplant training after the child has received the implant, including ongoing comprehensive intervention to develop listening skills (auditory training) and speech-language therapy to maximize the benefits of the device. [D1]
12. It is important to understand that the child's ability to hear is dependent on the device. Without the device, the child is not able to hear. [D2]
13. It is important to recognize that having an implant does not preclude the use of signing or cued speech. Some habilitation plans may continue use of signing or cueing. [D2]
14. There is a growing body of evidence indicating that in children with severe-to-profound sensorineural hearing loss, a cochlear implant in conjunction with other interventions can:
  - Enhance speech perception
  - Enhance speech production and speech intelligibility
  - Enhance language acquisition
  - Augment education
  - Increase visual attention

*[C] (Brackett 1998, Miyamoto 1997/Robbins 1997, Miyamoto 1999, Nikolopoulos 1999, Svirsky 1999)*
15. It is important to recognize that there are many variables affecting cochlear implant outcomes (Table 16). [D1]

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**Table 16: Variables Affecting Cochlear Implant Outcomes**

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**Examples of variables that can affect cochlear implant outcomes:**

- 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)*

16. It is important to understand that a failed device can be successfully replaced with a new device without degradation in patient performance. [D1]

*Selecting a cochlear implant center*

17. 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 with hearing loss
  - Outcomes history
  - Proximity of the implant center
  - Insurance participation and financial considerations
  - Specific plan for follow-up services [D1]

**Other Medical and Surgical Interventions**

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

Other organ systems that may be affected include the kidneys, heart, thyroid, musculoskeletal system, eyes, and skin. Early identification and management have obvious health consequences.

### *Etiology of hearing loss*

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 a sensorineural hearing loss. For example, children who have 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 etiology 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. The subtypes are defined by their audiometric, vestibular, and radiographic findings. A lengthy explanation of the types of hearing losses and their subtypes is beyond the scope of this document. Consultation with the otolaryngologist and a genetic counselor is important in all cases of confirmed hearing loss. The main subtypes include autosomal

dominant, autosomal recessive (e.g., connexional gene mutation), X-linked recessive, X-linked dominant, mitochondrial, digenic, and digenomic.

- *Inherited syndromic hearing loss.* There are numerous congenital inherited syndromes associated with hearing loss. These disorders usually have associated physical and medical manifestations. For example:
  - *Alport syndrome.* This syndrome is X-linked or autosomal dominant and includes kidney disease that requires treatment.
  - *Goldenhar syndrome.* This syndrome is associated with eye, kidney, and vertebral abnormalities.
  - *Jervell and Lang-Nielson Syndrome.* This is an autosomal recessive syndrome that manifests with electrocardiographic abnormalities (wide Q-T interval), resulting in cardiac rhythm irregularities.
  - *Pendred syndrome.* This syndrome is autosomal recessive and includes nontoxic thyroid goiter.
  - *Usher syndrome.* This autosomal recessive disorder is associated with retinitis pigmentosa and blindness later in childhood.
  - *Waardenburg syndrome.* This autosomal dominant disorder is often associated with characteristic facial features and pigmentary problems (such as a white forelock and differently colored eyes).
  - *Stickler syndrome.* This autosomal dominant syndrome is characterized by tall stature, hypermobile joints, severe myopia, and flat midfaces.
  - *CHARGE syndrome.* This disorder is characterized by a series of birth defects that includes coloboma of the eye, heart disease, choanal atresia, retarded growth and development and/or central nervous system anomalies, genital anomalies and/or hypogonadism, and ear anomalies and/or deafness. Children with four or more of these findings are classified as having this disorder. The etiology is unknown but is suspected to be a developmental defect that occurs during the second month of pregnancy.

*Other sensorineural hearing losses.* 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 and lead to hearing loss.
- 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. The infection often spreads from the fluids around the brain to the cochlea through a pathway called the cochlear aqueduct and can cause hair cell damage and hearing loss. This hearing loss 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 that 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.

### *Conductive hearing loss*

Otitis media with effusion or acute otitis media causes a mild to moderate transient conductive hearing loss when fluid is present in the middle ear. Persistent effusion causes a persistent hearing loss and therefore is of concern in young children where normal hearing is important for early speech and language development. Additionally, ongoing chronic lack of ventilation to the ear could lead to permanent hearing loss due to tympanic membrane collapse (atelectasis), middle ear fibrosis, tympanic membrane retraction pocket formation, or cholesteatoma formation. Medical interventions for chronic middle ear effusions or other conductive hearing losses may involve surgical procedures such as pressure-equalizing tube placement and/or adenoidectomy or other more

advanced ear surgery to eliminate the condition or repair the structural abnormality.

Other causes of conductive hearing loss include congenital otosclerosis or footplate fixation. The stapes bone is fixed in the oval window, and the conduction of sound from the drum to the inner ear is dampened by the fixation. Children may also be born with other abnormalities of the middle ear bones or with complete or partial atresia of the ear canals (the ear canals do not form). Usually the inner ear is normal in these situations. Many of the craniofacial syndromes have associated external ear, middle ear, or ossicular abnormalities (for example, Turner syndrome, dwarfism, Down syndrome, Kabuki syndrome).

