Early Identification of Hearing Loss

Conducting periodic Otoacoustic Emissions (OAE) hearing screening with infants and toddlers in early childhood settings

Getting a Hearing Head Start

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This guide is a companion to the instructional video entitled, "Getting a Hearing Head Start," available in CD-ROM and VHS formats (visit www.infanthearing.org/earlychildhood for more resources)

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Section 1
Overview of Otoacoustic Emissions (OAE) Screening

A variety of early childhood programs, such as Head Start, private preschools, programs for young children with disabilities, and healthy baby programs, have demonstrated a commitment to monitoring the health and development of infants and toddlers. The American Academy of Pediatrics recommends that a child's hearing be checked repeatedly during each of the first three years of life because hearing is central to a child's language development and communication.[1]

Unfortunately, subjective methods, such as sound makers, medical reports indicating that ears were "checked," or sole reliance on parent interviews, have not proven to be reliable for screening young children for hearing loss.

Hand-held otoacoustic emission (OAE) technology represents a significant breakthrough for screening children birth to three years of age.

This guide will describe how OAE technology can be used to reliably screen the hearing of all infants and toddlers in early childhood settings. It will discuss the importance of periodic, physiologic hearing screening throughout early childhood. While you, as an early childhood professional, can successfully implement a high quality OAE screening program, it is important that you develop a working relationship with at least one pediatric audiologist in your community who will understand your screening protocol, promptly evaluate children who are referred, and answer questions as they arise.

OAE hearing screening has proven to be a highly effective procedure for screening newborns in hospitals.[2]

It has also been used successfully to screen children in a variety of early childhood programs.[3]

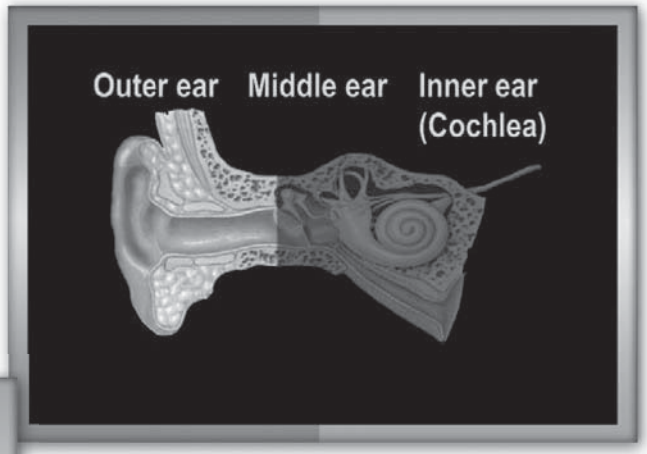
OAE screening is the most practical method for screening infants and toddlers because it:

- Does not require a behavioral response.
- Can help to identify a wide range of hearing health concerns.
- Is quick and painless.
- Is often a reimbursable procedure.
- Can be conducted by anyone who is trained to use the equipment and is skilled in working with children.

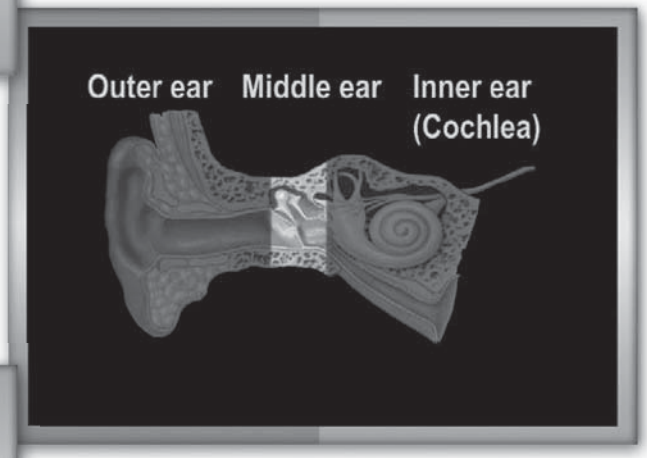
The Auditory System

There are three main parts to the auditory system:

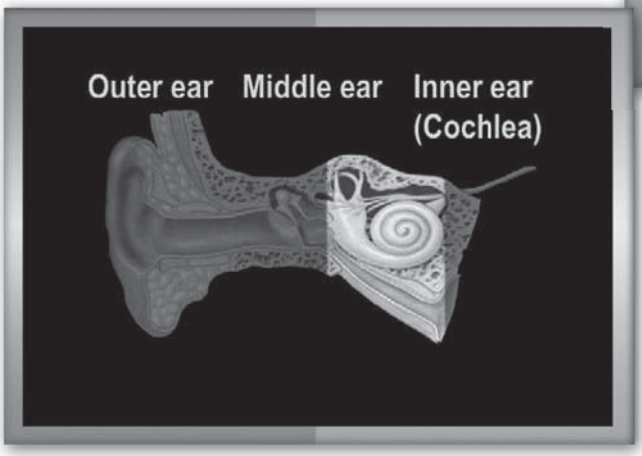
- Outer ear
- Middle ear
- Inner ear (cochlea)



As this mother's voice reaches her child's ear, the incoming sound causes the eardrum to vibrate which then moves three small bones in the middle ear.



This movement stimulates thousands of tiny, sensitive hair cells in the inner ear.



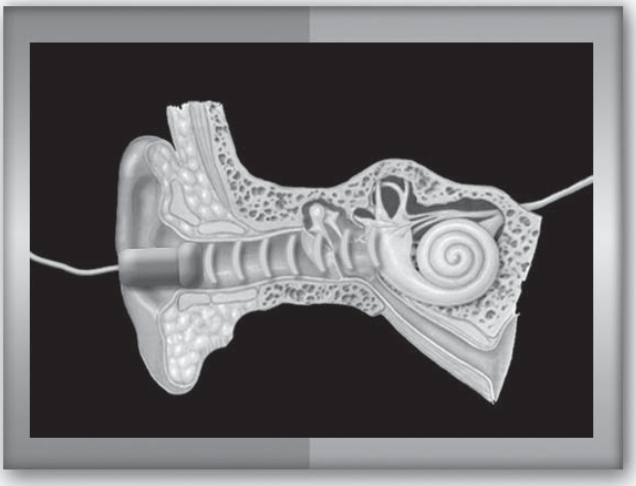
From the inner ear, the sound signal is carried along special nerves to the hearing centers of the brain—and the child experiences the sensation we call "sound."

Overview of the OAE Procedure

The screener first takes a thorough look at the outer part of the ear to make sure it is formed properly and does not show visible signs of infection or blockage.

The OAE screening procedure is then begun by placing a small probe in the child's ear canal. This probe delivers a low-volume sound stimulus into the ear.

A cochlea that is functioning normally will respond by sending the signal to the brain while also producing an "**otoacoustic emission**," sometimes described as an echo, which travels back through the middle ear to the ear canal.[4] This emission is then picked up and analyzed by the screening unit.



In approximately 30 seconds, the result is displayed on the computer screen as a "**pass**" or a "**refer**."

If either ear does not pass the OAE screening after repeated attempts, the child is referred to a health care provider to evaluate the middle ear through the use of tympanometry or pneumatic otoscopy. The most common reason an ear does not pass an OAE screening is the presence of fluid in the middle ear or an ear infection. After treatment has been completed and/or the health care provider determines that the pathway to the cochlea is clear, the early childhood program conducts an additional OAE screen. If the ear still does not pass, the child is then referred to a pediatric audiologist for a complete evaluation.

It is important to note that OAE screening does not diagnose a hearing loss. It simply identifies those children who need further medical or audiological assessment.

