Hearing Screening Guidelines and Resource Manual

Publication of:
The Kansas State Department of Education, Early Childhood, Special Education, and Title Services, and The Kansas Department of Health and Environment
July, 2003;
Revised: January, 2004; and
Edits Made: June, 2004 and October, 2014
The mission of the Kansas State Board of Education is to prepare Kansas students for lifelong success through rigorous, quality academic instruction, career training and character development according to each student's gifts and talents. To accomplish this mission the State Board has identified five goals. They are as follows:

- Provide a flexible delivery system to meet our students' changing needs.
- Provide an effective educator in every classroom.
- Ensure effective, visionary leaders in every school.
- Promote and encourage best practices for early childhood programs.
- Develop active communication and partnerships with families, communities, business stakeholders, constituents and policy makers.

Adapted Jan 2013

The Kansas State Department of Education does not discriminate on the basis of race, color, national origin, sex, disability, or age in its programs and activities and provides equal access to the Boy Scouts and other designated youth groups. The following person has been designated to handle inquiries regarding the non-discrimination policies: KSDE, Landon State Office Building, 900 SW Jackson St., Suite 102, Topeka, KS 66612-1212, (785) 296-3201.
ACKNOWLEDGMENTS

The following committee made recommendations to the Kansas State Department of Education for revising the previous procedures during 2003. Additionally, new and existing members suggested revisions to update the document in June, 2013 and for the revisions made in September, 2014. We gratefully acknowledge their commitment and hard work.

Elizabeth Abbey, MA CCC-A
Evelyn Alden, Data Analyst
Fred Britten, PhD, CCC-A
Mary Counts, AuD, CCC-A
Heidi Daley, MS, CCC-A
Victoria Hart, AA, Graphic Designer
Joan Houghton, EdD
Pat Murphy, MA, CCC-A
Molly Pottorf, MA, CCC-A/SLP
Hidy Schiesser, MS, CCC-A
Jane Shirley, BSN, RN
Kim Sykes, MS, CCC-A
Haris Zafar, PhD, CCC-A

This publication was jointly developed by the Kansas State Department of Education and Kansas Department of Health and Environment, with input from audiologists from the Kansas Speech-Language-Hearing Association. These guidelines and manual were edited in August, 2014 in order to reflect changes in governmental and departmental agencies, statutes, resources, and websites. Additionally, the information contained in Chapters 2 through 4 in the revised guidelines was shared with the Kansas Infant-Toddler Tiny-K Hearing Screening Guidelines and Resource Manual that was published by the Kansas Department of Health and Environment in July, 2010.

For more information, please contact:
Kansas State Department of Education
   Early Childhood, Special Education, and Title Services................................. 800-203-9462
   Out of State and Local Calls........................................................................... 785-296-2515

Kansas Department of Health and Environment............................................... 785-296-1270

Kansas Resource Guide.......................................................................................... 800-332-6262

Kansas Department of Child and Family Services............................................ 888-369-4777

Information about future training opportunities, including renewal workshops, is available at
www.kumc.edu/ku-ahec/about-us/staff.html
INTRODUCTION

For many years, the Kansas State Department of Education (KSDE) and the Kansas Department of Health and Environment (KDHE) have collaborated to develop hearing screening procedures for children. The purpose of this collaboration was to provide a statewide standard for hearing screening in the State’s public schools and other settings.

It is important to identify hearing loss early and provide timely intervention for very young children and their families. The purpose of this manual is to provide standardized hearing screening procedures for all Kansas children, from birth to 21 years old. Hearing may be screened at various screening sites, such as:

- Schools
- Local Health Departments
- Community Sites
- Physician or Clinically Certified Audiologists

Many Kansas early childhood programs routinely screen hearing, including:

- Infant-Toddler Services [Part C of the Individuals with Disabilities Education Improvement Act (IDEIA, 2006)]
- Early Head Start
- Parents as Teachers
- Child Health Assessments
- Community Child Find Strategies
- Head Start Programs
- Special Education
- General Education

The procedures in this document were written to be used as a training manual and a resource for Hearing Screening Technicians who conduct hearing screenings for children. After receiving the hearing screening training(s) and are certified, Hearing Screening Technicians conduct screenings to identify children in need of a referral. Hearing Screening Technicians should adhere closely to these procedures contained in these guidelines.

In 1999, a Kansas law was passed to require hearing screening of all babies born in Kansas hospitals. The Hearing Screening Guidelines and Resource Manual does not address newborn hearing screening prior to hospital discharge, follow-up screening, or assessment. For additional information about Newborn Hearing Screening, contact the SoundBeginnings Coordinator at 800-332-6262.
CONTENTS

Kansas State Board of Education ........................................................................................................ ii
Acknowledgements ....................................................................................................................... iii

Introduction iv

CHAPTER I – HEARING SCREENING TECHNICIAN REQUIREMENTS ........................................... 1

A. DEFINITION AND LEGAL REQUIREMENTS ........................................................................... 1
   1. The Kansas Department of Health and Environment Programs ................................................. 1
   2. Kansas Department of Child and Family Services KAN Be Healthy Screenings ......................... 2

B. TRAINING ................................................................................................................................. 2

C. SUPERVISION .......................................................................................................................... 2

CHAPTER II – PREPARATION FOR CONDUCTING LEVEL 1 AND LEVEL 2 HEARING SCREENING .......................................................... 3

A. EQUIPMENT AND SUPPLIES NEEDED ................................................................................. 3
   Level 1 – Pure-tone Hearing Screening ......................................................................................... 3
   Level 2 – Tympanometry and Infant-Toddler Hearing Screening .................................................. 3

B. LOCATIONS FOR CONDUCTING A HEARING SCREENING .................................................. 3

C. EQUIPMENT CHECK AND MAINTENANCE ........................................................................... 3
   1. Daily Listening Check of the Audiometer .................................................................................. 4
   2. Daily Check of Tympanometer .................................................................................................. 5
   3. Maintenance of Equipment ...................................................................................................... 5

D. THE HEARING SCREENING SESSION CHECKLIST ............................................................... 5

E. UNIVERSAL PRECAUTIONS .................................................................................................... 6
   1. Contaminant Exposure ............................................................................................................. 6
   2. Controlling Contaminant Exposure .......................................................................................... 6
   3. Disinfect the Tympanometer Probe Tips and Non-Disposable Otoscope Specula ...................... 6
   4. Universal Precautions Best Practices .................................................................................... 6

F. DIFFERENT TYPES OF HEARING SCREENINGS ................................................................... 6
   1. Pure-tone Sweep Frequency Screening ................................................................................... 6
   2. Tympanometry ....................................................................................................................... 6
   3. Threshold Screening ............................................................................................................... 7
   4. Play Audiometry .................................................................................................................... 7
   5. Otoacoustic Emissions (OAE) Screening ................................................................................ 7

CHAPTER III – LEVEL 1 TRAINING .............................................................................................. 9

A. REQUIREMENTS FOR INITIAL TRAINING (LEVEL 1) ............................................................ 9

B. CLASS SYLLABUS FOR LEVEL 1 INITIAL HEARING SCREENING TRAINING .................... 10

C. SWEEP FREQUENCY SCREENING ......................................................................................... 11
   1. Administering Screening ......................................................................................................... 11
   2. Instructions to the Child ......................................................................................................... 11
   3. Sweep Frequency Screening Procedures ................................................................................. 12
   4. Common Errors in Audiometry ................................................................................................ 12
   5. Complete the Hearing Screening Report ................................................................................ 12
   6. Referral Criteria .................................................................................................................... 12

D. VISUAL INSPECTION ................................................................................................................ 13
   1. Position the Child .................................................................................................................... 13
   2. Examination Procedure ........................................................................................................ 13
   3. What to Observe .................................................................................................................... 13
   4. When to Refer ...................................................................................................................... 13
   5. Complete The Hearing Screening Report .............................................................................. 14

E. THRESHOLD SCREENING PROCEDURES ............................................................................ 14
   1. Threshold Determination ...................................................................................................... 14
   2. Threshold Screening for Young or Difficult-to-Test Children .................................................. 14
   3. Complete The Hearing Screening Report .............................................................................. 15
   4. Referral Criteria .................................................................................................................... 15
CHAPTER I
HEARING SCREENING TECHNICIAN REQUIREMENTS

A. DEFINITION AND LEGAL REQUIREMENTS

In this manual, the term “Hearing Screening Technician” is defined as any person trained by a Kansas licensed audiologist to conduct hearing screenings. The technician administers hearing screening tests and an initial screening of the health and function of the ear. The level of training designates the level of competencies. Any unlicensed person who is assigned to conduct hearing screening is required to hold the appropriate level of certification. Links to the following statutes, laws, and regulations that pertain to hearing screenings are included in the appendix.

In compliance with (K.S.A. 72-1204-1207), every individual assigned by the Local Education Agency (LEA) to conduct hearing screening must be certified in the use of a calibrated audiometer. In addition, [K.S.A. 72-1205(d)] requires local school districts to designate the person(s) qualified to perform basic hearing screening. [K.A.R. 91-40-7(b)(1)] is the state regulation that refers to hearing and vision screenings conducted in schools. This only applies to children 3 years old to 5 years old.

1. The Kansas Department of Health and Environment Programs
   a. SoundBeginnings: In 1999, a Kansas law was passed to require hearing screening of all babies born in Kansas hospitals (K.S.A. 65-1, 157a). The law was revised in 2004 to include parameters for conducting hearing screenings for newborns and infants. This document does not address newborn hearing screening. The Kansas Newborn Hearing Screening Guidelines [KDHE (n.d.)] is located online at www.soundbeginnings.org
   b. Infant-Toddler Services: There is a possibility of progressive, late–onset, and newly acquired hearing losses in children. The Kansas Department of Health and Environment, Infant-Toddler Services, Part C (IDEIA, 2006) recognizes the need for staff members providing hearing screening services are qualified to check the hearing status of infants and toddlers. The Kansas Department of Health and Environment, Infant-Toddler Services requires that any Kansas Part C (IDEIA, 2006) personnel who conduct hearing screening of an infant or toddler (birth through 2 years old) is a licensed Audiologist or a certified Hearing Screening Technician.

2. Kansas Department of Child and Family Services KAN Be Healthy Screenings
   The Kansas Department of Child and Family Services (formerly known as The Kansas Department of Social and Rehabilitation Services) revised the KAN Be Healthy Screenings [under Kansas Medical Assistance Programs (K-MAP, 2012, also known as KanCare)] standard of practice for hearing screening within the KAN Be Healthy health assessment screening. In order to complete the KAN Be Healthy hearing screening and documentation requirements, providers may choose from one of the following four options:
   a. Paper hearing screening (meets the minimum requirements).
      Only one type of paper hearing screening is required (i.e., age appropriate). All of the below listed forms and reports are located in the appendix.
      Infant-Toddler:
      • The Risk Indicators for Hearing Loss Checklist (KDHE, 2010)
      • The Hearing Health History (KSDE, 2004)
      • The Developmental Scales (KDHE, 2010)
      All Ages:
      • The Hearing Screening Report: Birth through 2 Years Old (KDHE, 2010)
      • The Hearing Screening Report (KDHE, 2010)
   b. Audiometry (i.e., age appropriate; equipment needed)
   c. Tympanometry (i.e., age appropriate; equipment needed)
   d. Refer based on the results of a paper hearing screening and/or equipment parameters
B. TRAINING
The Hearing Screening Technician training should be conducted by a licensed audiologist. The number of participants who enroll for the training sessions should be limited to ensure effective learning environments. Questions regarding training and educational materials can be directed to the Area Health Education Center Program Manager (ACHE, 2013) or a local licensed audiologist.