#### *Medical and surgical interventions*

Medical or surgical interventions for all the possible conditions that might cause or be associated with hearing loss are beyond the scope of this guideline. However, the guideline does include recommendations about certain general considerations for medical and surgical interventions as well as recommendations about referral for otologic evaluation.

#### **Recommendations (Other Medical and Surgical Interventions)**

##### *General considerations for medical/surgical interventions*

1. It is important to remember that:
  - There are many types and causes of hearing loss, and some of these are treatable and reversible while others are not
  - Many conditions resulting in hearing loss also have associated medical conditions that are important to identify and treat [D2]
2. It is important to realize that for some conditions that can cause hearing loss, there is often a window of opportunity to treat the condition. Early identification and treatment generally result in the most favorable hearing outcomes. [D2]


##### *Referral for otologic evaluation*

3. It is recommended that children diagnosed with hearing loss of any type be referred to an otolaryngologist for a medical and otologic evaluation. It is important for this evaluation to include a thorough review of the child's medical and family history; a physical examination of the ears, 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. [D2]

4. It is recommended that children who have conductive hearing loss and no signs of middle ear disease or effusion be evaluated by an otolaryngologist for possible surgical correction of the hearing loss. [D2]
5. It is recommended that children with persistent middle ear effusion (for more than 3 or 4 months) be evaluated by an otolaryngologist. Treatment may include the placement of pressure equalizing tubes to ventilate the middle ear and improve hearing. [D2]
6. It is recommended that children with chronic middle ear infections be seen by an otolaryngologist for evaluation of hearing loss and the development of long-term ear conditions that might affect hearing. These include retraction pocket formation, tympanic membrane atelectasis, and cholesteatoma formation. [D2]
7. It is recommended that children who lose their hearing due to meningitis be seen as soon as possible by an otolaryngologist. Radiographic imaging (such as an MRI and/or CAT scan) of the inner ears may be necessary to evaluate the cochlear patency. [D2]
8. It is important that children who develop severe or profound hearing loss after meningitis be seen as soon as possible for consideration for cochlear implantation. The intracochlear infection can lead to ossification (filling in with bone) of the cochlea, which might inhibit the placement of a full electrode array. [D2]
9. It is recommended that children with external ear canal malformations or atresia be evaluated by an otolaryngologist. Surgical correction of the ear canal can significantly improve the hearing. Bone-anchored hearing aids are also an option for consideration. [D2]

*Ongoing otologic and audiologic monitoring*

10. 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. [D2]



**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: METHODOLOGY  
TABLES**

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**Table A-1: General Criteria for Selecting Evidence Studies**

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To meet the criteria for evidence of efficacy, a scientific article had to meet all of the general criteria given below, as well as the additional criteria applicable to studies of assessment or intervention methods (Tables A-2 and A-4).

To meet the general criteria for evidence, scientific articles had to:

- Be published in English in a peer-reviewed scientific/academic publication
  - Use original quantitative data for outcomes/characteristics of interest and appropriate statistical analysis of results (or be a systematic synthesis of such data from other studies)
  - Include data on the child (not just parent reaction or behavior)
  - Evaluate children of the appropriate age, either:
    - Majority of subjects are (approximately) 48 months of age or younger, or
    - The study group is described as “infant,” “toddler,” or “early intervention (EI)”
-

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**Table A-2: Criteria for Adequate Evidence: Assessment Studies**

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To meet the criteria for evidence of efficacy, articles about assessment methods for young children with hearing loss had to:

- A. Meet all the general criteria for evidence in Table A-1, and
- B. Meet the following additional criteria for studies of assessment methods:
  - Evaluate an assessment method currently available to providers in the U.S. (obsolete or clearly experimental methods were generally excluded)
  - Provide an adequate description of the assessment method evaluated
  - Give the sensitivity and specificity of the test or assessment method compared to an adequate reference standard or provide enough data so that these could be calculated
  - Include at least 10 subjects with the condition and at least 10 without the condition (according to the reference standard)

Studies were considered to have *high quality/applicability* if:

- All subjects were  $\leq 48$  months of age or the mean age of the subjects was  $\leq 36$  months or all subjects were described as infant, toddler, or EI
- Study design, study population and results were adequately described and no significant issues were noted regarding factors which might bias results

Studies were considered to have *intermediate quality/applicability* if:

- Age range of subjects was  $> 48$  months of age or the mean age of the subjects was  $> 36$  months or not reported
  - Auditory brainstem response (ABR) was the only reference standard
  - Study design, study population, and results were not adequately described or issues were noted regarding factors which might bias results
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**Table A-3: Interpreting Sensitivity and Specificity**

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The established method for evaluating the efficacy (or accuracy) of an identification or assessment test (or method) is to determine its **sensitivity** and **specificity** compared to an adequate reference standard. These concepts are defined as follows:

- The **sensitivity** of a test is the percentage of all persons with the condition (according to the reference standard) who are correctly identified by the test as having the condition. Sensitivity is also known as the true positive rate.
- The **specificity** of a test is the percentage of all persons who do not have the condition (according to the reference standard) who are correctly identified by the test as being free of the condition. Specificity is also known as the true negative rate.
- A **reference standard** is an independent measure to determine if a subject actually has the condition that the test is attempting to identify. It is presumed that the reference standard is a more accurate way to identify the condition than is the test being evaluated. To be useful in calculating sensitivity and specificity, a reference standard must have specified criteria to determine if a person does or does not have the condition.
- **Cutoff criteria** are the rules to determine if the test or reference standard is positive (indicating the individual has the condition) or negative (indicating that the person does not have the condition).