Children who are found to have permanent hearing loss are referred to a local early intervention program and are reported to the state's "newborn hearing screening" or "early hearing detection and intervention" public health program (see http://infanthearing.org/status/cnhs.html).

Incidence of Hearing Loss

The incidence of hearing loss is higher than most parents and professionals realize. Hearing loss is the most common birth defect in the United States.

- Approximately 1 of out every 300 children in the U.S. is born with a significant hearing loss.[5]
- Fifty percent of these infants do not have any neonatal risk indicators commonly associated with hearing loss.[6]

This is why most newborns in the U.S. now receive an initial hearing screening prior to hospital discharge. As a result, some babies may be referred to a pediatric audiologist and fitted with hearing aids by 4 weeks of age.

More young children than ever before are benefiting from timely enrollment in early intervention programs that facilitate language development.

Not all hearing loss can be identified at birth, however. Periodic, objective screening throughout early childhood is also important because gradual or sudden hearing loss can occur at any age.

Between birth and school age, the incidence of permanent sensorineural hearing loss doubles from:

1 in every 300, to

2 in every 300.[7]

In addition, mild, moderate or unilateral hearing losses are extremely difficult to detect and are rarely identified early through informal behavioral screening techniques.

Further, many preschoolers experience chronic middle ear conditions that limit hearing, sometimes to the degree that it interferes with language development. It is estimated that approximately 35% of preschool children have repeated episodes of otitis media that are nearly always accompanied by some degree of hearing loss.[8]

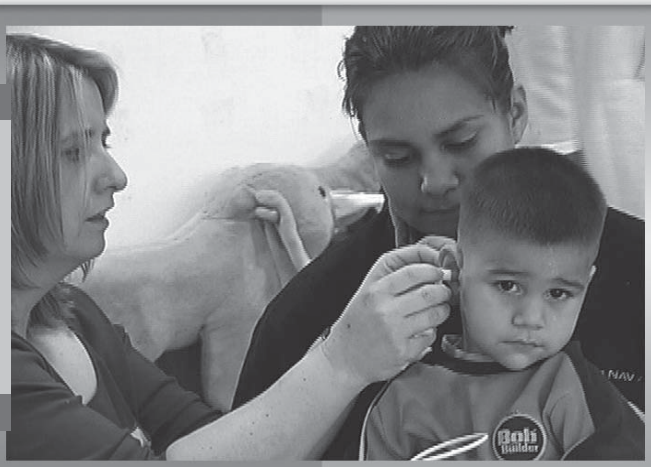
The repercussions of failing to recognize hearing loss are significant for children and their families. As noted by the U.S. Department of Health and Human Services, if hearing loss is not identified early, it can be nearly impossible for a child to acquire fundamental language, social and cognitive skills.[9]

Therefore, regular screening throughout a child's early life is critical for identifying hearing loss that can jeopardize development.

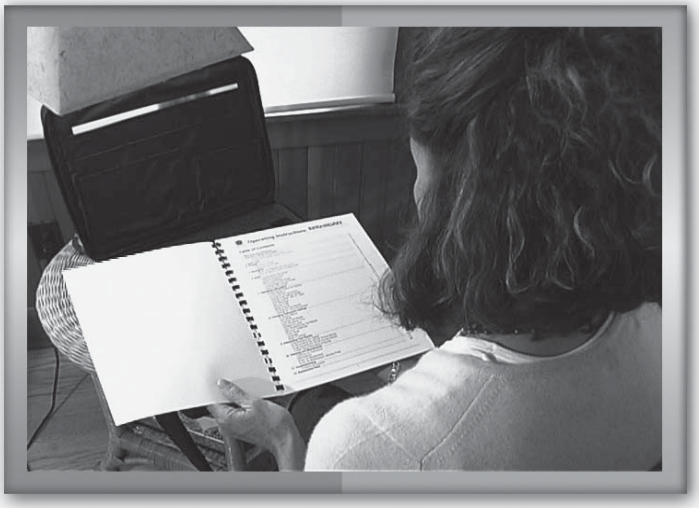
Section 2
OAE Equipment and Screening Process

This section will introduce OAE equipment and review how hearing screening is done. There are a number of handheld OAE screening units available, and the technology continues to change and improve.

Be sure to select a piece of equipment that has been demonstrated to work effectively for screening children birth to three years of age.



As you familiarize yourself with your equipment, refer to information provided by the manufacturer regarding:



- Probe care and cleaning.
- Power supply maintenance.
- Equipment calibration.
- Modifications that may be needed when screening children with pressure equalizations (PE) tubes.

Familiarizing Yourself with the Equipment

Here are some elements common to all OAE screening equipment:

- **Screening unit** that has a small display screen. This is a sensitive piece of electronic equipment. Be sure to treat it gently and avoid exposing it to extreme hot or cold temperatures.

- **Power supply** (rechargeable battery and/or adapter cord).

- **Probe assembly** that also attaches to the screening unit. This is an expensive component that can be damaged easily —always handle it carefully. Note the visual indicators that help you properly align the two components to avoid damaging the connecting pins. Whenever possible, it is a good idea to leave the probe attached to the screening unit rather than detaching it after each use. Also note that it is very helpful if a clip is supplied to attach the probe cord to the child's clothing during screening. The cord connecting the probe and the screening unit should be about 4 to 5 feet long in order to reach from the child's ear to the table where the unit is sitting.

- **Probe tips or covers** (sometimes called ear tips) in a variety of sizes that are designed to fit snugly on the probe and form a seal in the child's ear canal. You may use the same tip to screen both ears of the same child if it remains free of wax. Always use a new tip for each child.

Preparing to Screen

- Conduct the screening in a relatively quiet setting. The equipment is trying to pick up very small signals generated by the inner ear; therefore, it is best to limit the noise within the room.

- It is equally important to create an environment that maximizes the cooperation of the child with the comforting assistance of familiar adults and the use of quiet toys.

- Unlike some other procedures, **the OAE screening cannot be accomplished if a child is crying or physically resistant**. The screening will typically progress faster if the child is not actively sucking or chewing. If necessary, you can offer a pacifier, bottle, or cracker. If the child does not pass the screening, however, repeat the screening when sucking and chewing is not taking place.

- If the parent is present, complete a brief case history of the child's hearing-health. Note any parental concerns about hearing or language development. Explain to the parent that you are going to place a small microphone, covered by a soft tip, into the child's ear canal, and that the child will hear a series of quiet sounds.

- Check the probe to make sure it is not clogged by debris. Clean or exchange the probe nozzle if necessary.

The OAE Screening Procedure

STEP 1 **Visually inspect the ear to be screened.**
Look in front of and behind the ear for any abnormalities. Note any small pits, holes, or skin tags. These could be indicative of other abnormalities in the auditory system. Now, placing your index finger in front of the ear, pull gently back on the ear to open the canal. Look in as far as you can to make sure it is not blocked by anything that would obstruct the sound going in or the otoacoustic emission coming back out. If there is drainage coming from the ear, which is occasionally accompanied by a foul smell, or if the child displays heightened sensitivity to having the ear touched, do not proceed with the screening. Instead, bring the condition to the attention of the child's health care provider. Conduct the screening only when the child has been cleared by the health care provider. If some wax is present, you can proceed with the screening unless the canal appears to be totally blocked.

STEP 2 **Select a probe tip and place it on the probe.**
Note the size of the ear canal and choose a probe tip that is as large as, or slightly larger than, the ear canal opening. Place the tip over the end of the probe, pushing it all the way down. If you are using a soft, foam-type tip, you will want to compress it into a mushroom shape just before inserting it into the ear canal.