This training manual is online at www.ksde.org >Special Education >Sensory Losses. Hearing Screening Technicians should follow state and local policies, and procedures to conduct the hearing screenings [e.g., KSDE; KDHE; and/or Early Periodic Screening, Diagnosis, and Treatment (EPSDT)].

C. SUPERVISION
When participants have completed training and demonstrated competencies, they are ready to conduct hearing screenings, according to state law [K.S.A. 72-1205(d)]. When noncertified individuals register for these workshops, they identify their sponsoring certified professional who will list them on his or her license as required by regulation.

NOTE: Licensed persons include those who are licensed, certified, registered, or otherwise recognized, by any of the following state agencies:
- Board of Healing Arts (i.e., physicians)
- Board of Nursing (i.e., nurses)
- Health Occupations Credentialing (i.e., speech-language-pathologists or audiologists) through The Kansas Department of Aging and Disabilities (KDAD) (KDHE, 2010, p. 2).
CHAPTER II
PREPARATION FOR CONDUCTING LEVEL 1 AND LEVEL 2 HEARING SCREENING

A. EQUIPMENT AND SUPPLIES NEEDED
The following are lists of equipment and supplies that are needed to conduct Level 1-Pure-Tone Hearing Screening, and Level 2-Tympanometry and Infant-Toddler Hearing Screening Training.

**Level 1 – Pure-Tone Hearing Screening**
- an otoscope with appropriate sizes of disposable specula
- a calibrated audiometer
- play audiometry items (e.g., blocks)
- forms
- cleaning supplies
- gloves
- alcohol-free disinfectant wipes for headset and earphone cushion

**Level 2 – Tympanometry and Infant-Toddler Hearing Screening**
- all the items listed above in Level 1 Pure-Tone Hearing Screening
- a calibrated tympanometer
- probe tips

B. LOCATIONS FOR CONDUCTING A HEARING SCREENING
Locating a suitable acoustic environment is a very important part of the hearing screening protocol. Initially, a site can be tested for adequacy by performing a simple listening test. If each frequency to be screened can be heard at 20 dB HL or below by someone with “normal” hearing, the site is considered satisfactory to conduct a hearing screening. Check daily or more often as needed.

**AVOID THE FOLLOWING WHEN SELECTING A HEARING SCREENING SITE**
- an area near a gymnasium, construction, kitchen, or heavy traffic noise
- an area near an air conditioner and/or heating unit
- interference from a printer, clock, or other machines that make noise
- interference from florescent lighting (If the sunlight is adequate, turn off the lights during the hearing screening)
- Do not conduct a hearing screening session if there is interference.

**NOTE:** **DO NOT CONDUCT THE HEARING SCREENING** if the hearing screening cannot be conducted at 20 dB HL because of noise occurring in this environment. Also, be aware that conditions may change during testing hours.

C. EQUIPMENT CHECK AND MAINTENANCE
The following are parts of an audiometer that a Hearing Screening Technician will need to know, including:
- an intensity attenuator (dB HL)
- a frequency selector
- a tone presentation button or bar
- a power switch
- an output selector
- a headphone for the right ear and a headphone for the left ear
- a calibration sticker
A properly serviced and calibrated instrument is important for test reliability. It is helpful to use a few simple procedures to recognize equipment problems, or recognize the need to repair the equipment, between periodic maintenance.

1. **Daily Listening Check of the Audiometer**

   The following equipment and procedures for operation should be conducted on a daily basis to ensure the best hearing screening results for children.

   **Earphones**
   - Check the cords, including:
     - Set an attenuator at 50 dB HL or higher.
     - Set the frequency at 1000 Hz. While listening to the tone, flex the cord on the headset at the connections (at earphone and audiometer). If a scratchy noise is heard or the tone cuts out, a new cord may be needed.
     - Check the electrical cord and headset cords for breaks or static. Never bend or twist the cords.
   - Check for the hum in each earphone, including:
     - Set the frequency at 1000 Hz.
     - Set an attenuator to 80 dB HL (signal off) and listen for a noise or hum.
   - Check for tone in each earphone, including:
     - Direct a signal to the right earphone.
     - Disconnect the right earphone from the audiometer.
     - Rotate frequency switch through all frequency settings while the child listens for tones in the quiet (left) earphone.
   - Use the above steps for the opposite (right) earphone. Any sound that occurs in the quiet earphone will interfere with the hearing screening (i.e., particularly in a unilateral hearing loss).

   **NOTE:** There should not be a hum or extraneous noise in any of the above settings with the tone deactivated (i.e., the tone is turned in the “off” position). An audiometer may develop a tone in the quiet earphone.

   **Attenuation at Low Levels**
   - It is important to check the signal at the attenuator settings of 0 dB HL. Sometimes the signal in the earphone will drop to about 10 dB HL above 0 and remain constant. Sometimes it will increase slightly when the attenuator is turned below this point. This condition is most likely to be a problem between 1000 Hz and 4000 Hz.
   - To check for this problem, use a person with a threshold of 0 dB HL or better since a decrease should be detected as the attenuator is moved from 10 dB HL to below 5 dB HL.

   **Calibration**
   - Signed and dated sticker should be affixed somewhere on an audiometer to indicate the date of the last calibration.
   - Regardless of how often an audiometer is serviced, it is recommended to regularly obtain audiograms on a person who has “normal” hearing to verify the calibration.
   - Listen to each frequency tone and be sure the tone can be heard at least at 0 dB HL by a person with “normal” hearing.
   - If there is a difference of intensity level between the two earphones at some of the frequencies, the audiometer is not appropriately calibrated. It should be checked by a qualified service person.

   **NOTE:** Annual electroacoustic calibrations are required. Do not use an audiometer if it has not been calibrated within the past year.

   **Fitting the Headset**
   - The fit of the headset affects the limit on low-level measurements when the ambient noise level is high. Always check the following:
     - Examine the cushions on the earphones. They should be reasonably resilient and free of cracks. If not, they should be replaced.
     - Earphones may NOT be switched between audiometers without recalibration of audiometers.
     - Examine the shape of the head band for symmetry.
Clean headphones and the band with alcohol-free antiseptic solution. (See the section on Universal Precautions in this chapter.)

- If an acoustic enclosure is used:
  - Check to see that all plugs are inserted completely into the Sound Room Jack Panel. Ensure the cords are not frayed or the tongs are not bent.
  - Clean and tighten the jacks periodically. Earphone output may drop when plugged through the jack panel even though there is no drop in output when the earphone is directly connected to an audiometer.

2. Daily Check of Tympanometer
   A “pre-test” needs to be conducted on a nonparticipant who has a normal tympanogram. This person should have normal ear canal volume and eardrum motility. Conducting a pre-test will most likely ensure proper instrument function. If the tympanometer has a calibration cavity, refer to the instruction manual.

3. Maintenance of Equipment
   The following equipment needs to be maintained on a frequent basis prior to training sessions and/or conducting actual hearing screenings on students. The equipment and directions to ensure the maintenance of the equipment, includes:
   a. Otoscope
      - If the instrument is battery operated, ensure fresh batteries are available.
      - If the instrument is rechargeable, be certain that it receives a full charge daily.
   b. Audiometer
      - Transport carefully. Place an audiometer on the car seat and secure with seatbelt.
      - Do not expose an audiometer to extreme heat or cold.
      - Do not bump or drop an audiometer.

   **NOTE:** Give an electroacoustic calibration for every audiometer conducted by a qualified professional each year. For resources, contact a licensed audiologist.

   c. Tympanometer
      - Transport carefully.
      - Do not expose the tympanometer to extreme heat or extreme cold.
      - Probe tips must be cleaned after each examination. (See Universal Precautions in this chapter.)
      - A qualified professional should calibrate the tympanometer annually. A majority of the tympanometers conduct a self-calibration when the power is activated.

D. THE HEARING SCREENING SESSION CHECKLIST
   The following activities need to be conducted prior to the hearing screening session. These activities include:
   - Confirm acoustical calibration has occurred within the past year.
   - Confirm the tympanometer calibration has occurred within the past year.
   - Conduct the hearing screening in a quiet area if a sound-treated room is not available (e.g., all frequencies can be heard at 20 dB HL).
   - Test the site by doing a sample listening check (Section B).
   - Place an audiometer and a tympanometer on a table large enough for writing space.
   - Perform a listening check. Check the earphones for noise, tone production, and/or poor connections.
   - Use appropriate sized chairs for participants who are taking part in the hearing screening.
E. UNIVERSAL PRECAUTIONS

The following universal precautions must be used to control contaminants in the hearing screening environment. These precautions include:

1. **Contaminant Exposure**
   Exposure to contaminants may occur when:
   - performing a visual inspection
   - handling hearing aids and ear molds
   - placing earphones on ears
   - handling and placing tympanometer probe tips in ears
   - testing children with suspected head lice or scalp infections
   - handling toys used for play audiometry
   - touching work surfaces

2. **Controlling Contaminant Exposure**
   The following three levels of contaminant control include:
   1) **Cleaning** – gross removal of the germs, but the germs are not killed.
   2) **Disinfecting** – germs are killed.
   3) **Sterilizing** – 100% of the germs are killed through heat and pressure, or chemically. An autoclave is preferred, but may not be appropriate, if the materials used during the hearing screening will melt.

3. **Disinfect the Tympanometer Probe Tips and a Non-Disposable Otoscope Specula**
   The following recommendations need to be considered when disinfecting the tympanometer probe tips and a non-disposable otoscope specula:
   - use disinfectant wipes (one wipe per use),
   - soak the probe tips and an otoscope specula in disinfecting solution, or
   - use an ultrasonic cleaner with disinfectant solution.

4. **Universal Precautions Best Practices**
   The following recommended procedures are considered universal precautions to avoid cross contamination that may occur between children. These recommendations include:
   - washing both hands before and after screening each child (e.g., antibacterial hand gel or wipe may be used to supplement hand washing),
   - remove rings to eliminate contamination by microorganisms,
   - use a medical-grade antibacterial soap (bar soap is not recommended),
   - rinse hand thoroughly with water,
   - dry hands by blotting (rubbing will cause chaffing of the skin),
   - turn off the water faucet using a paper towel to avoid recontamination, and
   - clean the earphone cushions after each child is screened using a disinfectant wipe.

**NOTE:** Avoid getting moisture in the earphone diaphragm. Rubbing alcohol is not recommended.

F. **DIFFERENT TYPES OF HEARING SCREENINGS**

The following different types of hearing screenings are conducted to identify children whose hearing may not be within normal limits.

1. **Pure-Tone Sweep Frequency Screening**
   Conduct this type of hearing screening for all enrolled school children during the first year of admission and, not less than, once every 3 years [K.S.A.72-1205(a)].

2. **Tympanometry**
   a. Conduct tympanometry for all children between the ages of 6 months and 5 years (not in kindergarten) as part of the routine.
   b. Conduct tympanometry for all children through age 8 or Grade 3 as part of the routine.
3. Threshold Screening
   a. Conduct a threshold screening for any child who failed a second sweep frequency screening.
   b. Conduct an annual threshold screening for all children who:
      o are at risk for hearing loss, did not pass the hearing screening during the previous year; or
      o have been identified as having a hearing loss.