**Table A-3: Interpreting Sensitivity and Specificity**

Term	Definition	Formula
Sensitivity	The percentage of those who have the condition who have positive tests	$[a/(a+c)] [x100]$
Specificity	The percentage of those who do not have the condition who have negative tests	$[d/(b+d)] [x100]$

		Reference Standard		
		Have condition	Do not have condition	
Test	Positive	a true positive	b false positive	a + b
	Negative	c false negative	d true negative	c + d
		a + c	b + d	a + b + c + d

**Considerations for interpreting sensitivity and specificity**

1. The higher the sensitivity and specificity, the greater the accuracy of the test

Sensitivity and specificity are expressed as percentages. The perfect test would have both sensitivity and specificity of 100%:

- A test with 100% sensitivity would correctly identify all those with the condition (100% sensitivity = no false negatives)
- A test with 100% specificity would correctly identify a person without the condition as not having it (100% specificity = no false positives)

As sensitivity or specificity decreases, the rate of false negatives or false positives increases. For example:

- A test with 70% sensitivity would correctly identify 7 out of 10 with the condition, and there would be 3 individuals with the condition who are not identified by the test (false negatives)

*(Continued from previous page)*

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**Table A-3: Interpreting Sensitivity and Specificity**

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- A test with 70% specificity would correctly identify 7 out of 10 who do not have the condition, and there would be 3 individuals incorrectly identified as having the condition (false positives)
2. What is “acceptable” for sensitivity or specificity depends on the situation
- In the real world, assessment methods for screening and early identification of a disorder rarely have 100% sensitivity and specificity. There is no general agreement about what the acceptable levels of sensitivity and specificity for an assessment test are. Acceptable levels may vary depending upon a variety of factors, such as:
- The intent of the test
  - The potential impact of false positives or false negatives
  - The setting of testing (general population or a specific subgroup at risk for the condition)
  - The prevalence of the condition in the group being tested
  - Alternate methods of assessment
  - Costs and benefits of testing
3. Changing cutoff criteria affects sensitivity/specificity
- In calculating sensitivity and specificity, the reference standard must use specific criteria to determine if a person does or does not have a condition, and the test must use specific criteria to determine if the test result is positive or negative. Using different cutoff criteria for either the test or the reference standard will yield different sensitivity and specificity. In general, as one goes up, the other goes down.

*(Continued from previous page)*

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**Table A-4: Criteria for Adequate Evidence: Intervention Methods**

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To meet the criteria for evidence of efficacy, all articles about intervention methods for young children who have a hearing loss had to:

- A. Meet all the general criteria for evidence in Table A-1, and
- B. Meet the following additional criteria for studies of intervention methods:
  - All subjects have hearing loss
  - Evaluate an intervention method currently available to providers in the U.S. (obsolete or clearly experimental methods were generally excluded)
  - Provide an adequate description of the intervention method evaluated
  - Evaluate the efficacy of the intervention using functional outcomes important for the child

**Group studies:**

- Include a comparison group (receiving an alternate intervention) or a control group (receiving no intervention)
- Report baseline characteristics of subjects
- Provide adequate quantitative description of study findings and appropriate statistical analysis of results

Studies were considered to have *high quality/applicability* if:

- Subjects are reported to be allocated to groups randomly or using some other method not likely to introduce bias into the study
- Outcomes are reported for at least 10 subjects per group
- All subjects are  $\leq 48$  months of age or the mean age of the subjects is  $\leq 36$  months or all subjects are described as infant, toddler, or EI

Studies were considered to have *intermediate quality/applicability* if:

- Assembly of study groups is retrospective or the method of group assignment is not specified (but baseline characteristics are generally comparable between groups)
- Outcomes are reported for at least 8 subjects per group
- Age range of subjects is  $>48$  months of age or the mean age of the subjects is  $>36$  months or not reported

**Single Subject Design Studies:** (*all considered intermediate quality/applicability*)

- Use an acceptable single subject design methodology (either multiple baseline or ABAB design), and
- Include at least 3 subjects with hearing loss who are  $<48$  months of age

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**Table A-5: Strength of Evidence Ratings for Guideline Recommendations**

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Each of the guideline recommendations in Chapters III and IV is followed by one of the four “strength of evidence” ratings described below. These strength of evidence ratings indicate the amount, general quality, and clinical applicability (to the guideline topic) of scientific evidence used as the basis for each guideline recommendation.