STEP 3 **Turn on the equipment.**

STEP 4 **Clip the probe to the child's clothing.**
Clip the probe cord to the back of the child's shirt where the child cannot see or reach it easily. This keeps the cord out of the way and also helps keep the probe in the ear during screening.

STEP 5 **Prepare the child.**
Make sure the child is comfortable and content.

Step 6

Insert the probe.

With one hand, take hold of the ear, pulling it out to open the canal. With the other hand, take the probe and insert the tip into the ear canal, toward the nose, and then turn it slightly back, pushing it firmly into the canal. If you have chosen the correct size of probe cover, the probe will stay inserted firmly in the ear canal after you let go of it. **Never be tempted to hold the probe in the ear during the screening.** Learning how to select the right size tip and how to insert the probe firmly into the ear canal is central to reliable screening.

Step 7

Push the button to start the screening and monitor the progress of the test.

Watch the displays. They will often help you know if you have a secure probe fit. Help the child sit quietly while the screening is progressing. Some equipment will indicate the progress of the test, showing sound frequencies or pitches, while other equipment will simply indicate the test is in progress.

Step 8

Document the screening result.

When the screening is complete, the screen will either say "pass" or "refer." Instead of the word "refer," some equipment says "fail." It is helpful to record the OAE screening results on a form that guides you through each step of the recommended screening protocol.

Step 9

Prepare to screen the other ear.

Remove the probe, check the probe cover and nozzle to make sure they are not blocked with wax, and test the other ear. You may use the same probe cover to test the other ear if it is not clogged with wax.

Helpful Hints to Effective Screening

As you practice screening, notice how external noise can disrupt the screening procedure. For example, if someone is speaking loudly near the ear being screened, the equipment cannot continue to screen because the signal it is sending to the ear becomes mixed with the louder outside stimuli. The screening unit has to wait until the excess noise stops before proceeding with the screening.

Also notice how the screening stops when the child being screened becomes restless and moves a lot. This is called internal noise. Again, the unit has to "wait" until the movement has stopped before continuing the screen.

Obviously, if the child moves too much, the probe will become completely dislodged, and the test has to be started again.

The three keys that will allow you to screen efficiently are:

- Ensuring good probe fit.
- Minimizing external noise in the environment.
- Minimizing internal noise caused by the child's movement.

A good probe fit will reduce both internal and external noise! The more firmly the probe fits into the ear canal, the less external noise will "leak" into the ear canal, and the less likely it is that the probe will be dislodged by the child's movements.

Additional Helpful Hints

- **Check the equipment** at the beginning of the day by screening your own ear or by running the equipment's manual calibration check.

- **Elicit help from another adult or parent**, if possible, in keeping the child quiet and content while the screening is being done. The helper may need to gently hold the child's hands and redirect them to touch and play with a quiet toy.

- **Engage the child** in a listening game.

- **Gently tell the child** what you are about to do rather than ask permission. Questions are usually met with a "no" or an uncooperative response.

- Keep a variety of **visually interesting toys**, appropriate for different ages, with your screening unit. Be creative—find out what works for you!

- **Screen while the child is asleep.** If a child arrives asleep or relaxed in a car seat, or if screening during nap time is an option, perform the hearing screening before the child awakens.

Hints For Difficult-to-Screen Children

In almost every program, screeners will encounter some young children who are extremely defensive about having their ears screened. This is usually due to one or more causes described below:

The area around the ear is sensitive, possibly due to the presence of an active ear infection. To determine if this is the source of the child's resistance, as part of the visual inspection, massage around the ear canal area, pushing gently down and around on the area behind the ear. Most children will readily accept this if they are not experiencing any pain, but it could be uncomfortable if there is an acute or active ear infection. If the child manifests obvious discomfort during this process, refer the child for medical follow-up.

The child is frightened, often because of some past experience that has been uncomfortable and distressing. If the child appears to be resisting more from fear than from actual discomfort, with patience and a bit of creativity, it may still be possible to complete the screening. Some of the suggestions below take time and patience and may require more time than a screener has. If it is feasible to try them, it may allow you to complete the screening with the added benefit of helping the child become less fearful about having their hearing screened in the future.

- Screen the child while asleep (either during nap time, or in a car seat when first arriving at the program). You may work with the parent to wake the child early so that they are more likely to sleep on the day of the screening.

- Spend time conditioning the child to having the ear area touched and manipulated. Games and other positive experiences associated with the ear can then transition to having the ears screened. If time permits, let the child see and touch the probe and probe tip. Touch it to your ear, touch it to the child's forehead, then put it away (without attempting to put it close to the child's ear). An hour later, do the same thing again – touch the nose - repeat - touch the ear -then put it away. Do this over several days or even a week. Then try putting the probe lightly in the ear canal and removing it immediately, before the child cries or resists. Do this repeatedly, over a number of days, until the child accepts that the probe is not going to cause pain and he/she allows you place the probe firmly in the ear canal to conduct the screening. This method takes time and patience, but can result in the child permitted the screening to be done.

- If the child is a little older he or she may be more cooperative if allowed to hold the screening unit and push the buttons, hence having more control over the experience.

Screening and The Screener's Role

Screening:

- Is the first step in a process of evaluating a child's overall hearing health
- Does not diagnose
- Identifies those at risk for hearing loss who need further assessment

Your role as screener includes the following:

- Educating parents
- Obtaining consent
- Coordinating screening activities (with teachers and/or parents)
- Documenting screening outcomes
- Informing parents of results
- Making referrals and following up as necessary

Your role as a hearing screener/case manager does not include the following:

- Explaining the hearing screening technology to parents
- Diagnosing hearing loss
- Describing the anatomy or function of the ear, problems with the ear, or potential problems with hearing
- Explaining the results of the medical or audiological evaluation to parents

When informing parents:

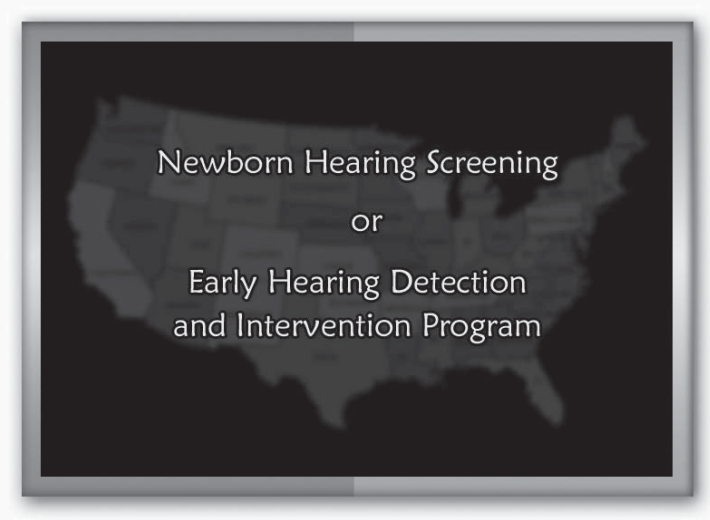
It is important to be careful about how you share the results of your screening activities. When you inform parents in person and/or in writing of the results of the hearing screening, you will want to be thoughtful about the language you use. For example, since screening is not a diagnostic test, it is usually best to say that the child "did not pass" the screening or "referred" from screening, and will therefore need follow-up screening or evaluation.

While you want to convey to the parents the importance of following through with the recommendation, you do not want to cause undue stress or alarm parents unnecessarily. See sample letters in the appendix: 1) Introducing the Hearing Screening Program, and 2) Referral Letter.