4. Play Audiometry
   a. Conduct play audiometry if the child is 2½ to 5 years old.
   b. Conduct play audiometry for children under 2½ years old who can be reliably conditioned.
   c. Conduct play audiometry for children at any age who:
      o are difficult to screen, or
      o can be reliably conditioned.

5. Otoacoustic Emissions (OAE) Screening
   Otoacoustic Emissions (OAE) Screening is:
   a. performed to elicit a response of the inner ear,
   b. used to determine if there is a potential sensorineural hearing loss or, if there is something
      obstructing the pathway to the inner ear,
   c. conducted by a licensed technician using a probe that is placed in the child’s ear,
   d. conducted with an initial OAE on both ears if the child is birth to 3 years old,
   e. conducted with an OAE again on the ear that does not pass the screening within two weeks of
      the initial screening, or
   f. referred to a health care professional if the child does not pass the second screening.

*NOTE:* Instructions to conduct an OAE and competency checks will be provided by the instructor who is
qualified to conduct the hearing screening training sessions.
CHAPTER III

LEVEL 1 TRAINING

A. REQUIREMENTS FOR INITIAL TRAINING (LEVEL 1)

Individuals trained at the Level 1 Initial Training are qualified to conduct an audiometric sweep screening, a visual inspection, a threshold screening, play audiometry, and an otoacoustic emissions (OAE) screening. The Level 1 Initial Training is valid for two years.

- Minimum of 7 clock hours of instruction
- Minimum of 6 clock hours of practicum
- Written test mastery (demonstrated by a minimum score of 80%)
- Practical skills mastery (demonstrated by a score of 100%)
- Course evaluation
- Meet the following competencies:

  **Level 1: Competencies**
  - Explain the hearing screening law, the rationale for mandatory hearing screening, and the need for early identification.
  - Describe the basic anatomy and physiology of the ear, and common hearing disorders.
  - Exhibit ability to work with children and to explain the hearing screening process.
  - Perform a listening check on the audiometer and determine that audiometer is working properly.
  - Determine an environment is satisfactory for performing hearing screenings.
  - Perform air conduction sweep frequency screening, threshold screening, and play audiometry procedures.
  - Prepare audiograms to determine whether there is a need for a referral.
  - Perform a visual inspection.
  - Discuss and explain hearing screening results, and the need for appropriate follow-up.
  - Record and maintain hearing screening results accurately.
  - Identify unusual or difficult screening situations (e.g., noise, behavior disturbance, etc.), and report these to an audiologist or supervisor/coordination of the hearing screening program.
### B. CLASS SYLLABUS FOR LEVEL 1 INITIAL HEARING SCREENING TRAINING

**Course Content - Level 1 Initial Hearing Screening Training**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Suggested Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td>- State laws and regulations</td>
<td></td>
</tr>
<tr>
<td>- Frequency of screenings</td>
<td></td>
</tr>
<tr>
<td>- Who is screened</td>
<td></td>
</tr>
<tr>
<td>- Rationale - early identification</td>
<td></td>
</tr>
<tr>
<td>- Reporting to parents</td>
<td></td>
</tr>
<tr>
<td>- Ethics</td>
<td></td>
</tr>
<tr>
<td><strong>Anatomy and Physiology</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td>- Three parts of the ear</td>
<td></td>
</tr>
<tr>
<td>- General anatomy and function of ear</td>
<td></td>
</tr>
<tr>
<td>- Sound - physiology and basic acoustics</td>
<td></td>
</tr>
<tr>
<td><strong>Disorders of Hearing</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Three types of hearing loss</td>
<td></td>
</tr>
<tr>
<td>- Causes of hearing loss</td>
<td></td>
</tr>
<tr>
<td>- Air conduction vs. bone conduction</td>
<td></td>
</tr>
<tr>
<td>- Common disorders</td>
<td></td>
</tr>
<tr>
<td><strong>Audiometer</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Parts of machine and operation</td>
<td></td>
</tr>
<tr>
<td>- Care of audiometer</td>
<td></td>
</tr>
<tr>
<td>- Calibration</td>
<td></td>
</tr>
<tr>
<td>- Definition and use of dB and Hz</td>
<td></td>
</tr>
<tr>
<td>- Troubleshooting audiometer</td>
<td></td>
</tr>
<tr>
<td>- Listening check</td>
<td></td>
</tr>
<tr>
<td><strong>Hearing Screening Procedures</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Screening environment</td>
<td></td>
</tr>
<tr>
<td>- Positioning of student</td>
<td></td>
</tr>
<tr>
<td>- Earphone placement</td>
<td></td>
</tr>
<tr>
<td>- Equipment/material needs</td>
<td></td>
</tr>
<tr>
<td><strong>Sweep Screening</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td>- Instructions to student</td>
<td></td>
</tr>
<tr>
<td>- Record keeping</td>
<td></td>
</tr>
<tr>
<td>- Tips on screening</td>
<td></td>
</tr>
<tr>
<td>- Referral criteria</td>
<td></td>
</tr>
<tr>
<td><strong>Visual Inspection</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td><strong>Threshold Screening</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Instructions to student</td>
<td></td>
</tr>
<tr>
<td>- Audiogram/record keeping</td>
<td></td>
</tr>
<tr>
<td>- Threshold screening process</td>
<td></td>
</tr>
<tr>
<td>- Tips on screening</td>
<td></td>
</tr>
<tr>
<td>- Behavioral observations/play audiometry</td>
<td></td>
</tr>
<tr>
<td>- PASS/REFER criteria</td>
<td></td>
</tr>
<tr>
<td><strong>Common Errors in Audiometric Screening</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td><strong>Audiogram Interpretation</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td>- Case history</td>
<td></td>
</tr>
<tr>
<td>- Effect of degree of loss on understanding of speech and language</td>
<td></td>
</tr>
<tr>
<td>- Modifications for individuals who are deaf or hard-of-hearing</td>
<td></td>
</tr>
<tr>
<td>- Degree of loss</td>
<td></td>
</tr>
<tr>
<td><strong>Play Audiometry</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td><strong>Otoacoustic Emissions (OAE) Screening</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td><strong>Practicum (sweep and threshold screening)</strong></td>
<td>6 hours</td>
</tr>
</tbody>
</table>

Each participant needs 6 clock hours of hands-on practicum with children. Direct supervision is required and is not to exceed 8 participants. The practicum will include practice in sweep and threshold screening, completing audiograms, record keeping, and determining appropriate referrals.
C. SWEEP FREQUENCY SCREENING

The audiometric sweep frequency screening is designed to identify the need for further testing. This procedure should be administered carefully in order to avoid passing anyone with a hearing loss. Before beginning any audiometric procedures; (1) make sure that the screening environment meets criteria, and (2) complete a successful listening check of an audiometer. Once the above steps have been conducted, proceed with the following:

- Screen every child during the first year of admission to school, and not less than every 3 years, thereafter.
- Screen children upon request or referral from an educator, administrator, parent, or physician.
- Screen all children who are at high risk for hearing loss, failed the hearing screening from the previous year, or who have been identified as having a hearing loss on an annual basis.
- Screen any child following an extended illness which is associated with risk for hearing loss (e.g., chicken pox, chemotherapy, head trauma, meningitis, or episodes of a very high fever).
- Conduct a sweep frequency screen within 12 months prior to an educational evaluation.
- Rescreen children who were referred for medical care during previous hearing screenings and after any medical interventions.

**NOTE:** DO NOT screen children with hearing aids or cochlear implant. Children with hearing aids or cochlear implant should be referred to an audiologist for evaluation.

1. Administering Screening

   - Listen to each frequency to ensure the tone can be heard at 20 dB HL, or below by a person with “normal” hearing. Check each frequency daily or more often as needed, especially if the screening environment becomes noisy.
   - Seat the child facing away from an audiometer so half of the child's face may be observed. Be sure the child cannot watch movements.
   - Seat the child in a position facing away from other people in the room.
   - Ask the child to remove items, such as glasses, a ball cap, a hair ribbon, headband, hair clips, facial piercings, or large earrings.
   - Ask the child to remove candy or chewing gum.
   - Place the earphones on the child; red on the right ear, and blue on the left ear.
   - Be sure the earphones are properly placed over the ear canals.
   - Position the earphone cords behind the child to prevent noise.
   - Vary the time interval between tone presentations.
   - Avoid presenting a pattern of tone presentations.
   - Present the tone for approximately one second. A tone may be presented more than one time at each frequency. (Children often respond to the "offset" of a tone rather than the "onset," especially younger children, or those with developmental delays.)
   - Avoid clicking the tone interrupter switch.

**NOTE:** If the screening cannot be conducted at 20 dB HL because of noise, DO NOT CONDUCT THE HEARING SCREENING.

2. Instructions to the Child

   - Give the instructions as simply as possible.
   - Give instructions before the earphones are placed on the ears.
   - Allow questions before the hearing screening.
   - Instruct the child to respond to every tone during the hearing screening. (The technician should understand that some children take longer to respond than other children.)
   - Instruct the child to remain very quiet during the hearing screening.
   - Tell the child to raise either hand during the hearing screening.
**NOTE:** The following are suggestions to say to the child (adapt to the age of the child):
- “You will hear a tone.”
- “Every time you hear the tone, raise your hand high. When the tone stops, put your hand down quickly.”
- “Raise your hand every time you hear a tone, even if the tone is different, or if you just barely hear the tone.”

3. **Sweep Frequency Screening Procedures**
- Set the audiometer frequency dial at 1000 Hz and the intensity dial at 40 dB HL.
- Present one tone for identification purposes only.
- Set the intensity dial at 20 dB HL and present tone at 1000 Hz.
- Use the below listed patterns in the table to present frequencies during the hearing screening.
- Record if the child passes the hearing screening, or if a recheck is needed.

<table>
<thead>
<tr>
<th>Age of Child</th>
<th>Right Ear</th>
<th>Left Ear</th>
<th>Tympanometry Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>2½ years old to 5 years old, and not in kindergarten</td>
<td>1000, 2000, and 4000 Hz</td>
<td>4000, 2000, and 1000 Hz</td>
<td>Recommended</td>
</tr>
<tr>
<td>5 years old through 8 years old, or in the 3rd grade</td>
<td>500, 1000, 2000, and 4000 Hz</td>
<td>4000, 2000, 1000, and 500 Hz</td>
<td>500 Hz can be deleted if a tympanometry screening is administered</td>
</tr>
<tr>
<td>9 years old, or 4th grade, and older*</td>
<td>1000, 2000, 4000, and 6000 Hz</td>
<td>6000, 4000, 2000, and 1000 Hz</td>
<td>Not applicable, unless otherwise noted.</td>
</tr>
</tbody>
</table>

*To identify high-frequency hearing losses for children who are 9 years old or in the 4th grade, and older screen at 6000 Hz. Screening conducted at 500 Hz is optional.

4. **Common Errors in Audiometry**
- fatigue caused by extended screening time
- a rushed screening process
- inaccurate or unclear directions given to the child
- child is in direct view of the audiometer control panel
- distractions by the motions of the operator
- earphone is on the wrong ear
- visual cues given through eye movements or body movements of the examiner
- tone presentation longer than one second
- tone presentation in a rhythmic manner
- failure to note changes in ambient noise levels during the screening procedures
- unnecessary talking during screening

5. **Complete the Hearing Screening Report**
If the child responds to all stimuli at 20 dB HL, check “PASS” on the Hearing Screening Report. If the child fails to respond to one of the tones at 20 dB HL, check “RESCREEN” on the Hearing Screening Report. (Refer to appendix for all forms and reports.)