- [A] = **Strong evidence** is defined as evidence from two or more studies that met criteria for adequate evidence about efficacy and had high quality and applicability to the topic, with the evidence consistently and strongly supporting the recommendation.
  - [B] = **Moderate evidence** is defined as evidence from at least one study that met criteria for adequate evidence about efficacy and had high quality and applicability to the topic, and where the evidence supports the recommendation.
  - [C] = **Limited evidence** is defined as evidence from at least one study that met criteria for adequate evidence about efficacy and had moderate quality or applicability to the topic, and where the evidence supports the recommendation.
  - [D] = **Consensus panel opinion** (either [D1] or [D2]):
    - [D1] = **Consensus panel opinion** based on information not meeting criteria for adequate evidence about efficacy, on topics where a systematic review of the literature was conducted
    - [D2] = **Consensus panel opinion** on topics where a systematic literature review was not conducted
-





**APPENDIX B: SUMMARY OF  
EVIDENCE**

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## ASSESSMENT

### Newborn Screening and Identification of Hearing Loss

This section provides a summary of the scientific research articles that met the criteria for evidence for newborn hearing screening methods.

The 15 studies in this section that met the panel's criteria for adequate evidence of efficacy evaluate the efficacy of methods for hearing screening during early infancy, primarily in the newborn period (defined as the first 30 days after birth). Programs for newborn hearing screening are a topic of great current interest among health professionals, in part because advances in technology have increased the ability to detect hearing loss at a very early age. In addition, there is a growing body of evidence that early intervention for young children with hearing loss may result in better long-term developmental outcomes for the child. Many states, including New York State, have adopted regulations requiring newborn hearing screening.

Topics included in the review of evidence for newborn screening and identification of hearing loss include:

- A. General Use of ABR or OAE
- B. Auditory Brainstem Response (ABR)
- C. Evoked Otoacoustic Emissions (EOAE)
- D. Acoustic Reflex Test
- E. Behavioral Screening Tests
- F. Identification Based on Risk Factors

### Studies Meeting Criteria for Evidence

#### *Auditory brainstem response (ABR) testing*

1. **Chen, S. J., Yang, E. Y., Kwan, M. L., Chang, P., Shiao, A. S., and Lien, C. F.** Infant hearing screening with an automated auditory brainstem response screener and the auditory brainstem response. *Acta Paediatrica* 1996; 85[1]: 14-18.
2. **Desai, S., Kollros, P. R., Graziani, L. J., Streletz, L. J., Goodman, M., Stanley, C., Cullen, J., and Baumgart, S.** Sensitivity and specificity of the neonatal brainstem auditory evoked potential for hearing and language deficits in survivors of extracorporeal membrane oxygenation. *Journal of Pediatrics* 1997; 131[2]: 233-239.

3. **Jacobson, J. T., Jacobson, C. A., and Spahr, R. C.** Automated and conventional ABR screening techniques in high-risk infants. *Journal of the American Academy of Audiology* 1990; 1[4]: 187-195.
4. **Watkin, P. M., Baldwin, M., and McEnery, G.** Neonatal at-risk screening and the identification of deafness. *Archives of Disease in Childhood* 1991; 66[10 Spec No]: 1130-1135.
5. **Yang, E. Y., Stuart, A., Mencher, G. T., Mencher, L. S., and Vincer, M. J.** Auditory brain stem responses to air- and bone-conducted clicks in the audiological assessment of at-risk infants. *Ear and Hearing* 1993; 14[3]: 175-182.

*Evoked otoacoustic emissions (EOAE) testing*

6. **Apostolopoulos, N. K., Psarommatis, I. M., Tsakanikos, M. D., Dellagrammatikas, H. D., and Douniadakis, D. E.** Otoacoustic emission-based hearing screening of a Greek NICU population. *International Journal of Pediatric Otorhinolaryngology* 1999; 47[1]: 41-48.
7. **Gill, A. W., Gosling, D., Kelly, C., Walker, P., and Wooderson, S.** Pre-discharge screening of very low birthweight infants by click evoked otoacoustic emissions. *Journal of Paediatrics and Child Health* 1998; 34[5]: 456-459.
8. **Kennedy, C. R., and the Wessex Universal Neonatal Screening Trial Group.** Controlled trial of universal neonatal screening for early identification of permanent childhood hearing impairment: Coverage, positive predictive value, effect on mothers and incremental yield. *Acta Paediatrica Supplement* 1999; 88[432]: 73-75.
9. **Norton, S. J., Gorga, M. P., Widen, J. E., Folsom, R. C., Sininger, Y., Cone-Wesson, B., Vohr, B. R., Mascher, K., and Fletcher, K.** Identification of neonatal hearing impairment: Evaluation of transient evoked otoacoustic emission, distortion product otoacoustic emission, and auditory brainstem response test performance. *Ear and Hearing* 2000; 21[5]: 508-528.
10. **Stevens, J. C., Webb, H. D., Hutchinson, J., Connell, J., Smith, M. F., and Buffin, J. T.** Click evoked otoacoustic emissions in neonatal screening. *Ear and Hearing* 1990; 11[2]: 128-133.
11. **Wessex Universal Neonatal Hearing Screening Trial Group.** Controlled trial of universal neonatal screening for early identification of permanent childhood hearing impairment. *Lancet* 1998; 352[9145]: 1957-1964.