Section 3
Implementing a Hearing-Health Protocol

Audiological supervision and support is an essential element of an OAE screening program. By following the recommendations of the audiologist providing guidance to your program, and with the aid of the screening protocol outlined in this section, you will know what to do in response to a given screening result.

The Hearing Screening and Diagnostic Follow-up Forms discussed in this section will greatly facilitate your success in documenting screening outcomes while simultaneously providing prompts on the "next step" in the screening process.



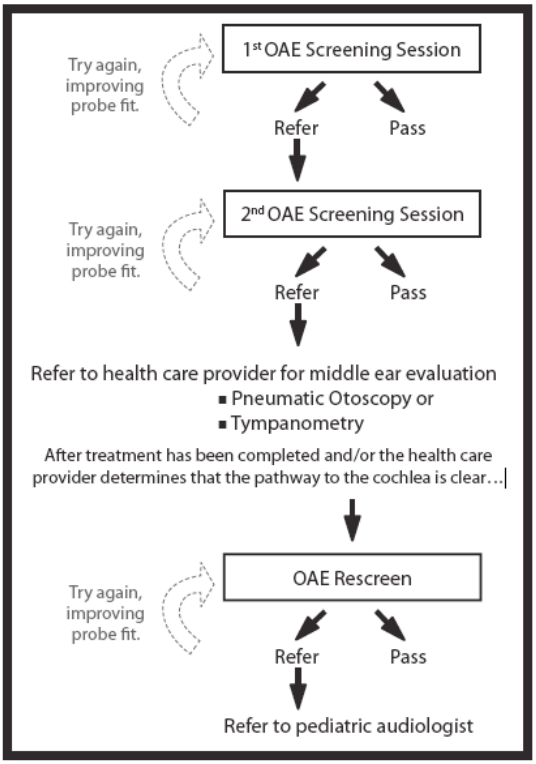
It is also helpful to get acquainted with your state's newborn hearing screening or Early Hearing Detection and Intervention (EHDI) Program (see www.infanthearing.org/status/cnhs.html). Staff from this program can link children who have permanent hearing loss and their families with important resources. They can also be a valuable resource to you in locating resources, information and technical assistance.

Recommended OAE Screening Protocol

An effective screening protocol helps you know what to do in response to specific screening outcomes.

Visual Inspection and Case History

If the ear:	The next step is to:
PASSES the visual inspection…	**Document the outcome and proceed with the OAE screening.**
Has pits, skin tags or other minimal malformations, which do not affect the ear canal opening…	**Proceed with the OAE screening.** If the ear does not pass the OAE screening, make a direct referral to a health care provider. Otherwise, note the abnormality in the child's health record and share this with the health care provider along with the OAE results.
Has a blockage of the ear canal, signs of an infection or a significant malformation of the ear…	**Refer to medical follow-up.** Proceed with the OAE screening only after obtaining medical clearance from the health care provider.
Has a PE Tube…	**Adjust screening equipment,** if your model of equipment requires this, and proceed with the OAE Screening. The ear should pass if tubes are functioning properly.



OAE (1 and 2) Screening in Detail

Each ear is screened independently; whenever one does not pass, proceed to the next step for that ear.

If the ear:	The next step is to:
PASSES the OAE screening…	Assume that the **middle ear and inner ear are functioning properly (**also true for children with PE tubes). Unless there are additional concerns about the child's hearing or language development, no further action needed until the next periodic screening.
DOES NOT PASS on the **first** attempt during a screening session…	Check the probe tip and opening to make sure it is not blocked with wax; **select a different size tip**, if needed, **refit** the probe and **try the OAE screening again, making sure the environment and child remain relatively quiet.**
DOES NOT PASS after **multiple attempts** during the 1st OAE screening session…	Conduct 2nd OAE Screening session within 2 weeks. ▪ If the ear **PASSES** during the 2nd OAE screening session, assume that both the middle and inner ear are functioning properly. No further action is necessary until the next periodic screening. ▪ If the ear **DOES NOT PASS** after multiple attempts during the 2nd OAE screening session, **refer the child to a health care provider for middle ear evaluation.**

OAE (3) Rescreening After Medical Referral in Detail

Programs should communicate with medical providers and work together to determine the optimal time to rescreen as per the provider's diagnosis and treatment plan. **Rescreening after medical clearance is extremely important.** The OAE equipment is able to screen the inner ear ONLY when the pathway through the outer and middle ear is clear.

If the ear:	The next step is to:
Is medically "**cleared**" (infection, fluid or blockage not present or resolved)…	Conduct the OAE Rescreen immediately.
Is **treated for otitis media/middle ear fluid**…	Conduct the OAE Rescreen approximately 2 - 3 weeks <u>after antibiotic treatment has been completed,</u> allowing time for the fluid to dissipate. If the child is referred to an Ear Nose and Throat (ENT) specialist, receives PE tubes, etc., discuss with ENT whether a hearing test (VRA, ABR or OAE) was conducted at conclusion of treatment and if child passed. If not, discuss with ENT when to conduct OAE Rescreen (usually about 1 week after PE tube placement, for example).
Is **not examined** by provider because parents do not follow up…	Conduct OAE Rescreen in 2 weeks.

If the ear:	The next step is to:
PASSES the OAE Rescreen (or other hearing test)…	Assume that the **middle ear and inner ear are functioning properly (**also true for children with PE tubes). Unless there are additional concerns about the child's hearing or language development, no further action is needed until the next periodic screening. If a child has chronic otitis media, more frequent monitoring may be needed.
DOES NOT PASS the OAE Rescreen…	Refer to a pediatric audiologist for a complete evaluation.

OAE Hearing Screening Form

Program _____ **Child's Name** _____

Child Information

Child's ID #: _____ **Date of Birth:** (____/____/____)

☐ **Male** ☐ **Female**

Screened for hearing loss at birth? ☐ Unknown ☐ Not screened ☐ Passed ☐ Referred

Hearing Screening Outcomes

Screener's Name: _____

Child's LEFT Ear

Visual Inspection

☐ *Refer* — **Date** (___/___/___) → Consult health care provider; conduct OAE screening after medical clearance

☐ *Pass*

1st OAE (___/___/___)

☐ *Can't test*
☐ *Refer*
☐ *Pass*

2nd OAE (___/___/___)

☐ *Can't test*
☐ *Refer*
☐ *Pass*

Schedule follow-up (___/___/___)
Middle Ear Consultation
(by health care provider)

Record outcomes on the **Diagnostic Follow-up Form**. After medical clearance, conduct an OAE Rescreen and refer for Audiological Evaluation (by a pediatric audiologist) if needed.

Notes:

_____

_____

Child's RIGHT Ear

Visual Inspection

☐ *Refer* — **Date** (___/___/___) → Consult health care provider; conduct OAE screening after medical clearance

☐ *Pass*

1st OAE (___/___/___)

☐ *Can't test*
☐ *Refer*
☐ *Pass*

2nd OAE (___/___/___)

☐ *Can't test*
☐ *Refer*
☐ *Pass*

Schedule follow-up (___/___/___)
Middle Ear Consultation
(by health care provider)

Record outcomes on the **Diagnostic Follow-up Form**. After medical clearance, conduct an OAE Rescreen and refer for Audiological Evaluation (by a pediatric audiologist) if needed.