6. **Referral Criteria**
- If the child does not respond to any one tone at the 20 dB HL, rescreen either on the same visit, or not more than 2-4 weeks later.
- If the child does not pass the second sweep frequency screening, administer a threshold screening.

**NOTE:** IF THE RESULTS ARE QUESTIONABLE OR INCONSISTENT, REFER FOR FURTHER TESTING.
D. VISUAL INSPECTION

A visual inspection is a critically important part of any hearing screening, particularly for a child from age 6 months to 5 years old who may have a number of the following conditions. These conditions will affect the outcome of audiometric and tympanometric hearing screening. These conditions include:

- collapse of the ear canal
- impacted cerumen (ear wax)
- foreign objects in the canal
- perforations of the tympanic membrane

NOTE: Frequently, other problems will be observed, but may not cause abnormal audiometric results. The observation of problems should be referred for prompt medical attention.

1. Position the Child
   - The child needs to be seated. (If the child is small, use an appropriate sized chair as a place to sit during the hearing screening.)
   - The child’s head needs to be still and steady.
   - The examiner's eye should be at the child's ear level, about 1 inch from the magnifying lens of an otoscope.

2. Examination Procedure
   - Inspect the outer ear and the area around it for abnormalities. Unusual color of the ear or mastoid should be noted and brought to the attention of a physician.
   - Hold an otoscope close to the light source with the handle pointing upwards. (Imagine the otoscope as a big pencil, and the light source end is the point.) Grip the otoscope towards the top of the handle, near the light source for better control.
   - Stabilize the child’s head.
   - Select the largest speculum that will fit comfortably in the ear canal. A small speculum in a large canal may not provide enough light from the otoscope to see the tympanic membrane. A speculum that fits snugly into the canal permits a larger area of the tympanic membrane to be visible and helps straighten the ear canal.
   - Insert the speculum to a comfortable depth without touching the canal walls.
   - Pull back the ear with the hand not holding the otoscope to straighten the canal.

NOTE: Infants and small children have an upward curvature of the canal. The examiner must grasp the lower portion of the ear and pull it down and back to straighten the canal. The canal straightens as the child gets older. The examiner will need to pull the ear up and back to straighten the canal for older children.

3. What to Observe
   - A healthy ear will have a tympanic membrane (TM) that is shiny, pearly white, and semi-transparent. The degree of transparency will vary from child to child. If impacted cerumen is seen, the child should be referred to a physician.
   - Landmarks within the middle ear can often be observed through the tympanic membrane, such as the long process of the malleus should extend to the center of the tympanic membrane.
   - Tubes are known by various names such as: bilateral myringotomy tubes (BMTs), pressure equalization tubes (PE tubes), or tympanostomy tubes. Tubes may be made of different colors of plastic or may be metal. They may be seen either in the TM itself or laying in the ear canal. There should be no drainage from the tube. Drainage indicates the presence of middle ear problems.

4. When to Refer
   Refer the child to a physician if any of the following are noted:
   - Structural defects of the ear, head, or neck, such as abnormal positioning of the ear, a malformed ear, absence of outer ear, an extremely narrow ear canal, or presence of pre-auricular pits or tags.
   - Ear canal abnormalities, such as
     - impacted wax
     - presence of foreign object
     - inflammation or swelling
o bleeding
o tumor or unknown growth
o fungal growth
o dermatitis

• Tympanic membrane abnormalities, such as
  o perforation
  o drainage or effusion
  o bleeding
  o redness
  o blistering
  o unknown growth or cholesteatoma (KDHE, 2010, p. 10)

**NOTE:** NEVER try to remove wax or a foreign object from the child's ear canal. **ALWAYS REFER** the child to the physician.

5. **Complete the Hearing Screening Report**
   - Record any abnormalities observed as a result of the cursory visual inspection of each ear on the *Hearing Screening Report* under the Visual Inspection and the Comments sections.
   - The presence of tubes should be noted on the form.
   - If the child has a structural abnormality of the head, neck, ear, ear canal, or tympanic membrane, check “REFER” under the section Visual Inspection on the form.
   - If no abnormalities are observed for either ear, check “PASS” under Visual Inspection on the form.

E. **THRESHOLD SCREENING PROCEDURES**
   Threshold screening is designed to identify children who need further testing. (A visual inspection of the child's ears is done prior to this procedure.)

1. **Threshold Determination**
   - Threshold is defined as the faintest tone that can be heard at least 50% of the time and is established after several threshold responses (usually 2 out of 4 presentations). The procedure for determining threshold is the same for all frequencies.
   - Present a continuous tone of 1 second in duration at 1000 Hz, 40 dB HL (in the better ear) for easy identification of the tone.
   - If the child responds, decrease the intensity by 10 dB HL until no response is obtained.
   - Once a response is obtained, decrease the intensity by 10 dB until no response is obtained. Increase intensity by 5 dB HL until a response is obtained. (This “down 10/up 5” pattern is repeated until the child's hearing threshold level is identified.)
   - If a response is not obtained at 40 dB HL for any frequency, increase the intensity in 20 dB HL until a response is obtained. Do not exceed an 80 dB HL.
   - When a response is obtained, follow “down 10/up 5” procedure. If no response is obtained at 80 dB HL, record “NR” or appropriate arrow on the audiogram for the frequency that is being tested.
   - After the threshold for 1000 Hz has been established in the better ear, the procedure is repeated for 2000, 4000, 6000, and 500 Hz, in that order.
   - Threshold screening for the second ear should begin with 1000 Hz, and thresholds for the same frequencies are obtained for 2000, 4000, 6000, and 500 Hz, in that order.

2. **Threshold Screening for Young or Difficult-to-Test Children**
   Threshold screening is very tiring for a child. Fatigue and all of its manifestations must be taken into account during a screening because it will affect the reliability of the child's responses. If the child shows any indication of tiring, alter the frequency sequence. The altered sequence should include 1000 and 4000 Hz in each ear. It is better to have reliable measures for the 1000 and 4000 Hz than to have a complete test of all frequencies with questionable accuracy. Continue threshold screening at the required frequencies in each ear if the child’s attention span is maintained. Switch to a pulsed or warbled tone if the child begins to respond inconsistently at 4000 or 6000 Hz.
3. Complete the *Hearing Screening Report*

   Complete the *Hearing Screening Report* or a similar form. Write the results of the Right and Left Ear for 500, 1000, 2000, 4000, and 6000 Hz. Check "PASS," "REFER," or "RESCREEN" as appropriate.

4. Referral Criteria

   A more extensive evaluation is recommended if any of the following criteria are met:
   - There is a threshold of 25 dB HL or greater at 500, 1000, or 2000 Hz in either ear.
   - There is a threshold of 35 dB HL or greater at 4000 or 6000 Hz in either ear.
   - If the child does not pass the sweep frequency screening at 4000 Hz and/or 6000 Hz at 20 dB HL, and does not meet referral criteria, the parent should be notified that the child did not pass the hearing screening. A referral for further evaluation is not indicated. However, the child should be considered to be “high risk” for a high frequency hearing loss and rescreened the following year.

   Passing a sweep frequency or threshold screening does not rule out the possibility of an auditory problem. Frequently, children are referred for a hearing screening because they demonstrate behavior in the classroom that suggests their hearing is not normal. Children may have difficulty following directions; understanding the teacher when background noise is present; or have difficulty in reading, spelling, speech, or language development. Audiometric screenings assess only basic auditory sensitivity.

   Hearing screening personnel should recognize the need to make an appropriate referral. Special testing may be needed in order to determine the source of the child’s difficulty. Inform the audiologist if any of the above concerns are present.

   **NOTE:** DO NOT ignore the child’s parent(s) or classroom teacher(s) observations.

F. PLAY AUDIOMETRY

1. The Purpose of Play Audiometry

   The purpose of play audiometry is to incorporate a “fun” response technique that is developmentally appropriate with sweep frequency screening and/or threshold screening procedure. The rationale behind play audiometry is to keep a child’s attention long enough to complete the task. This “fun” technique also may be useful in screening difficult-to-test children.

   Play audiometry is a reliable conditioning procedure for screening children between the ages of 2½ to 5 years old. In play audiometry, a child is rewarded for an appropriate response to a tone presentation, to increase an occurrence of the child’s response. Any task that requires a behavioral response, such as putting a cotton ball in a can, putting a ring on a spindle, dropping a block in a box, connecting snap beads, and similar activities are used to keep the child motivated during the session.

   Consistent responses may be obtained with children 2½ to 5 years old, although many children under the age of 3 years may not respond consistently to play audiometry. Inconsistent responses may be due to children not wanting to wear the earphones, or not understanding the task. Children should receive reinforcement that can be given in many different ways. Physical and verbal reinforcement usually is used for screening tests. Verbal reinforcement, such as “Good! You are doing a nice job,” or physical reinforcement, such as applause or a pat on the back, may be effective increasing response rates in the presence of stimuli. Once the child begins to respond consistently, frequency of physical and/or verbal reinforcement may be faded.

2. Play Audiometry Screening Procedures

   - Play audiometry may be used for the child who is 2½ to 5 years old, or for a child under 2½ years old if the child responds to conditioning.

   - Use the presentation techniques learned for school-age hearing screenings that previously were addressed in this chapter. Modify the following:
     - Keep the instructions simple. Show the child how to respond appropriately. Have the child drop a block or cotton ball in a bucket, or place a ring on a peg when responding to a tone.
o Be generous with verbal and physical reinforcement. Continue training until reliable conditioned responses are obtained.
o If the child is restless, unhappy, and not able to complete the screening with all of the frequencies, try to obtain reliable screening results at one or two frequencies in each of the child’s ear, usually at 1000 Hz and 4000 Hz.

• It may be helpful to use two technicians for play audiometry. One technician may present the stimuli while the other technician provides conditioning, observes responses, and reinforces the child.
• Establish a conditioned response by initially by presenting an audible tone through the earphones when the earphones are placed on the table.
• Once conditioning is established, place the earphones on the child and present a 1000 Hz at 40 dB HL (identification tone) in the right ear. If no response is obtained, try the left ear. If a response is obtained, decrease the intensity to 20 dB HL and continue to screen at 1000, 2000, and 4000 Hz in each ear.
• Alternate the presentation of frequencies and stimuli if needed for the child to maintain consistent responses.
• Avoid using verbal cues, such as “Did you hear that?” during the hearing screening. Continue to provide frequent positive reinforcement for each response. If a verbal cue is used, always repeat the presentation without a verbal cue, to be sure the response is valid.
• Avoid giving visual cues, such as looking at the child or leaning forward as the tone is presented. Arm, shoulder, and hand movements should not be visible to the child.
• If a tone is presented at the screening level of 20 dB HL does not elicit a response from the child, present the tone again at 40 dB HL. If the child responds, decrease the intensity to 20 dB HL and present the tone again. If the child does not respond at 40 dB HL, increase the intensity level to 60 dB HL. If the child does not respond at 60 dB HL, present the tone to the child’s opposite ear.
• The child may have trouble generalizing the appropriate behavioral response to the opposite ear. If the child fails to respond when the tone is presented to the opposite ear, prompt the child or recondition the appropriate behavioral response.
• The child may respond to the “offset” of the pure-tone rather than the “onset.” If the child consistently responds to the “offset,” it can be counted as a conditioned response.
• If the child fails to respond to a tone, move quickly to another frequency. The child must be kept involved. The child usually will not sit for long periods of time and will rapidly lose interest in the hearing screening activity.
• Vary the presentation pattern of the tones to the child.
• If the child does not give a consistent conditioned response, this test cannot be conducted. A referral to an audiologist may be necessary.