*Acoustic reflex testing (AR)*

12. **Hirsch**, J. E., Margolis, R. H., and Rykken, J. R. A comparison of acoustic reflex and auditory brain stem response screening of high-risk infants. *Ear and Hearing* 1992; 13[3]: 181-186.

*Behavioral screening tests*

13. **Durieux-Smith**, A., Picton, T., Edwards, C., Goodman, J. T., and MacMurray, B. The Crib-o-gram in the NICU: An evaluation based on brainstem electric response audiometry. *Ear and Hearing* 1985; 6[1]: 20-24.
14. **Hosford-Dunn**, H., Johnson, S., Simmons, F. B., Malachowski, N., and Low, K. Infant hearing screening: Program implementation and validation. *Ear and Hearing* 1987; 8[1]: 12-20.

*Identification based on risk factors*

15. **Smith**, R. J., Zimmerman, B., Connolly, P. K., Jerger, S. W., and Yelich, A. Screening audiometry using the high-risk register in a level III nursery. *Archives of Otolaryngology Head Neck Surgery* 1992; 118[12]: 1306-1311.

**Panel Conclusions (Newborn Screening and Identification of Hearing Loss)****A. 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. Both ABR and OAE, when used for newborn hearing screening, 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).

***B. 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).

***C. 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 who 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).

***D. 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 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).

***E. 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).

***F. 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).

**Identification and Assessment of Hearing Loss in Young Children**

Topics included in the review of evidence for identification and assessment of hearing loss in young children:

- A. Auditory Brainstem Response (ABR)
- B. Evoked Otoacoustic Emissions (EOAE)
- C. Tympanometry
- D. Behavioral Screening Tests
- E. Language Development Milestones
- F. Parent Questionnaires

**Studies Meeting Criteria for Evidence****A. Auditory brainstem response (ABR)**

1. **Fjermedal**, O., and **Laukli**, E. Paediatric auditory brainstem response and pure-tone audiometry: Threshold comparisons, a study of 142 difficult-to-test children. *Scandinavian Audiology* 1989; 18[2]: 105-111.
2. **Hyde**, M. L., **Malizia**, K., **Riko**, K., and **Alberti**, P. W. Audiometric estimation error with the ABR in high-risk infants. *Acta Oto-Laryngologica*
3. **Hyde**, M. L., **Riko**, K., and **Malizia**, K. Audiometric accuracy of the click ABR in infants at risk for hearing loss. *Journal of the American Academy of Audiology* 1990; 1[2]: 59-66.
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8. **MRC Multi-Centre Otitis Media Study Group.** Sensitivity, specificity and predictive value of tympanometry in predicting a hearing impairment in otitis media with effusion. *Clinical Otolaryngology* 1999; 24[4]: 294-300.
9. **Rosenfeld, R. M.,** Goldsmith, A. J., and Madell, J. R. How accurate is parent rating of hearing for children with otitis media? *British Journal of Audiology* 1998; 124[9]: 989-992.

**D. Behavioral screening tests**

10. **Johnson, A.,** and Ashurst, H. Screening for sensorineural deafness by health visitors. *Archives of Disease in Childhood* 1990; 65[8]: 841-845.

**E. Language development milestones**

11. **Eilers, R. E.,** and Oller, D. K. Infant vocalizations and the early diagnosis of severe hearing impairment. *Journal of Pediatrics* 1994; 124[2]: 199-203.

**F. Parent questionnaires**

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14. **Newton, V. E.,** Liu, X., Ke, X., Xu, L., and Bamford, J. M. Evaluation of the use of a questionnaire to detect hearing loss in babies in China. *International Journal of Pediatric Otorhinolaryngology* 1999; 48[2]: 125-129.

**Panel Conclusions (Identification and Assessment)***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 when 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  $\geq 3$  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 who have 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. Parents can perform effective surveillance for severe hearing loss when given information and feedback about how to recognize canonical babbling (Eilers 1994).

*Parent questionnaires*

16. Parent 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 who have 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**

Early intervention for most infants and young children with hearing loss often includes a combination of approaches including:

- Providing sensory aids to maximize the child’s use of residual hearing (such as hearing aids, tactile aids, or cochlear implants)

- Providing specific communication interventions
- Facilitating family support in parenting an infant with hearing loss.

Most of the studies that met criteria for evidence evaluated interventions providing sensory aids, hearing aids, tactile aids, or cochlear implants to infants and young children. Some studies provided information about specific communication interventions. Topics included in the review of evidence for intervention include:

- A. Hearing Aids
- B. Cochlear Implants
- C. Communication Interventions

#### ***A. Hearing Aids***

There was only one study that met the panel’s criteria for adequate evidence about efficacy of hearing aids.

#### **Studies Meeting Criteria for Evidence**

1. **Ramkalawan, T. W., and Davis, A. C.** The effects of hearing loss and age of intervention on some language metrics in young hearing-impaired children. *British Journal of Audiology* 1992; 26[2]: 97-107.