Notes:

_____

_____

Time Data

Approximate total time with child required for screening (in minutes):

1st OAE _____ **2nd OAE** _____

Diagnostic Follow-up Form (referral from OAE hearing screening)

CHILD'S NAME _____

Middle Ear Consultation (typically conducted by a health care provider)

Date: (___/___/___) ☐ MD Name of person performing service: _____

Medical service(s) performed:

☐ Otoscopy ☐ Pneumatic Otoscopy ☐ Tympanometry ☐ Other _____

Diagnosis & Treatment:

Ear	L	R	
	☐	☐	Normal (no condition or disorder detected)
	☐	☐	Cerumen removal
	☐	☐	PE tube blockage cleared
	☐	☐	Middle ear disorder (describe): _____ _____
	☐	☐	Other: _____

Follow-up recommendation(s) and date by which recommendation should be completed:
(check all that apply)

- ☐ None
- ☐ Repeat hearing screening (___/___/___)
- ☐ Audiological evaluation (___/___/___)
- ☐ Further medical evaluation (___/___/___)
- ☐ Referral to Early Intervention (___/___/___)
- ☐ Medical treatment (___/___/___)
- ☐ Other _____ (___/___/___) _____

when medical clearance is given (outer and middle ear are clear)

Inner Ear Outcome

OAE Rescreen (by program)

Ear	L	R	
	☐	☐	Can't test
	☐	☐	Refer
			- - - - - - - - - -
	☐	☐	Pass

Pass on both ears Screening Completed

Audiological Evaluation (by pediatric audiologist)

Date: (___/___/___) Name of person performing service: _____

Audiological services performed: ☐ ABR ☐ Behavioral ☐ Other _____

Hearing Status: (check one box under Type and Degree for each ear)

Ear	L	R	Type of loss
	☐	☐	Permanent loss (sensorineural, conductive, mixed)
	☐	☐	Temporary loss (fluctuating conductive)
	☐	☐	Normal—no loss

Ear	L	R:	Degree of Loss
	☐	☐	Mild
	☐	☐	Moderate
	☐	☐	Severe
	☐	☐	Profound
	☐	☐	Normal—no loss

Follow-up recommendation(s) and date by which recommendation should be completed: (check all that apply)

- ☐ None
- ☐ Repeat hearing screening (___/___/___)
- ☐ Further medical evaluation (___/___/___)
  - ☐ ABR ☐ Behavioral
- ☐ Referral to Early Intervention (___/___/___)
- ☐ Other _____ (___/___/___)

Please complete evaluation as soon as possible and send this form to:

Name: _____ Address: _____

Title: _____ _____

When to Refer to an Audiologist

Referral to a pediatric audiologist is warranted when a child:

- Does not pass a follow-up OAE screening, and there is no evidence of temporary blockage or fluid in the middle ear.
- Is experiencing chronic otitis media that is not resolved in three months or less.
- Is consistently uncooperative across two or more screening sessions and an OAE screening cannot be completed.
- Demonstrates hearing or language delays, or when parents are concerned about the child's development, even though the child passed the OAE screening.

When to Contact the State Early Hearing Detection and Intervention (EHDI) Program

- To report screening outcomes of children who did not pass their newborn hearing screening and for whom you are providing the follow-up screening.
- To report any children who are ultimately identified with a permanent hearing loss.
- To obtain contact information for pediatric audiologists in the state.
- To obtain information about available resources for families of children with hearing loss or for your hearing screening program.

When to Pay Extra Attention to Hearing

At a minimum, children should have their hearing screened annually. Additionally, you will want to pay particular attention to a child's hearing health whenever a parent has a concern about hearing, speech, or language development or a child has:

- A family history of childhood hearing loss.
- A tendency toward repeated ear infections.
- Recently experienced a head injury or serious illness involving high fever.
- Risk factors for hearing loss (see position statement at http://www.jcih.org/).
- Subtle behavioral clues that maybe associated with chronic middle ear disease such as irritability, short attention span, high activity level, disrupted peer relationships, uncooperative behavior, inappropriate conversational responses, failure to follow directions, failure to respond when spoken to.

By integrating OAE technology into an appropriate screening protocol, we no longer have to take a "wait and see" approach to identifying hearing loss.

Conducting periodic OAE screening is a way you can help children Hear and Now!

Follow-up Checklist When a child is Identified With a Permanent Hearing Loss

Medical Follow-Up in the Medical Home

❑ Is the child's primary care provider (medical home) fully informed about all diagnoses and follow up and intervention activities?

❑ Has the child received appropriate medical specialty evaluations to help determine the cause of the loss and the type of treatment needed?
- Otolarnygology evaluation to determine the etiology of the loss and to identify related medical conditions that may affect treatment;
- Opthalmological evaluation to assess vision;
- Medical genetics consultation to help determine etiology of loss and the potential for related conditions.

Audiological Follow-Up

❑ Is the child being followed by a pediatric audiologist on a regular basis? (e.g., in the process of being fit for amplification, refinement of amplification, monitoring of hearing sensitivity for possible progression of loss, evaluation of acceptance and use of hearing aids, etc.)

❑ Have the child's siblings been screened for hearing loss as well?

Early Intervention

❑ Has the child been referred to the State Early Hearing Detection and Intervention (EHDI) program and the local early intervention program?

❑ Have staff at your program received education or consultation from an audiologist and/or professional in deaf education regarding the support and inclusion of a child with hearing loss (how to check hearing aids, batteries, classroom modifications)?

Family Support and Other Resources

❑ Has the family received support from professionals and other families in making educational and early intervention decisions?

How teachers and parents can accommodate for a child's temporary or permanent hearing loss

Parents and teachers can minimize the negative consequences of hearing loss by creating an optimal language-listening environment. It is important to remember that even children with middle ear infections nearly always experience some degree of hearing loss which can negatively affect their social and learning experiences.

Reduce the background noise level when speaking to the child:

- At home, this may mean turning off the TV or stereo.
- At school, cover large surfaces with carpet and other sound-absorbent materials.
- Provide separate "quiet" areas for intensive verbal interaction or as a place where a child can retreat from a stressful sound environment.

When it is important for the child to hear a verbal message:

- Be sure the child is attentive before you begin speaking.
- Stand as close to the child as necessary (this may mean preferential classroom seating or not calling to the child from another room).
- Face the child (to increase visual information from the lips, facial expressions, gestures).
- Check to be sure the message has been received (repeat, rephrase, or demonstrate, if necessary).

Provide periods of intense, one-to-one language stimulation (reading aloud, verbal play or conversation) as a regular part of the child's home and school education, within an optimal listening environment.

OAE Hearing Screening Implementation Checklist

Early childhood programs undertaking Otoacoustic Emissions (OAE) hearing screening for children 0 - 3 years of age are strongly encouraged to do so with the involvement of a pediatric audiologist who can provide training, technical support and consultation in program planning. Audiologists can also play a supervisory role in monitoring screening and follow-up activities that significantly contribute to the long-term quality of the screening program. If you do not have access to an audiologist to partner with, it may be helpful to contact your state's newborn hearing screening or Early Hearing Detection and Intervention (EHDI) Program to find out if there are audiologists in your area who have expertise with children and can assist you in your efforts. Additional partners may include individuals/entities implementing other state screening efforts and local health care providers who may also play a role in training, technical assistance and information sharing.

Early childhood program staff, the consulting audiologist and persons who will be providing technical support should print this Checklist and work through each item together. (All materials and resources referenced below are available at http://www.infanthearing.org/earlychildhood/library.html. Some are available in Spanish.)

☐ 1. Watch a 25-minute Introduction to the ECHO Initiative video to understand the elements involved in getting trained and ready to implement an effective OAE hearing screening program.