3. Complete the Hearing Screening Report
• If the child responds to all stimuli at 20 dB HL, check “PASS” under “Sweep Frequency Screening” on the Hearing Screening Report.
• If the child fails to respond to one of the tones at 20 dB HL, check “RESCREEN” on the Hearing Screening Report.

4. Referral Criteria
• If the child does not respond to any one tone at 20 dB HL, rescreen either on the same visit, or within 2-4 weeks.
• If the child does not pass the second sweep screening, a threshold screening is administered.

G. OTOACOUSTIC EMISSIONS (OAE) SCREENING
Otoacoustic Emissions (OAE) Screening is conducted to determine the likelihood that the child has a sensorineural unilateral or bilateral hearing loss. The procedures necessary to conduct an OAE will be presented by the instructor. Additionally, the instructor will provide participants with the appropriate form for recording the child’s responses, as well as a referral form, after the OAE is conducted.
H. PARENT NOTIFICATION REQUIREMENTS
Parents need to be informed of hearing screening results. Kansas schools must follow the state law, “The results of the test and, if necessary, the desirability of examinations by a qualified physician shall be reported to the parents or guardians of such pupils” [K.S.A.72-1205(d)].

I. RENEWAL TRAINING REQUIREMENTS
Requirements for Renewal (Level 1 and/or Level 2)
- Hearing screening renewal training should be attended every two years.
- Satisfactory completion of the hearing screening renewal workshop is required to renew the current level of training.
- Renewal should be at the highest level of training completed. (When participants attend the initial Level 2 training, Level 1 is automatically renewed.)
- If a Hearing Screening Technician cannot renew at Level 2, the audiologist responsible for the training should renew the Hearing Screening Technician at the level of competency.
- A minimum of 6 clock hours of instruction must include at least 75 minutes of discussion concerning current issues.
- Demonstrate the ability to conduct the different types of hearing screenings.
- Written test mastery (demonstrated by a minimum score of 80%) must be obtained.
- Practical skills mastery (demonstrated by a score of 100%) must be obtained.

J. CLASS SYLLABUS FOR LEVEL 1 HEARING SCREENING RENEWAL TRAINING
Pure-Tone Sweep, Threshold, Play Audiometry, and Otoacoustic Emissions (OAE) Hearing Screenings
The minimum course content for Level 1 Renewal Training shall be 6 clock hours of instruction that includes a written examination. Individuals who have been trained at the Level 1 Initial Training and Practicum are qualified to conduct an audiometric sweep screening, a threshold screening, and an otoacoustic emissions (OAE) screening. The Level 1 Renewal Training is necessary every 2 years. Under special circumstances, the documentation may be issued for 4 years with an audiologist's approval and written justification.
### COURSE CONTENT - LEVEL 1 HEARING SCREENING RENEWAL TRAINING

<table>
<thead>
<tr>
<th>Topic</th>
<th>Suggested Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Issues in Hearing</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Overview of Current State Law</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Care of Equipment</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Hearing Screening Procedures</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Visual Inspection</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Sweep Frequency Screening</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Threshold Screening</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Play Audiometry</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Common Errors in Audiometric Screening</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Audiogram Interpretation and Referral Sources</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Otoacoustic Emissions (OAE) Screening</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Guided Practice</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Written Examination</td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

Objectives of the Level 1 Renewal Training are as follows:

- Recognize current issues in hearing screening.
- Explain the hearing screening laws and the rationale for mandatory hearing screening.
- Describe the basic anatomy and physiology of the ear.
- Identify general behaviors, signs, and symptoms of hearing loss.
- Perform a visual inspection.
- Exhibit the ability to work with children by explaining the hearing screening process and the results.
- Perform listening check of an audiometer and determine if the audiometer is working properly.
- Perform sweep screening, threshold screening, and OAE screening.
- Prepare an audiogram and determine if there is a need for referral.
- Record and maintain reports accurately.
- Discuss and explain hearing loss identified through threshold screening and the need for appropriate follow-up.
- Perform play audiometry.
CHAPTER IV
LEVEL 2 TRAINING

Hearing Screening Technicians who participate in Level 2 initial training are expected to demonstrate competency in the following procedures (Level 1 skills including tympanometry, and completing an infant-toddler paper screening). The Level 2 initial training includes a review of play audiometry, OAE screening, and visual inspection.

A. REQUIREMENTS FOR INITIAL TRAINING (LEVEL 2)
Hearing Screening Technicians who participate in Level 2 initial training are expected to demonstrate the following competencies (Level 1 skills including tympanometry, and completing an infant-toddler paper screening). The Level 2 initial training includes a review of play audiometry, OAE Screening, and visual inspection. The Level 2 applicant must first complete Level 1 initial training. Level 2 initial training is valid for 2 years.

Requirements for Initial Training (Level 1 and/or Level 2)
- Minimum of 7 clock hours of instruction
- Minimum of 6 clock hours of practicum
- Written test mastery (demonstrated by a minimum score of 80%)
- Practical skills mastery (demonstrated by a score of 100%)
- Meet the following competencies:

Level 2: Competencies
- Complete Level 1 training successfully.
- Explain the purpose and rationale for including tympanometry in the hearing screening protocol.
- Determine measurement parameters used in tympanometry and give a normal range for each.
- Demonstrate knowledge of symptoms related to various stages of otitis media and possible consequences.
- Be familiar with other middle ear disorders and current trends in medical care.
- Demonstrate skill in performing tympanometry and recognizing valid results.
- Demonstrate application of “PASS/REFER” criteria when interpreting a tympanogram.
- Explain need for early identification.
- Describe the components of Infant-Toddler Hearing Screening Protocol, and how each of these components is used in the screening process.
- Identify and explain indicators that place an infant-toddler at risk for hearing loss.
- Discuss normal auditory development and the use of developmental scales.
- Administer the paper screening for risk of hearing loss.
- Explain results of the Infant-Toddler Hearing Screening Protocol.
- Determine if there is a need for referral to an audiologist or a physician based on a paper screening or hearing screening results.
- Keep accurate records.
**B. CLASS SYLLABUS FOR LEVEL 2**

**DAY 1**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Suggested Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td>- State laws and regulations</td>
<td></td>
</tr>
<tr>
<td>- Procedure</td>
<td></td>
</tr>
<tr>
<td><strong>Anatomy and Physiology/Disorders</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- General anatomy and physiology</td>
<td></td>
</tr>
<tr>
<td>- Common middle ear disorders</td>
<td></td>
</tr>
<tr>
<td><strong>Program Development</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Background rationale</td>
<td></td>
</tr>
<tr>
<td>- Personnel training requirements</td>
<td></td>
</tr>
<tr>
<td>- Equipment/supply needs</td>
<td></td>
</tr>
<tr>
<td>- Review Level 1 competencies</td>
<td></td>
</tr>
<tr>
<td><strong>Screening Rationale</strong></td>
<td>30 minutes</td>
</tr>
<tr>
<td>- Occurrence/prevalence of otitis media</td>
<td></td>
</tr>
<tr>
<td>- High-risk populations</td>
<td></td>
</tr>
<tr>
<td>- Symptoms of otitis media</td>
<td></td>
</tr>
<tr>
<td>- Other conditions</td>
<td></td>
</tr>
<tr>
<td>- Effect on speech, language, cognition, and other areas</td>
<td></td>
</tr>
<tr>
<td><strong>Review of Visual Inspection</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td><strong>Screening Procedures and Results</strong></td>
<td>75 minutes</td>
</tr>
<tr>
<td>- Types of tympanogram procedures</td>
<td></td>
</tr>
<tr>
<td>- Reliability</td>
<td></td>
</tr>
<tr>
<td>- Operation of a tympanometer</td>
<td></td>
</tr>
<tr>
<td><strong>Review of Play Audiometry</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td>- Fun response techniques</td>
<td></td>
</tr>
<tr>
<td>- Instructions to the child</td>
<td></td>
</tr>
<tr>
<td>- Conditioning/reinforcing responses</td>
<td></td>
</tr>
<tr>
<td>- Screening procedures</td>
<td></td>
</tr>
<tr>
<td><strong>Review of Otoacoustic Emissions (OAE) Screening</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td>- Screening procedures</td>
<td></td>
</tr>
<tr>
<td>- Responses</td>
<td></td>
</tr>
<tr>
<td>- Instructions to the child</td>
<td></td>
</tr>
<tr>
<td>- Referrals</td>
<td></td>
</tr>
<tr>
<td><strong>Reporting/Referral Criteria</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td><strong>Infant-Toddler Screening Procedures</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>- Birth/case history</td>
<td></td>
</tr>
<tr>
<td>- Normal development</td>
<td></td>
</tr>
<tr>
<td>- Tympanometry</td>
<td></td>
</tr>
<tr>
<td>- High-risk indications</td>
<td></td>
</tr>
<tr>
<td>- Otoscopy</td>
<td></td>
</tr>
<tr>
<td>- Flow charts</td>
<td></td>
</tr>
<tr>
<td><strong>The Hearing Screening Report and Record Keeping</strong></td>
<td>15 minutes</td>
</tr>
<tr>
<td>- The Hearing Screening Report</td>
<td></td>
</tr>
<tr>
<td>- Referral criteria</td>
<td></td>
</tr>
<tr>
<td><strong>Guided Practice with Tympanometry Screening Procedures</strong></td>
<td>45 minutes</td>
</tr>
<tr>
<td>(This time is to be used on the first day for practicing the techniques.)</td>
<td></td>
</tr>
<tr>
<td><strong>Referral Procedures</strong></td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

**Day 2**

**Practicum for the Hearing Screening Technician - Level 2** 6 hours

Each participant needs to have 6 clock hours of hands-on practicum with children. Direct supervision is required. The practicum cannot exceed 8 participants per instructor. The practicum includes practice in record keeping, otoscopy, tympanometry screening, interpreting tympanograms, and determining appropriate referrals.

**NOTE:** It is recommended that Hearing Screening Technicians allow adequate time to establish competency at Level 1 Training before seeking Level 2 Training.
C. REVIEW OF VISUAL INSPECTION
The purpose of this procedure is to provide a visual inspection to determine if any conditions may interfere with the hearing screening, and to make appropriate referrals. A visual inspection should be performed prior to tympanometry or threshold screening. Findings, such as tympanic membrane perforation, impacted wax, or collapsing canals may affect screening results. Otoscopy also can help determine the proper probe tip size and placement for tympanometric measures.

D. REVIEW OF SWEEP FREQUENCY SCREENING
The purpose of sweep frequency screening is to identify the need for further testing. It is essential that the screening environment meets the criteria and that a successful listening check has been completed before beginning any audiometric procedures. The following are conditions when the child should have a sweep frequency screening. These conditions include:
- during the first year the child is admitted to a new school, and not less than once every 3 years [K.S.A.72-1205 (a)]
- annually if child is at high risk for hearing loss, failed screening in the previous year, or has been identified as having a hearing loss
- upon request of an educator, administrator, parent, or physician
- after the child has recovered from an extended illness that is known to have a high risk for a hearing loss
- within 12 months before the child has an educational evaluation
- after medical intervention the child has received which is known to have a high risk for a hearing loss

E. REVIEW OF THRESHOLD SCREENING
The child who does not pass the second sweep frequency screening will need to receive a threshold screening. Again, the purpose of the threshold screening is to identify if the child who needs to have further testing conducted. Hearing Screening Technicians need to adhere carefully to the required procedures, record results accurately, and follow referral criteria.