#### **Panel Conclusions (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)

#### ***B. Cochlear Implants***

This section evaluates the use of cochlear implants in infants and young children. There were eight studies that met the panel’s criteria for adequate evidence.

#### **Studies Meeting Criteria for Evidence**

1. **Brackett, D., and Zara, C. V.** Communication outcomes related to early implantation. *American Journal of Otology* 1998; 19[4]: 453-460.

2. **Miyamoto**, R. T., Kirk, K. I., Svirsky, M. A., and Sehgal, S. T. Communication skills in pediatric cochlear implant recipients. *Acta Oto-Laryngologica* 1999; 119[2]: 219-224.
3. **Miyamoto**, R. T., Svirsky, M. A., and Robbins, A. M. Enhancement of expressive language in prelingually deafened children with cochlear implants. *Acta Oto-Laryngologica* 1997; 117[2]: 154-157.
4. **Nikolopoulos**, T. P., O'Donoghue, G. M., and Archbold, S. Age at implantation: Its importance in pediatric cochlear implantation. *Laryngoscope* 1999; 109[4]: 595-599.
5. **Robbins**, A. M., Svirsky, M., and Kirk, K. I. Children with implants can speak, but can they communicate? *Otolaryngology Head and Neck Surgery* 1997; 117[3 Pt 1]: 155-160.
6. **Svirsky**, M. A., and Meyer, T. A. Comparison of speech perception in pediatric CLARION cochlear implant and hearing aid users. *Annals of Otolology, Rhinology, and Laryngology Supplement* 1999; 177: 104-109.
7. **Tait**, M., and Lutman, M. E. Comparison of early communicative behavior in young children with cochlear implants and with hearing aids. *Ear and Hearing* 1994; 15[5]: 352-361.
8. **Truy**, E., Lina-Granade, G., Jonas, A. M., Martinon, G., Maison, S., Girard, J., Porot, M., and Morgon, A. Comprehension of language in congenitally deaf children with and without cochlear implants. *International Journal of Pediatric Otorhinolaryngology* 1998; 45[1]: 83-89.

#### **Panel Conclusions (Cochlear Implants)**

1. 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).
2. 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).
3. 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).

4. 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).
5. 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).
6. 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).
7. Children who receive cochlear implantation have greater improvement in vocal and auditory communication than children who use hearing aids as measured one year after implantation have (Tait 1994).
8. 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 the control group has prior to implantation. However, individual maturation and duration of deafness may influence outcomes (Truy 1998).

### ***C. Communication Interventions***

This section evaluates the use of communication interventions for infants and young children. There were ten studies on this topic that met the panel’s criteria for adequate evidence.

#### **Studies Meeting Criteria for Evidence**

1. **Greenberg**, M. T. Family stress and child competence: The effects of early intervention for families with deaf infants. *American Annals of the Deaf* 1983; 128[3]: 407-417.
2. **Greenberg**, M. T., Calderon, R., and Kusche, C. Early intervention using simultaneous communication with deaf infants: The effect on communication development. *Child Development* 1984; 55[2]: 607-616.
3. **Moeller**, M. P. Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics* 2000; 106[3]: E43.

4. **Musselman**, C. R., Wilson, A. K., and Lindsay, P. H. Effects of early intervention on hearing impaired children. *Exceptional Children* 1988; 55[3]: 222-228.
5. **Robbins**, A. M., Bollard, P. M., and Green, J. Language development in children implanted with the CLARION cochlear implant. *Annals of Otolaryngology, Rhinology, and Laryngology Supplement* 1999; 177: 113-118.
6. **Watkins**, S. Long-term effects of home intervention with hearing-impaired children. *American Annals of the Deaf* 1987; 132[4]: 267-271.
7. **Watkins**, S., Pittman, P., and Walden, B. The Deaf Mentor Experimental Project for young children who are deaf and their families. *American Annals of the Deaf* 1998; 143[1]: 29-34.
8. **Yoshinaga-Itano**, C., and Apuzzo, M. L. Identification of hearing loss after age 18 months is not early enough. *American Annals of the Deaf* 1998; 143[5]: 380-387.
9. **Yoshinaga-Itano**, C., and Apuzzo, M. L. The development of deaf and hard of hearing children identified early through the high-risk registry. *American Annals of the Deaf* 1998; 143[5]: 416-424.
10. **Yoshinaga-Itano**, C., Sedey, A. L., Coulter, D. K., and Mehl, A. L. Language of early- and later-identified children with hearing loss. *Pediatrics* 1998; 102[5]: 1161-1171.

#### **Panel Conclusions (Communication Interventions)**

##### *Effects of early intervention on communication, language, and general development*

1. 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).
2. 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).
3. 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).

4. 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).
5. 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).
6. 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).
7. Children with hearing loss who participate in an early intervention program beginning at 8 to 9 months of age, when 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*

8. 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).