☐ 2. Decide on the specific screening and follow-up protocol to be followed. (See Instructional Guide, Snapshot of OAE Screening Protocol, and OAE Screening Form.) Determine how often children will be screened as a matter of standard practice (at a minimum, annually) and whether some children will be screened at more frequent intervals based on risk factors.

☐ 3. Select and purchase OAE equipment demonstrated to work effectively for screening children 0 - 3 years of age. (See Elements to Consider When Purchasing OAE Equipment, OAE Equipment Comparisons and OAE Equipment Reviews.) Current cost of OAE equipment is approximately $3400 - $4000. Also purchase an adequate supply of disposable probe tips. If funding for equipment is needed, identify charitable organizations from whom funds might be requested and use the Sample Grant Application to solicit funds.

☐ 4. Use the following resources to invite participation and prepare all individuals who will ultimately contribute to screening program success including children, parents, teachers, and health care providers:

- Listen Up sing-along video prepares children, parents and teachers for OAE screening.
- Information for Teachers helps teachers to know how they can support OAE screening.

- Information for Parents explains OAE screening to parents.
- Information for Health Care Providers introduces your OAE screening program to health care providers who may be receiving referrals.

☐ 5. Identify who will perform the OAE screening, and when and where the training will be conducted using the Training Preparation Checklist. The Training and Technical Assistance Manual for Audiologists provides useful information to the consulting audiologist on how to set up and structure the training.

☐ 6. Train all individuals responsible for screening and follow-up using the 4-part Training Video followed by supervised hands-on practice screening other adults and then children. The Instructional Guide can be printed and provided to each participant.

☐ 7. Designate where the OAE equipment will be stored and who will be responsible for equipment care, maintenance, ordering supplies, coordinating use of equipment, etc.

☐ 8. Determine what documentation of screening results will be provided to parents, health care providers and audiologists when children refer from screening and need further evaluation. A sample referral letter for parents and referral letter to health care providers can be adapted to meet your needs.

☐ 9. Review the Diagnostic Follow-up Form and determine how the referral process will be managed for children who do not pass the OAE Screening and need follow-up diagnostic consultation from a health care provider and/or audiologist. Establish a two-way referral system whereby you transmit information on children not passing the screening to health care providers AND obtain results of subsequent diagnoses and treatments. You will then need to rescreen children and potentially facilitate referral to an audiologist or other specialist.

☐ 10. Determine how each individual child's screening results, and any subsequent diagnostic or treatment information, can be thoroughly documented in your tracking system. (See Tracking and Monitoring Tools.)

☐ 11. Monitor pass/refer rates, adherence with protocol and timelines, and follow-up on referrals. The audiologist should be prepared to provide additional technical assistance and support when needed. See the Screening Skills Checklist and Monitoring for Program Quality Guidelines.

☐ 12. Report to your State EHDI Program any child identified with a permanent hearing loss. Your EHDI program may have additional resources to help your program and/or the child's family. (See also the Checklist for Supporting Families and read an article on Including Children with Hearing Loss in Early Childhood Programs.)

Information for Teachers

We will be coming to complete hearing screenings on children in your class. The following describes the hearing screening process and explains how you can facilitate this being done in an efficient manner.

The Hearing Screening Procedure

The procedure we will be using is called Otoacoustic Emissions or OAE Testing. This is the same procedure used in many hospitals across the country to screen newborns. It is a highly reliable hearing screening method that will help us identify a wide range of hearing health needs, including middle ear disorders (infections) or permanent hearing losses that we otherwise might not know about. These conditions can have a significant negative impact on the social, educational and developmental progress of a child when left untreated.

If a child does not pass the screening we will repeat it several times over a several-week period. If the child still does not pass, the child will be referred to a primary care provider for initial treatment and to an audiologist for a complete evaluation when necessary. **NOTE: If a child does not pass a hearing screening, this does NOT necessarily mean they have a serious hearing health need. Rather, it means that a complete evaluation is necessary.**

What you need to know about OAE hearing screening:

- It involves a tiny sound transmitter/microphone being placed in the child's ear from which the child will hear a clicking or musical tone.
- Does not require the child to respond to the sounds in any way, except to be quiet.
- Will be painless for the child.
- Will take about 3-5 minutes per child.
- Must be done in a relatively quiet environment, but silence is not required.
- May be done while the child is sleeping.

Teachers may facilitate the screening process by:

- **Preparing the children for screening** by playing a little game in which the children pretend to listen to the sound of a bird or other animal coming from a small toy, or even the teacher's hand (the game should NOT involve actually placing anything in the child's ear canal). It is best if the teacher avoids introducing the screening activity by stating anything like, "You are going to have your hearing tested," which is likely to make children feel nervous. It is much better for teachers to **tell children that they will each have a chance to "play a listening game."** Having rewards such as stickers available after the screening can also be a good idea.

- **Recommending an especially cooperative child** as the first to be screened, one who can model cooperative behavior during screening for other children.

- **Designating a specific area in the room** where screening will take place and where something special is set up for the children that will encourage them to sit quietly in this place.

- **Occupying the children's hands and attention** during the screening process, helping to hold the child, and finding ways to soothe them if they are distressed during the procedure. Having quiet toys available for the children, especially novel ones, can be very effective.

Test Your Knowledge about OAE Hearing Screening

Circle the correct response.

1. How many children are born annually in the United States with permanent hearing impairment?

   a. 1 in 100
   b. 1 in 200
   c. 1 in 300
   d. 1 in 400

2. Middle ear infections, if chronic, can cause problems with language development. What percentage of preschool children experience repeated episodes of middle ear infections?

   a. 10%
   b. 25%
   c. 35%
   d. 75%

3. Most children with permanent hearing loss:

   a. Have parents who are hearing impaired
   b. Have parents who do not have any hearing loss
   c. Use cochlear implants
   d. Need pressure equalization tubes

4. The otoacoustic emission is a response from which part of the ear?

   a. Eardrum
   b. Auditory nerve
   c. Cochlea
   d. Ossicles

5. Hearing screening with OAE:

   a. Involves a behavioral response from the child
   b. Is an objective test
   c. Requires the child to be awake and alert
   d. Is provided by most physicians

6. The role of the screener does NOT include:

   a. Re-screening following treatment for an ear infection
   b. Diagnosing hearing loss
   c. Educating parents about the importance of hearing to a young child
   d. Providing a medical referral

7. When selecting the tip size for screening it is best to:

   a. Begin with the smallest available size
   b. Choose a size slightly smaller than the ear canal opening
   c. Choose a size slightly larger than the ear canal opening
   d. Begin with the largest available size

8. When screening a child for the first time you notice that he/she is congested and the result is a "refer" in both ears. Which action would be appropriate for the screener to take?

   a. Refer the child to the physician
   b. Refer the child to the audiologist for further testing
   c. Repeat the screening while holding the probe in place
   d. Repeat the screening within the next few weeks

9. After a child refers from screening, is seen by a healthcare provider, and completes treatment for an ear infection, you should:

   a. Refer the child immediately to an audiologist
   b. No further action is needed
   c. Rescreen the child in 4-6 weeks
   d. Repeat the screening only if concerns arise

10. A child with an ear infection and accompanying fluid in the middle ear:

   a. Will pass the OAE screening
   b. Will not pass the OAE screening
   c. Will usually be identified easily without OAE screening
   d. Will typically not have difficulty hearing

11. If a child is uncooperative and consistently displaces the probe from the ear canal during the initial screening session, you should:

   a. Try to screen the child again during nap time
   b. Hold the probe firmly in the ear canal while screening
   c. Refer the child immediately to the audiologist
   d. Attempt to screen him/her the following year

12. If excessive noise is present during the screening:

   a. It will take longer to complete the screening
   b. The probe should be held in place
   c. A smaller probe tip should be used
   d. The equipment will increase the volume of the stimulus

Answer Key:

1 - c	5 - b	9 - c
2 - c	6 - b	10 - b
3 - b	7 - c	11 - a
4 – c	8 - d	12 - a

Appendix 1: Sample Letters

Sample Letter Introducing OAE Screening to Physicians/Audiologists

Dear _____

I am writing to inform you of a new hearing screening process we are implementing for children, birth to three-years-old, who are served by our program. It is important to us that you are aware of our screening activities as we will be referring children who do not pass our screening to you for a more thorough examination. Our goal is to create a screening system that is as efficient and effective as possible.