F. REVIEW OF PLAY AUDIOMETRY
The purpose of play audiometry is to incorporate a "fun" response technique to keep a child's attention long enough to complete the pure-tone screening. This technique also may be used to screen difficult-to-test children. Generally, play audiometry can be used reliably for screening children from the age of 2½ years old to 5 years old.

G. REVIEW OF OTOACOUSTIC EMISSIONS (OAE) SCREENING
The purpose of an OAE screening is to determine the likelihood of a sensorineural hearing loss. The techniques used to conduct an OAE will be provided by the instructor. Forms to record results, as well as to make referrals will be provided by the instructor who is conducting the Level 2 initial training session.

H. TYMPANOMETRY SCREENING
Tympanometry measures the compliance or mobility of the tympanic membrane as a function of varied air pressure in the ear canal. It is not a test of hearing. The pure-tone hearing screening, covered in Level 1 training addresses how well the child detects the tones that are presented. Pure-tone hearing screening alone may not provide enough information for making referrals. Children, age 6 months to 5 years old (not in kindergarten), should be screened using a visual inspection, a paper screening or pure-tone screening, and tympanometry. The addition of tympanometry to the hearing screening protocol complements the overall objectives of a hearing screening program. Tympanometry is a valuable tool in the detection of medically related conditions of the ear. The American Academy of Pediatrics (2001) reports a growing amount of evidence connecting a hearing impairment caused by middle ear disease, and delays in the development of speech, language, and cognitive skills of a child.
Tympanometry screening is an essential part of the hearing screening for all children who are 6 months through 5 years old (not in kindergarten). It also is recommended as part of the hearing screening for all children who are 5 years old through 8 years old, or who are in Grade 3. The information obtained by conducting tympanometry screening is beneficial in assessing the middle ear system. It is important to remember that tympanometry is a screening process to identify possible disorders. It is not to be used as a diagnostic tool.

1. **Parameters of Tympanometry Screening**

Tympanometry is a test that can be used to identify possible disorders of the middle ear. It identifies conditions of the ear that may be missed by hearing screening alone. Two components of tympanometry are considered in interpreting results and making referrals. The parameters are physical volume and compliance (mobility) of the middle ear system.

a. **Physical Volume**

The physical volume is the amount of air measured in the space between the probe tip of the tympanometer and the tympanic membrane. It may be called physical volume, volume, or absolute volume. Physical volume is measured in milliliters (ml) or cubic centimeters (cc). The normal range of volume for a particular instrument should be determined by reading the manual and using the values recommended by the manufacturer. In general, physical volumes between 0.3 and 2.0 ml are considered normal ranges for most instruments.

There is a large variance in normative values for physical volume measurements. Many adults will have physical volume measurements of greater than 2.0 ml. The size of the ear canal, as well as the amount of wax present, should be taken into account when determining the need for a referral. The following volume measurements to consider are:

- **Volume measurements below 0.3 ml** may indicate that the probe is placed against the side of the ear canal or against wax in the ear canal. Occasionally, the ear canal may be completely occluded by wax, and a low volume measurement may indicate the size of the ear canal from the probe tip to the wax.
- **Volume measurements above 2.0 ml** indicate that the cavity being measured is larger than the ear canal volume. If there is a patent (open) Pressure Equalizer (PE) tube in the tympanic membrane, or if there is a perforation of the tympanic membrane, a large physical volume measurement may be obtained. The reason for a large physical measurement should be considered when determining the need for a referral.

It is helpful to compare the volume of both ears to check validity of the measurements. Most children will have ear canal volumes that are roughly equal in both ears, and the measurements should fall within the normal range of 0.3 and 2.0 ml.

<table>
<thead>
<tr>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 to 2.0 ml</td>
<td>Normal</td>
</tr>
<tr>
<td>&lt;0.3 ml</td>
<td>Abnormally small</td>
</tr>
<tr>
<td>&gt;2.0 ml</td>
<td>Abnormally large</td>
</tr>
</tbody>
</table>

Check the manual for equipment specific criteria (KDHE, 2010, p. 5).
b. Compliance (Mobility) of the Middle Ear System

A normal middle ear system has a tympanic membrane and attached ossicular chain that vibrates easily, allowing the transmission of sound energy to the inner ear by converting the sound waves to mechanical motion. Considerations when conducting tympanometry to measure the compliance of the middle ear system include:

- The freedom compliance of the tympanic membrane and ossicular chain is assessed by measuring the amount of energy necessary to move the parts of the ossicular chain. It is represented by the height of the peak and is expressed in milliliters (ml).
- Some conditions of the middle ear cause the compliance of all or part of the middle ear system to be reduced. Other conditions may allow excessive motion. Extremely low or extremely high compliance may indicate a condition that needs to receive further attention.
- A compliance peak from 0.2 to 2.0 ml is within the normal range.
- A compliance measurement of less than 0.2 ml indicates the middle ear is stiffer than normal.
- A compliance measurement of greater than 2.0 ml indicates a hyper-flaccid tympanic membrane. A value greater than 2.0 ml may indicate a disarticulated ossicular chain. High compliance measurements are not considered a factor in referral criteria unless a hearing loss is present.

<table>
<thead>
<tr>
<th>COMPLIANCE MEASUREMENTS</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 to 1.8 ml</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>&lt;0.2 ml</td>
<td>Abnormally Low</td>
<td></td>
</tr>
<tr>
<td>&gt;1.8 ml</td>
<td>Abnormally High</td>
<td></td>
</tr>
</tbody>
</table>

Check the manual for equipment specific criteria (KDHE, 2010, p. 16).

- Other Parameters

There are three additional parameters that can be measured on some instruments, but are not used as factors in the referral criteria. These factors include:
  - acoustic reflexes (AR)
  - gradient
  - middle ear pressure (tympanometric peak pressure)

In a normal middle ear system, the Eustachian Tube will open, allowing air to move into and out of the middle ear cavity. This keeps air pressure behind the tympanic membrane roughly equal to the atmospheric or ambient air pressure in the ear canal. If the Eustachian Tube does not function normally, a negative or occasionally a positive pressure may develop in the middle ear. The results are expressed in deca pascals (daPa) or millimeters water pressure (mmH2O). Most tympanometers measure values from 300 deca pascals. There are some tympanometers that express even greater negative values.

Middle ear pressure has not been shown to be reliable in determining middle ear problems because conditions in the middle ear change frequently. It is reasonable to expect fairly large swings in middle ear pressure throughout a typical day. Consequently, one single measurement may not be reliable. In the presence of negative pressure greater than 200 daPa, the results of hearing testing should be considered when making a referral.

2. Reliability of Test Results

Tympanometry provides reliable information regarding middle ear function under most conditions. However, there are factors that affect the reliability and validity of test results. Individuals conducting tympanometry should be aware of these factors in order to obtain accurate information. These factors are:

a. Tympanometry screening should not be administered to children under the age of 6 months. A high incidence of false negative results (normal tympanometric results found in infants with middle ear effusion) has been obtained from tympanometry conducted on newborn infants. The reason for this is the highly compliant nature of the external auditory canal wall in infants. The
normal tympanogram may be a compliance measure of the external auditory canal rather than the tympanic membrane.

b. Middle ear surgeries may include interventions, such as cholesteatoma removal, tympanoplasty, or canaloplasty. Tympanometry should not be administered to children who have had middle ear surgery (other than myringotomy and PE tubes) within the past 6 months unless requested by a physician.

3. Procedure for Conducting Tympanometry

a. Turn on the machine.

b. Check the calibration of the tympanometer. A newer tympanometers will check the calibration automatically each time it is activated. An older unit requires a manual check of the calibration by measuring the size of the volume using a specified probe tip. This is only a routine calibration check. It does not take the place of full electroacoustic calibration, which is required annually. (Read the operating manual to determine which procedure to use on the unit.)

c. Conduct a visual inspection.
   o Wax that completely occludes the ear canal will interfere with the test. If the wax does not completely occlude the canal, a reliable tympanogram can be obtained.
   o While doing the visual inspection, note the size and shape of the ear canal to determine the appropriate size probe tip.

d. Select the appropriate size probe tip and place on the probe assembly. As a rule, it is better to have a probe tip that is too large than too small.

e. Place against the ear canal for seal. When placing the probe test against the ear canal, consider the following:
   o Most new units obtain a seal rather easily. (It may be difficult to obtain a seal during the initial learning phase.)

f. Hold the probe steady once a seal is obtained.

g. Maintain the seal until the test is completed (typically less than 10 seconds).

h. Watch the tympanometer signals to assure that a tympanogram is being obtained.

i. Remove the probe after the test is completed.

j. Print the results if possible. Some tympanometers automatically print after each test.

k. If the tympanogram is different from what was expected, repeat the test. Tympanograms also should be repeated for reliability, particularly when a medical referral is being made.

l. Clean the probe tip after each child by doing the following:
   o Remove the probe tip from the probe assembly to clean it. Never clean it while it is still assembled.
   o Use a disinfectant or clean the probe tip with an antiseptic after each use.
4. How to Interpret Results of Tympanograms

TYMPANOGRAM INTERPRETATION

<table>
<thead>
<tr>
<th>TYMPANOGRAM</th>
<th>COMPLIANCE</th>
<th>PHYSICAL VOLUME</th>
<th>POSSIBLE CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak is present</td>
<td>Compliance within normal limits</td>
<td>*Normal 0.3 – 2.0 ml</td>
<td>Normal tympanogram</td>
</tr>
<tr>
<td></td>
<td>0.2 – 1.8 ml</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No peak</td>
<td>Low compliance &lt;0.2 ml</td>
<td>Small &lt;0.3 ml</td>
<td>May suggest blockage of external ear canal with wax or other object, or the probe tip was placed against the ear canal.</td>
</tr>
<tr>
<td>No peak</td>
<td>Low compliance &lt;0.2 ml</td>
<td>Normal 0.3 – 2.0 ml</td>
<td>May suggest fluid-filled middle ear, otitis media, or retracted tympanic membrane.</td>
</tr>
<tr>
<td>No peak</td>
<td>Low compliance &lt;0.2 ml</td>
<td>Large &gt;2.0 ml</td>
<td>May suggest perforation or patent ventilation tube.</td>
</tr>
</tbody>
</table>

Physical volume is sometimes greater than 2.0 ml for normal ears. Check the manual for equipment specific criteria (KDHE, 2010, p. 18).

5. Recommendation Criteria

At the conclusion of the child’s screening, all components of tympanometry screening (physical volume, compliance, and whether ventilation tubes are present) must be considered when making “PASS” or “REFER” determinations. The result of one tympanometry screening is not adequate for determining whether or not to make a referral.