9. Auditory training is a valuable aspect of a total communication program (according to parent interviews) (Greenberg 1983/Greenberg 1984).
10. It is helpful to include fathers and siblings in intervention programs to develop the child's communication skills (Greenberg 1983/Greenberg 1984).
11. 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).
12. 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 at <30 months or >30 months (Watkins 1987).
13. 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 to the addition of a deaf mentor (Watkins 1998).



**APPENDIX C: DEVELOPMENTAL  
ASSESSMENT  
TESTS**

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


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<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.

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**Ages and Stages Questionnaires (ASQ)**

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<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.

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**Auditory – Verbal Ages and Stages of Development**

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<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.

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**Battelle Developmental Inventory (BDI)**

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<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, 0-30 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>Adaption 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.

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


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<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.

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

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<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>	<p>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.</p> <p>Instructional activities are process-oriented, providing suggestions for incorporating activities into daily care and modifications for infants with motor, visual, or hearing impairments.</p>
<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.

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**Carolina Picture Vocabulary Test, 1985**

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<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.

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

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<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.

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

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<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 defects 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.

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**Hawaii Early Learning Profile (HELP)**

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<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.

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**Hiskey-Nebraska Test of Learning Aptitude, 1966**

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<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).

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

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<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.

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


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<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.

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**MacArthur Communicative Development Inventory (CDI)**

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<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.

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


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<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.

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**Ordinal Scales of Psychological Development, 1989**

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<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

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**Peabody Picture Vocabulary Test (PPVT)**

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<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.

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**Reynell Developmental Language Scales**

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<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.

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**Rossetti Infant Toddler Language Scale**


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<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.

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**Sequenced Inventory of Communication Development (SICD)**

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<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.

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**SKI-HI Language Development Scale (LDS)**


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<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.

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**Smith-Johnson Nonverbal Performance Scale, 1977**

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<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.

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**Vineland Adaptive Behavior Scales**

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<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.

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**Vineland Social-Emotional Early Childhood Scales (SEEC)**

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<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.

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**APPENDIX D: EARLY  
INTERVENTION  
PROGRAM  
INFORMATION**

*New York State*

**D-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 that children and their 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 230). 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 objects 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, or 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 (IFSP) agreed to by the parent and the Early Intervention Official



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*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 accesses 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.

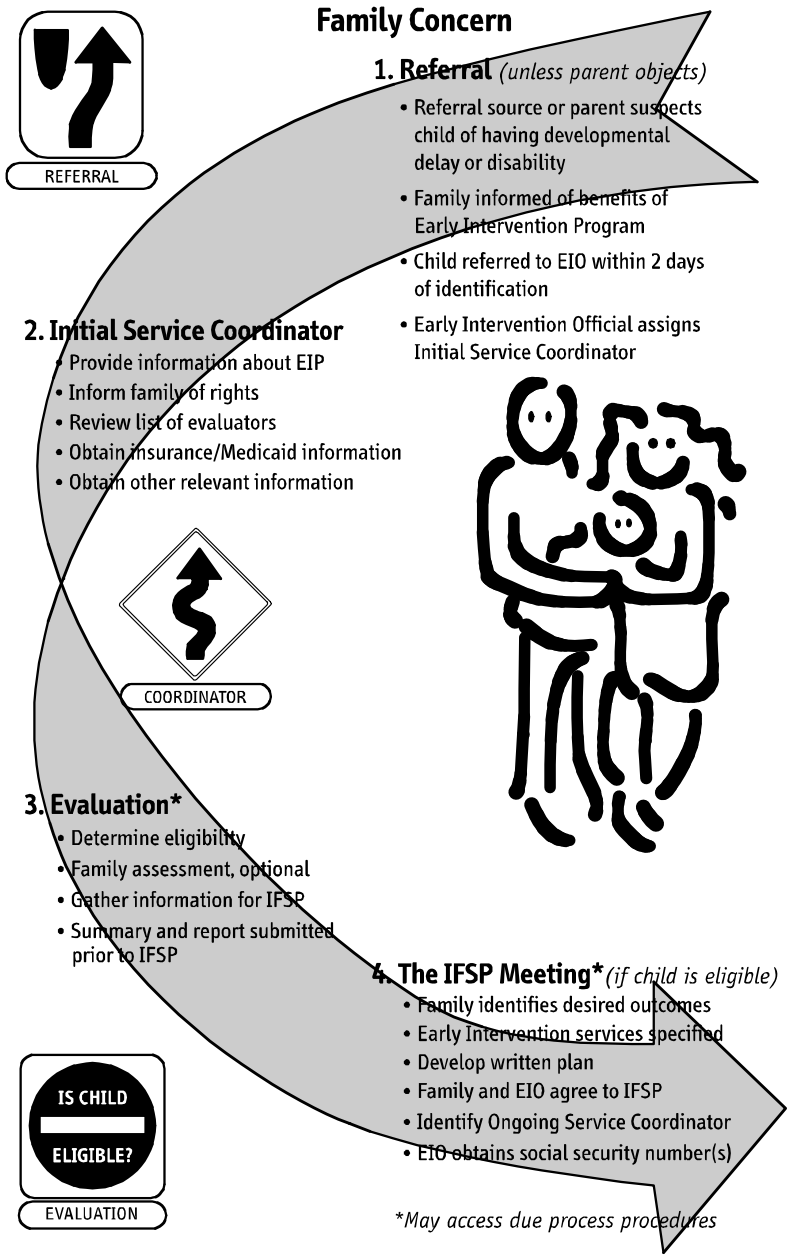
New York State Department of Health  
Bureau of Early Intervention  
Corning Tower Building, Room 287  
Empire State Plaza  
Albany, NY 12237-0660