To achieve that goal, we are conducting hearing screenings using otoacoustic emissions (or OAE) technology. The highly reliable measurement of OAEs is one of the technological developments that has led to universal newborn hearing screening being legislatively mandated in more than 32 states. During OAE screening, a small microphone is placed in the child's ear emitting a series of soft clicks or tone bursts while a connected micro-computer measures the responding sound waves generated in the inner ear (cochlea). For us, this technique represents an opportunity to screen young children in our program in a much more effective and reliable manner than ever before.

By implementing this type of hearing screening, we hope to:

1. Help identify middle ear conditions, such as the presence of chronic fluid or undetected ear infections, which can potentially affect a child's hearing and language acquisition. If a child does not pass the screening, we will be able to refer him or her to you promptly for appropriate medical evaluation.

2. Help identify any cases of more permanent, sensorineural hearing loss. Although hearing loss of this type is relatively rare in children, when it does exist, is it important to find as early as possible so that the child does not miss out on language-learning opportunities during the most critical period of development from birth to three years of age.

As early childhood educators, we are very aware of the significance of conditions that can impair a child's ability to hear. Our goal is to work collaboratively with you and local audiologists so that children who do not pass our hearing screening receive subsequent medical and, if needed, audiological evaluations in the most timely manner possible. Attached is a copy of a hearing screening protocol recommended by the National Center for Hearing Assessment and Management at Utah State University that we will be following. As with any screening process, we are aware of the risk of over-referring children who may not pass the screening due to screener inexperience or environmental factors reducing test reliability. Therefore, as you will see in the recommended protocol, a child will be referred to you only after repeated screening attempts. We expect that this will result in a reliable screening process that will not place an undue burden on families, medical providers or audiologists. As with any new endeavor, we are open to your feedback so that we can refine our process in ways that make the best sense. We welcome your ideas and input.

As always, we appreciate our working relationship with you. Please let us know if you have any preferences in how referrals are made, and how we can best work together to serve children with hearing loss.

Sincerely,

Sample Letter Introducing Parents to OAE Screening

Dear _____,

I am writing to let you know of an exciting improvement in the area of hearing screening for all children, birth to three-years-old, in our program.

We are pleased that children in our program receive a variety of health screenings. As a part of this, we will be conducting hearing screening using otoacoustic emissions (or OAE) technology. This highly effective screening technique is already being used in many states across the country to screen newborns for potential hearing problems.

During OAE screening, a small microphone is placed in the child's ear. This microphone makes a series of soft clicks or tones. A micro-computer then measures how well the inner ear is working. For us, this technique represents an opportunity to screen young children in our program in a much more effective and reliable manner than ever before.

We have two goals in conducting hearing screenings:

1. We want to help identify any undetected ear infections that can potentially affect your child's hearing. If your child does not pass the screening, we will be able to refer him or her for prompt medical evaluation and treatment.

2. We want to identify any cases of more permanent hearing loss. This type of hearing loss is relatively rare in children. However, when it does exist, it is important to find it as early as possible. If a hearing loss goes undetected, a child will miss out on language-learning opportunities during the most critical period of development, from birth to three years of age. By identifying any hearing loss early in a child's life, we can provide immediate intervention.

The hearing screening process we are using is a simple and totally painless process. Some children even enjoy it. It takes only a few minutes to complete. In some cases, it may need to be repeated to obtain accurate screening results. If your child does not pass the screening, we will notify you and recommend that your child be examined by either a doctor or an audiologist (hearing specialist) for a more complete evaluation.

We are proud of the ways we continue to grow and improve our services. We are very fortunate to be able to provide this enhanced hearing screening service to our children. If you have any questions, please feel free to contact me.

Sincerely,

Sample Letter Introducing Parents to OAE Screening – Spanish

Estimados Padres de Familia,

Les escribo para informarles de un emocionante avance en el area de pruebas de audición, para todos los niños de 0 a 3 años de edad en nuestro programa..

Nos da gusto que los niños que son parte de nuestro programa reciben una gran variedad de pruebas de salud. Para mejorar nuestro proceso de pruebas de audición, nos han seleccionado como uno de los primeros programas en el pais, que implementatará estas pruebas utilizando tecnología de emisiones otoacústicas (OAE). Esta técnica de evaluación es altamente efectiva y ya está siendo utilizada en muchos estados del país, para evaluar e identificar a todos los recién nacidos con posibles problemas de oído.

Durante la evaluación OAE, se coloca un pequeño micrófono en el oído del niño. El micrófono produce una serie de tonos o 'clicks' bajos. Una microcomputadora
entonces determina la forma en la que el oído interno esta funcionando. Para nosotros, esta técnica representa una oportunidad para evaluar a los niños pequeños que son parte de nuestro programa en una forma mucho más efectiva y confiable de lo que ha sido posible hasta ahora.

Al realizar pruebas auditivas tenemos dos metas:

1. Queremos ayudar a identificar cualquier infección de oído que no se haya detectado que pudiera afectar la capacidad auditiva de su niño. Si su niño no pasa la prueba de oído, podremos rápidamente referirle para recibir una evaluación y tratamiento médico.
2. Queremos identificar cualquier caso de pérdida de oído más permanente. Este tipo de pérdida de oído es relativamente rara en los niños. Sin embargo, cuando esta sucede, es muy importante detectarla lo más pronto posible. Si la pérdida de oído no se detecta, el niño puede perder muchas oportunidades de apredizaje de lenguaje durante el período de desarrollo más importante, de 0 a 3 años de edad. Al identificar tempranamente cualquier pérdida de oído, podemos proporcionar intervención inmediata.

El proceso de evaluación auditiva que usamos es un proceso sencillo y no ocasiona ningún dolor. A algunos niños parece gustarles. Toma solamente unos minutos para completar. En algunos casos, es necesario repetirlo para obtener resultados confiables. Si su niño no pasa la prueba de oído, se lo notificaremos y le recomendaremos que su niño sea evaluado por un médico o una audiólogo (especialista de oído) para recibir una evaluación más completa.

Nos sentimos orgullosos del modo en que seguimos desarrollando y mejorando nuestros servicios. Afortunadamente podemos ofrecer a nuestros niños este avanzado servicio de pruebas de audición. Si tienen alguna pregunta, por favor no duden en Contactarme.

Atentamente,

Sample Letter of Referral for Parents

Dear Ms. / Mr. <contact last name>,As you know, all children participating in our program receive a hearing screening. We are pleased to offer this as a helpful resource in caring for your child's hearing health.

The results of your child's hearing screening are as follows:

Your Child's Left Ear:

Your Child's Right Ear:

After reviewing your child's hearing screening results, we are recommending that a more detailed examination be scheduled with a doctor. Some children may not pass the hearing screening due to wax blockage in the ear canal or a mild, undetected middle ear infection. It is therefore important that your child's ears be examined by a doctor as soon as possible.