<table>
<thead>
<tr>
<th>VISUAL INSPECTION</th>
<th>PURE-TONE HEARING</th>
<th>TYMPANOLOGY</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
<td>Rule out: PE tubes, perforation, or equipment errors. Repeat the tympanogram in 2-4 weeks and, if failed, refer to a physician. Repeat the hearing test if tympanogram is normal at a rescreen.</td>
</tr>
<tr>
<td>Pass</td>
<td>Pass</td>
<td>Abnormal</td>
<td>Refer to a physician. Rescreen in 2-4 weeks.</td>
</tr>
<tr>
<td>Refer</td>
<td>Pass, Rescreen, or Refer</td>
<td>Pass or Refer</td>
<td>Repeat the hearing test and tympanogram in 2 weeks. If both are failed, refer to a physician and an audiologist.</td>
</tr>
<tr>
<td>Pass</td>
<td>Refer</td>
<td>Refer</td>
<td>Refer to an audiologist.</td>
</tr>
<tr>
<td>Pass</td>
<td>Refer</td>
<td>Pass</td>
<td>Refer to an audiologist.</td>
</tr>
</tbody>
</table>

6. Completing The Hearing Screening Report

a. On the Hearing Screening Report record the physical volume and compliance measurement for each ear. If a tube is present, indicate whether or not the tube is patent by marking "YES" or "NO."

b. If the results meet the pass criteria under Tympanometry, check "PASS." If the results meet the referral criteria under Tympanometry, check "REFER."

7. Special Considerations

a. Middle ear function is a dynamic, non-static system. Fluctuations in negative pressure measurements often will be observed. This is not clinically significant for determining the need to refer. Always consider the medical and the hearing history information.

b. If a flat tympanogram is obtained (compliance of <0.2 ml), always repeat the tympanogram. This will minimize inaccurate results based on improper probe placement. Referrals should be made on results that can be replicated.

c. When tympanometry is repeated, physical volume measurements should be monitored to ensure that the probe tip is properly placed. It should not be placed against the canal wall, or in excessive wax.

d. If a perforation or an open PE tube is present and the Eustachian Tube is open, an airtight seal may not be obtainable. Do not keep trying to get a probe tip seal.
I. INFANT-TODDLER HEARING SCREENING

Kansas state law K.S.A. 65-1,157(a) requires hearing screening of all newborns prior to hospital discharge using physiologic measures with specialized equipment [i.e., automated auditory brainstem response (ABR) and/or otoacoustic emissions]. Physiologic hearing screening of newborns and/or infants is beyond the purview of these guidelines and is not addressed in this section. The newborn hearing screening program, SoundBeginnings located at KDHE has separate regulations, training, and guidelines to perform physiologic hearing screening of newborns and/or infants.

Many programs require periodic reviews of the hearing status for the infant-toddler. Periodic reviews of the hearing status for the infant-toddler are essential. There is the possibility of a progressive, late-onset, and newly acquired hearing loss.

**NOTE:** When working with infants and toddlers, the Hearing Screening Technician should ask family members about the newborn hearing screening results.

Hearing Screening Technicians must be qualified to check the hearing status of infants and toddlers through 2 years old. Ideally, all infant-toddler hearing screenings should be administered by an audiologist; however, this is not practical. Screening the hearing of a very young child is a challenge for Hearing Screening Technicians. This age group of children is not developmentally ready to respond in a traditional manner to sweep frequency screenings or threshold hearing screenings. It is difficult to judge infant-toddler behavioral responses to sound stimuli reliably. Therefore, behavioral hearing screening is generally not conducted by Hearing Screening Technicians for this age group. Rather, a “Paper Screening” that includes a child and family history, and a Developmental Scale Checklist is used to identify children at risk for hearing loss. There are limitations of any screening protocol. Passing this at-risk screening does not rule out the possibility of hearing loss.

This section describes techniques for screening children who are at risk of hearing loss. It is recommended that infants and toddlers who are receiving services according to Individualized Family Service Plans (IFSPs) or children Pre-K who are receiving services according to Individualized Education Programs (IEPs) have their hearing status checked annually and, possibly, more frequently (or referred for audiological assessments), depending on the existence of risk indicators for hearing loss. Children who are in the KAN-Be-Healthy Screening Program [part of K-MAP (2012)] must have their hearing checked regularly, according to a schedule based on the children’s ages, or when parents or caregivers express concern about their children's' hearing.

Techniques described in these guidelines also should be used to screen the hearing of young children under 3 years old who attend a community's Child Find. Additionally, these techniques may be useful for children who are difficult to test.

1. Impact of Hearing Loss on Infants and Toddlers

A moderate, severe, or profound hearing loss has a significant impact on the cognitive, psychological, speech, and language development of the child. A slight or mild bilateral or unilateral hearing loss also may cause significant developmental delays. The impact of hearing loss on speech and language development and on academic achievement has been well documented. To minimize these debilitating effects, the use of early identification and intervention strategies (both medical and educational) are crucial.

An infant-toddler who is deaf or hard of hearing can receive language input through a hearing aid if the infant-toddler has sufficient residual hearing, or through visual and manual language inputs, or both. As soon as the hearing loss is confirmed, the parents of the infant-toddler who is deaf or hard of hearing should be encouraged to get appropriate early intervention for their child. The Infant-Toddler Services System Part C (IDEIA, 2006) provides community-based early intervention services statewide through local interagency networks. These networks provide services to meet the individualized needs of the child and family in natural environments, such as in the child’s home or at the child’s day care. Other options, such as home correspondence courses in auditory, visual, and manual language training procedures, and private intervention service centers are also available. Early intervention gives infants and toddlers the opportunity to use their residual hearing to develop optimal speech and language skills.
2. Equipment and Supply Needs

The following equipment and materials are needed to screen children (birth through 2 years old) who are at-risk of hearing loss:

- otoscope and specula
- tympanometer
- probe tips
- disinfectant solution

**NOTE:** If the specified equipment is not available, it is not possible to adequately screen for children birth through 2 years old who are at risk of a hearing loss.

3. Infant-Toddler Hearing Screening

a. Protocol

Conventional hearing screening techniques are seldom effective with very young children, children with disabilities, or children who are difficult to test. The following battery of screening procedures should be used for the identification of children, birth to 2 years old, at risk of hearing loss who cannot be conditioned for play audiometry, and for children above 3 years old who are difficult to test (e.g., will not respond behaviorally).

Once conditioned responses are obtained, children’s hearing can be screened objectively. For this reason, play audiometry should be attempted with most children ages 2½ years old and older, although success will vary depending on the developmental readiness of the children to be screened. If conditioned responses to auditory stimuli can be obtained successfully, Level 1 screening components are applicable.

The infant toddler at risk for hearing loss screening protocol includes:

- paper screening
- visual inspection (if the infant-toddler is older than 6 months)
- otoacoustic emissions (OAE) screening
- tympanometry (if the infant-toddler is older than 6 months)

Each component is necessary to obtain an accurate assessment possible for children who are at-risk or who are difficult to test. The following information provides descriptions of each component used to conduct the screening. Additionally, other types of screening tools are described to increase the objectivity of screening results.

b. Paper Screening

A paper screening is the first part of this type of hearing screening protocol. A paper screening is a collection of the child’s history and development by using information from sources other than those who have direct contact with the child. This type of screening protocol includes two questionnaires. The recommended screening questionnaires are:

- The Risk Indicators Checklist (KDHE, 2010), and
- The Developmental Scales Form (KDHE, 2010).

Information obtained in this manner does not screen hearing per se, but it alerts the Hearing Screening Technician to the increased possibility, or of a child at risk for hearing loss. Both the Risk Indicators Checklist (KDHE, 2010) and the Developmental Scales Form (KDHE, 2010) should be completed for any child at birth through 2 years old.

**NOTE:** The child should be referred to an audiologist if referral criteria are met on either questionnaire.
c. The Risk Indicators Checklist (KDHE, 2010)

The Risk Indicators Checklist incorporates risk criteria that are often associated with infant and childhood hearing loss that is identified in The American Speech Language Association (2007) The Executive Summary of the Joint Committee on Infant Hearing (JCIH) Position Statement. It is vital to obtain complete and accurate information about the child’s prenatal and birth history, results of the newborn hearing screening, and the presence of specific early childhood conditions in order to determine if factors associated with hearing loss are present.

The identification of risk indicators is an essential component of a comprehensive hearing screening program for children ages birth through 2. However, use of risk indicators alone will identify only 40-50% of infant-toddlers with hearing loss.

The American Speech Language Association (2007) identified the indicators associated with hearing loss in two age groupings:
- birth through 1 month old (using physiological measurements)
- 1 month old to 3 years old

When an indicator is present, a hearing screening is recommended every six months until the child is three years old to monitor for delayed-onset, progressive, and newly acquired hearing loss (and to identify the child that may require an ABR as part of a diagnostic referral).

The Kansas Part C Infant-Toddler, Tiny-K Hearing Screening Guidelines and Resources Manual (2010) indicated that the child is referred to an audiologist when an indicator is present. The Hearing Screening Technician must work with the child’s audiologist to determine ongoing referral and rescreening recommendations after the child is initially referred to an audiologist. For example, if, at the six-month rescreen, the risk indicator “parental/caregiver concern” is no longer present, the Hearing Technician probably can resume an annual hearing rescreening.

d. Completing The Risk Indicators Checklist (2010)

The Risk Indicators Checklist (2010) includes identifying information, as well as information regarding newborn hearing screening results, birth weight, prematurity, and history of middle ear infections. If the infant is 28 days or less and has not had newborn hearing screening, ask the questions only with the capital “N” next to them. For infants 29 days and older, ask about all of the risk indicators.

- The parent/caregiver should complete the identifying information requested, and respond to the questions regarding birth history, and the results of the newborn hearing screening. The Hearing Screening Technician should complete the remainder of the Risk Indicators Checklist (2010) by asking the parent/caregiver each question. The Hearing Screening Technician should define terminology and provide clarification of the questions to obtain accurate information. The technician should mark either “YES” or “NO” for each risk indicator.

- Follow-up on all “YES” risk indicators to determine:
  - if the child has already been referred to an audiologist or physician, and the results of the referral; or
  - what recommendations are being followed [return visit(s) to audiologist/physician]]?

- If all indicators are marked “NO” on the Risk Indicators Checklist (2010), then check “PASS” at the bottom of the form. If one or more indicators are marked “YES,” then check “REFER” at the bottom of the form.

- Complete the Hearing Screening Report Form - Birth through Two Years by circling “PASS” or “REFER” under “Paper Screen - Risk Indicators.” Identify the indicator(s) present under “Comments” at the bottom of the form. If the child has previously been referred for a specific risk indicator, note whether the child is being followed by an audiologist or physician for that risk indicator.
o If no risk indicators are present, recommend annual rescreen. If the answer to any one indicator is “YES” on an initial hearing screening, the child should be referred to an audiologist for evaluation. Subsequent rescreening should occur every 6 months or as directed by the audiologist. If on a subsequent rescreening another (different) risk indicator is identified, the child should be referred to an audiologist for evaluation.

e. Explanation of Risk Indicators
All of the risk indicators have been shown to have a potential impact on hearing in young children. A brief explanation of each indicator is provided below in order to ensure that accurate and pertinent information is obtained from each parent and/or caregiver. A capital letter “N” next to the indicator denotes an indicator for those infants who are birth to 28 days old, and did not have hearing screened as a newborn. All of the indicators are pertinent for infants and children 29 days to 3 years old. The following questions are accompanied by descriptions that help guide the delivery of the questionnaire.

1N Do you have a concern about your child’s hearing, speech, or language? Do you have a concern about other developmental delays?

It is important that hearing loss be identified as early as possible to prevent speech, language, and other developmental delays. Most parents are reliable reporters of their child’s development.

2N As a newborn, did your child have an illness/condition requiring 48 hours or more in a Newborn Intensive Care Unit (NICU)?