518/473-7016

[www.nyhealth.gov/community/infants\\_children/early\\_intervention/index.htm](http://www.nyhealth.gov/community/infants_children/early_intervention/index.htm)

[bei@health.state.ny.us](mailto: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



**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



**Early Intervention Services\***

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• assistive technology devices and services</li> <li>• audiology</li> <li>• family training, counseling, home visits and parent support groups</li> <li>• medical services only for diagnostic or evaluation purposes</li> <li>• nursing services</li> <li>• nutrition services</li> </ul> | <ul style="list-style-type: none"> <li>• occupational therapy</li> <li>• physical therapy</li> <li>• psychological services</li> <li>• service coordination</li> <li>• social work services</li> <li>• special instruction</li> <li>• speech-language pathology</li> <li>• vision services</li> <li>• health services</li> <li>• transportation and related costs</li> </ul> |
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*Parent/guardian consent is required for evaluation, IFSP, provision of services in IFSP, and transition.*



Revised 12/04

**D-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.nyhealth.gov/community/infants\\_children/early\\_intervention/index.htm](http://www.nyhealth.gov/community/infants_children/early_intervention/index.htm)

*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:

*Personnel:*

- (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)**

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.

**D-3: TELEPHONE NUMBERS FOR MUNICIPAL EARLY INTERVENTION PROGRAMS**

The following phone numbers were up to date at the time this document was published. Please visit our Web page for updates at [www.nyhealth.gov/community/infants\\_children/early\\_intervention/index.htm](http://www.nyhealth.gov/community/infants_children/early_intervention/index.htm)

Albany	518-447-4820
Allegany	585-268-9767
Broome	607-778-2851
Cattaraugus	716-373-8050
Cayuga	315-253-1459
Chautauqua	716-753-4788
Chemung	607-737-5568
Chenango	607-337-1729
Clinton	518-565-4798
Columbia	518-828-4278 Ext. 1303
Cortland	607-753-3439
Delaware	607-746-3166
Dutchess	845-486-3507
Erie	716-858-6360
Essex	518-873-3522
Franklin	518-481-1710
Fulton	518-736-5720
Genesee	585-344-2580 Ext. 5496
Greene	518-719-3617
Hamilton	518-648-6497
Herkimer	315-867-1440
Jefferson	315-785-3283
Lewis	315-376-5453
Livingston	585-243-7270
Madison	315-366-2361
Monroe	585-753-2991
Montgomery	518-853-3531
Nassau	516-227-8661

New York City	212-219-5213
Niagara	716-278-1991
Oneida	315-798-5592
Onondaga	315-435-3230
Ontario	585-396-4546
Orange	845-291-2333
Orleans	585-589-7004, Ext.3250
Oswego	315-349-3510
Otsego	607-547-6474
Putnam	845-278-6014 Ext. 2137
Rensselaer	518-270-2665
Rockland	845-364-2626
Saratoga	518-584-7460
Schenectady	518-386-2815 Ext. 283
Schoharie	518-295-8705
Schuyler	607-535-8140
Seneca	315-539-1920
St. Lawrence	315-386-2744
Steuben	607-664-2146
Suffolk	631-853-3130
Sullivan	845-292-0100 Ext. 1
Tioga	607-687-8600
Tompkins	607-274-6674
Ulster	845-334-5221
Warren	518-761-6580
Washington	518-746-2400
Wayne	315-946-5749
Westchester	914-813-5090
Wyoming	585-786-8850
Yates	315-536-5160

*(Continued from previous page)*



**APPENDIX E: 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 (500-4,000 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 health care 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.
  - (3) Contractors must be article 28 facilities or health care 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 health care 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 health care provider, when such provider is known, shall be notified of the parents' 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 health care provider.
  - (6) The infant's primary health care 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 health care 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 F: ADDITIONAL  
RESOURCES**

**Alexander Graham Bell Association for the Deaf & Hard of Hearing**

3417 Volta Place, NW  
Washington, DC 20007  
Internet: [www.agbell.org](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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 120<sup>th</sup> Street, Box 223  
Teachers College  
Columbia University  
New York, NY 10027  
Internet: [www.tc.columbia.edu/nystap](http://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 G: PEER  
REVIEWERS**

**PEER REVIEWERS**

**Karen Arnold**  
Speech-Language Pathologist  
Pyramids Pediatric Intervention  
Services  
Plattsburgh, NY

**Abbey Berg, PhD**  
Assistant Professor  
Pace University  
Columbia University, College of  
Physicians & Surgeons  
New York, NY

**Barbara Bodner-Johnson, PhD**  
Professor  
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