We are referring your child to Dr. _____ whose phone number is:

_____. Please make an appointment as soon as possible.If you have questions or concerns, please call us at .
Let us know if you need any help in making this follow-up appointment.Sincerely,

Sample Letter of Referral for Parents – Spanish

Estimado Sr./ Sra. <last name>,

Como usted sabe, todos los niños que participan en nuestro programa reciben una prueba de oído. Nos complace ofrecerles este servicio como una ayuda en el cuidado de la salud auditiva de su hijo o hija.

Los resultados de la prueba de oído de su hijo/a son los siguientes:

Oído Izquierdo:

Oído Derecho:

En base a una revisión de los resultados de la prueba de oído de su niño/a, le recomendamos que programe una evaluación más detallada con un médico. Algunos niños no pasan las pruebas de oído por tener el canal auditivo
bloqueado con cera, o por una infección leve del oído medio que no se haya detectado. Por lo tanto es importante que un médico examine los oídos de su niño/a lo más pronto posible.

Estamos recomendando que lleve a su hijo/a a una consulta con

Dr./Dra. _____

Teléfono_____

Por favor haga una cita lo más pronto posible, y avísenos si necesita alguna ayuda para comunicarse con el despacho médico al pedir la consulta.

Si tiene alguna duda o pregunta, por favor llámenos al_____.

Atentamente,

Appendix 2: OAE Equipment Evaluation Checklist

- Otoacoustic Emissions (OAE) Hearing Screening Equipment - Criteria for Evaluating the Appropriateness of Screening Equipment for Lay Screeners Working with Children 0–3 Years of Age

This document provides a description of how early childhood health and education providers can evaluate OAE hearing screening equipment before making purchasing decisions. All OAE equipment does not work equally well when it comes to screening infants and toddlers--the best way to assess the utility of a particular unit is by actually using it to screen a number of young children and noting the ease of use and speed of screening. Specifically, prior to buying equipment, a program's hearing screening coordinator should work with a local audiologist to:

1) Arrange with equipment vendors/manufacturers to obtain several different brands of portable OAE equipment on loan for a short period of time.

2) Become familiar with the equipment components, including the probe and probe covers, as well as the screening menu that allows the screener to begin and run the procedure.

3) Select a number of young children of different ages (some who are very comfortable being screened, some who are not) and try to screen each child with each type of equipment. Vary the conditions under which the screening is conducted. Take notes on how easy/difficult it is to get a good probe fit and whether the probe will stay firmly seated in the ear canal even if the child is moving. Also pay attention to the speed with which the test runs when conditions are optimal (quiet child and environment) and when conditions are less than optimal (child is wiggling, ambient noise in the environment created by other children talking and playing). It is extremely important to note that well-designed OAE screening equipment should allow you to screen in the child's natural environment. Very loud sounds, such as a child crying or manipulating a very noisy toy, may make it difficult/impossible to complete the screening, but in general, the sound of children talking or laughing nearby should not interfere significantly with being able to complete the test.

4) Purchase a piece of screening equipment only when you feel satisfied that it is able to perform consistently under a variety of screening conditions and with a variety of children.

On the following pages you'll find a few more specific features to consider in evaluating OAE equipment.

Name of Equipment: _____

Manufacturer: _____

Manufacturer/Distributor Contact:_____

Equipment specs: ___DPOAE ___TEOAE ____Both

Default pass/fail criteria: ___ 4 out of 4 frequencies

___ 3 out of 4 Frequencies

___ 2 out of 4 frequencies

Is data available documenting how many children this equipment has formally been tested on/their age range/outcomes, etc.? Sensitivity/specificity?

Purchase and Maintenance:

Assess:	Cost & Other Info.
1. What is the cost of the equipment? 2. What is the cost of a replacement probe or microphone? 3. What is the cost for each disposable probe cover or tip?	
4. What is the cost of battery replacement? 5. What is the cost of each replacement nozzle/filter /probe coupler? 6. What is the cost of annual maintenance/calibration?	
7. What accessories are included in the standard package? (extra probe, battery printer, printer labels, etc.) What options are available for substituting accessories if some are not needed? 8. What software upgrades are included in the purchase price?	
9. Is this unit considered the basic model most appropriate for screeners? Does it have an “easy mode” for screeners?	

Manufacturer/Distributor Support:

Assess:	Yes	No
10. Are customers allowed to use the machine on a trial basis prior to purchase? On what terms? 11. Is local support available and, if so, from whom?		
12. Are "hands-on" in-service and follow-up visits (if needed) included as part of the purchase?		
13. Does the service contract provide quick, reliable repair and include loaner equipment if the equipment must be returned to the manufacturer for more extensive repair?		
14. Is the manufacturer's warranty satisfactory? What are the terms?		
15. Does the equipment come with sufficient training materials such as a training video, user's guide and quick reference sheet?		

Screening Unit Inspection:

Assess:	Yes	No
16. Is the equipment handheld? Easy to hold? Easy to place on a floor or tabletop and use? 17. Can the equipment be kept clean easily? Is there an infection control sleeve? 18. Does the display have a lighted option for screening in low light?		
19. Is a carrying case provided that allows easy access, minimizes cord damage and the need to disconnect the probe from the unit?		
20. Can the equipment run on either battery or a plug-in power source? 21. How long does the battery maintain a charge? (Should hold a charge for 3 hours of testing or be able to perform 50-100 tests before needing to be recharged.) 22. How long does it take the battery to charge? (Should fully charge in 3 hours or less.)		
23. Does it have a memory? How many tests does it hold/store in memory?		

Assess:	Yes	No
24. Is there software available that allows the unit to link to specific databases? 25. Are there options for changing the default pass/fail criteria? Could this be accidentally changed by screeners?		

Probe Inspection:

Assess:	Yes	No
26. Is the probe easy to clean and service?		
27. Is the length of the cord from the machine to the probe 48 inches or longer? 28. Does it have a "clip" allowing the screener to attach the cord to the child's clothing to keep the cord weight from pulling the probe from the child's ear, leaving the screener's hands free to run the equipment and work with the child?		
29. Is the probe designed so that once it is inserted in the ear the screener does not hold it in place while the test is run?		
30. Are foam or similar compressible/expandable probe covers available? 31. Does the probe come with a selection of probe tip covers for all ages? 32. Are the disposable probe tips easy to change? (easy to place snugly on the probe, also easy to remove in one piece) 33. If the probe itself become clogged, is it easy to clean (or to replace the clogged part?		

Ease of Use:

Assess:	Yes	No
34. Is the equipment easy to turn on and use right away? (should not have to navigate through many menus). If not, does it have an easy mode, featuring only essential capabilities? 35. Does the display allow you to quickly begin, stop and restart tests?		
36. Is the probe easy to place in the ear? 37. Does the probe stay firmly seated in the ear canal of an upright child while s/he is moving?		

Assess:		
38. Does the unit allow for screening a child with PE tubes? 39. Is it necessary to manually change something when screening a child with PE tubes?		
40. Does the display tell you if the probe fit is good, poor or if there is too much noise? 41. Are error messages intuitive/easy to understand? 42. Does the screening proceed even with a modest amount of ambient noise? 43. Can the screening be completed quickly (2 minutes or less on a cooperative child)? 44. Does the equipment provide an overall outcome (pass, refer/fail) that is simple to understand and requires no interpretation? 45. Are ear-specific results saved?		

Overall Result: Equipment well suited for lay screeners screening children 0-3 years of age?

Yes _____ No _____

Comments: _____

_____

_____

_____

_____

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