Infants admitted to a NICU are at greater risk for hearing loss. For example, infants with very low birth weight are at increased risk for both sensorineural and conductive hearing loss.

3N Was your child exposed to any of the following during mother’s pregnancy, such as cytomegalovirus, herpes, rubella, syphilis, and/or toxoplasmosis?

The presence of these infectious agents has been linked to hearing loss in children. The majority of infections in pregnant women involves the upper respiratory and gastrointestinal tracts and is not known to cause hearing loss. Some infectious agents are contracted by the mother during pregnancy that may cross the placental barrier and invade fetal tissue. Severe infections, especially those occurring in the first trimester, can be related to hearing loss since this is when the auditory system develops. Many infections go unrecognized due to the lack of clinical symptoms in the mother. Semi-annual hearing screening is recommended due to the potential of delayed onset sensorineural hearing losses. The following are the most common occurring infections and diseases that can be contracted during pregnancy.

- **Cytomegalovirus (CMV):** is a virus in the herpes family. It is the leading cause of fetal viral infection in the United States of America (USA). The CMV infection often is most asymptomatic in the mother. Cytomegalovirus can cause sensorineural hearing loss, which varies in severity, may have a delayed onset, may be unilateral, and is often progressive.
- **Herpes:** is a virus that is present in two forms; Herpes Simplex 1 or Herpes Simplex 2. It is in the same family as the CMV virus. Herpes may cause severe to profound sensorineural hearing loss.
- **Rubella (German Measles):** is a virus that can be contracted during all trimesters of pregnancy. Rubella poses a serious risk to the developing fetus if it is present during the first trimester. In addition to hearing loss, other anomalies which may occur include a heart disorder, low birth weight, mental retardation, and vision loss. Fifty percent of children are likely to acquire bilateral severe to profound hearing loss. The hearing loss may be progressive.
- **Syphilis:** is a bacterial infection that can be contracted during pregnancy. Congenital syphilis may become apparent in infants up to 20 years old and older. Hearing loss is sensorineural and may be sudden, progressive, or fluctuating. Early onset hearing loss caused by syphilis may be reversible with early detection and prompt treatment with antibiotics.
- **Toxoplasmosis:** is an infection that is caused by a protozoan parasite. The infection is usually asymptomatic in the mother. The incidence of intrauterine toxoplasmosis averages 1 case per 750 deliveries in the United States of America. Toxoplasmosis acquired during the first trimester is most likely affect the fetus. It can involve the central nervous system, mental retardation, seizures, and vision loss.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your child have any abnormal features of the outer ear, ear canal, mouth, nose, head, or neck?</td>
<td>Craniofacial abnormalities (e.g., cleft lip and/or palate, shortened neck, webbed neck, and/or abnormal head circumference) may indicate the presence of a hearing loss. Malformation of the ears may include atresia, low set ears, skin tags, and/or preauricular pits. Additionally, these outer ear abnormalities may be indicative of a syndrome.</td>
</tr>
<tr>
<td>Have any of your child’s relatives had a permanent hearing loss before they were 5 years old?</td>
<td>This question is aimed at identification of hereditary (genetic) hearing loss from either maternal and paternal family members who are living or deceased. However, a family history of hearing loss is not necessarily genetic. A hearing loss that is genetic is most often sensorineural. It is important to ensure that the relative’s hearing loss was not acquired (such as, hearing losses that result from meningitis, noise exposure, chemotherapy, and/or the aging process). Acquired hearing losses are not inherited. The type of hearing losses which are inherited typically are present at a very young age. A semi-annual hearing screening is recommended because an inherited hearing loss may have delayed onset.</td>
</tr>
<tr>
<td>Has your child been diagnosed at birth as having a syndrome or condition known to include a sensorineural hearing loss, a conductive hearing loss or Eustachian Tube dysfunction?</td>
<td>There are many syndromes associated with hearing loss that include observable physical anomalies of the head, neck, and ears which frequently result in hearing loss (e.g., Down Syndrome).</td>
</tr>
<tr>
<td>Has your child been diagnosed as having a syndrome associated with progressive hearing loss, such as neurofibromatosis, osteopetrosis, or Usher Syndrome? A neurodegenerative disorder, such as Hunter Syndrome? Or, sensorimotor neuropathies, such as Friedreich Ataxia or Charcot-Marie-Tooth Syndrome?</td>
<td>Some syndromes are not evident at birth. As noted above, there are many syndromes that include the possibility of a congenital hearing loss. Neurofibromatosis Type II (NF2) is an inherited syndrome. It causes tumors in various parts of the body.</td>
</tr>
<tr>
<td>Has your child had bacterial meningitis (or other postnatal infections) associated with a hearing loss?</td>
<td>Postnatal infections that have the greatest incidences of hearing loss are Hemophilus influenza (Type B) and bacterial meningitis. Bacterial meningitis is the leading cause of acquired deafness in infants and children ranging from 5 to 30 percent. Either infection is quite serious and typically causes a severe, bilateral and/or sensorineural hearing loss with 30% that result in a profound hearing loss. The age at which meningitis occurs significantly affects rehabilitative needs. The younger the child, the greater the impact a hearing loss will have on speech and language acquisition.</td>
</tr>
<tr>
<td>Has your child had any incidences resulting in head trauma?</td>
<td>Head trauma (e.g., a skull fracture, traumatic brain injury (TBI), etc.) may affect a child’s hearing (regardless of age) due to potential damage to either the cochlea in the inner ear, or the ossicular chain or tympanic membrane in the middle ear that most likely results in a sensorineural hearing loss or a conductive hearing loss. A sensorineural hearing loss may occur due to damage or obliteration of the temporal bone that houses the inner ear. A conductive hearing loss may occur due to the perforation of the tympanic membrane, bleeding, or disruption of the ossicular chain.</td>
</tr>
<tr>
<td>As a newborn, did your child need an exchange (blood or blood platelets) transfusion because of hyperbilirubinemia? Or, have the need for mechanical ventilation? Or, have conditions requiring extracorporeal membrane oxygenation (ECMO)?</td>
<td>Jaundice is a condition which occurs in infants when there is too much by-product from the liver in the blood. This condition eventually results in high bilirubin levels. High levels of bilirubin (hyperbilirubinemia) are ototoxic. It may cause a hearing loss. Premature infants and infants with low birth weight are at greater risk for high bilirubin levels. Low bilirubin levels (slight jaundice) typically do not affect hearing. Infants who require prolonged use of mechanical ventilation are at-risk for a hearing loss (e.g., persistent pulmonary hypertension, and other conditions requiring the use of extracorporeal membrane oxygenation).</td>
</tr>
<tr>
<td>Does your child have a history of recurrent or persistent otitis media with effusion lasting at least 3 months?</td>
<td>Middle ear infection is a frequently occurring illness in very young children, second only to the common cold. “Recurrent” is defined as three or more bouts of otitis media within a 12 month period; “persistent” is defined as lasting 3 months or longer. Pressure equalization tubes may have been inserted to address the otitis media with effusion (OME). Frequent episodes of OME may result in a fluctuating conductive hearing loss that can impact a child’s speech and language development. Otitis media with effusion should be monitored regularly.</td>
</tr>
</tbody>
</table>
f. The Developmental Scales Form (2010)

The Developmental Scales Form (2010) is a screening tool to acquire knowledge about a child’s speech, language, and auditory development. It helps determine the presence of specific behaviors that often are observed in typically developing children of similar age with normal hearing. The Hearing Screening Technician obtains the information from the child’s parents or primary caregiver.

Each age category on the form contains several items related to behavior demonstrated by the child. The absence of one or more of these behaviors may indicate the presence of a hearing loss. If the answer to any one of the items is “NO,” the Hearing Screening Technician should be alerted to the possibility of hearing loss in the child. If 2 of the items are answered “NO,” the child must be referred to an audiologist for further hearing testing.

g. Completing The Developmental Scales Form (2010)

If the child being screened is younger than 2 years old and was born prematurely, use the child’s adjusted age to determine the appropriate age category of questions to be completed on The Developmental Scales Form (2010). An adjusted age is the age of the child who is premature is calculated. To calculate for an adjusted age, identify the chronological age of the child. Subtract the number of weeks that the child was premature from the chronological age.

For example, the child was born on December 1, 2000, was eight weeks premature, and the child’s hearing was screened on June 1, 2001. The adjusted age for the child in the example is four months. The “birth to 4 months” age category of questions would be asked.

Child’s chronological age: 6 months
Premature: minus 2 months (8 weeks)
Adjusted age: 4 months

NOTE: This adjustment for prematurity is made only for children younger than 2 years old. No adjustment is made for children ages 2 and older who were born prematurely.

Once the adjusted age (if appropriate) is calculated, continue with the following steps to complete The Developmental Scales Form.

• Circle the appropriate age category on the Developmental Scales Form.
• The Hearing Technician should ask the parent/caregiver each of the questions in the appropriate age category. The Hearing Technician should mark “YES” or “NO” for each of the questions after the parent(s) and/or caregiver(s) response.
• If only one or no question(s) is marked “NO” on the Developmental Scales Form, then check “PASS” at the bottom of the form. If two or more questions are marked “NO” on the Developmental Scales Form, check “REFER” at the bottom of the form.
• Complete the Hearing Screening Report for Birth through Two Years by circling “PASS” or “REFER” under Paper Screen - Developmental Scales. Identify the reason for “REFER” in the “Comments” section of the form.

4. Complete the Hearing Screening Report for Birth through Two Years

If this is an initial screening for the child, complete the column under “Screen #1.” Additional columns are provided for rescreening results. Both the Risk Indicators Checklist (2010) and the Developmental Scales Form (2010) must have “PASS” circled in order for the child to pass the paper screening. If either questionnaire is circled “REFER,” the child does not pass the paper screening.

a. Complete the paper screening referral options.

b. If the child passes the paper screening, complete an otoscopic examination and tympanometry screening if the child is older than 6 months.

c. Complete the otoscopy section on the Hearing Screening Report for Birth through Two Years by circling “PASS” or “REFER” for each ear.
d. Complete the tympanometry section on the *Hearing Screening Report for Birth through Two Years* by recording the information requested for each ear.

- Tympanogram: Normal or Flat (circle one)
- Tube(s) present? Yes or No (circle one)
- Record Physical Volume (Write volume measurement)

e. Circle “PASS” or “REFER” for each ear.

f. Circle the appropriate referral action.

g. Record the date of the next recommended screening (annually, 6 months, or 2 to 4 weeks).

5. **Complete the Otoacoustic Emissions (OAE) Hearing Screening**

The OAE Hearing Screening is covered in more depth during Level 2 Hearing screening training sessions than in the Level 1 hearing screening training sessions. The instructor will provide information, demonstration, and offer opportunities to practice skill competencies during the Level 2 Training. Additionally, the instructor will provide forms to record results of the OAE screening that will include instructions on when to REFER or when to PASS the child. The OAE screening forms are not included in these guidelines and resources manual. (See Chapter II for more information about OAE Hearing Screenings.)

6. **Referral and Rescreening Criteria for Birth through Two Years**

After the Hearing Technician has completed screening the child for risk for hearing loss, the Hearing Technician should make recommendations regarding the referral and when the child needs to be rescreened. The below listed recommendations are given unless otherwise directed by the audiologist or the child’s primary care physician. When in doubt, REFER.

<table>
<thead>
<tr>
<th>BIRTH THROUGH SIX MONTHS</th>
<th>DOES NOT PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPER SCREENING</td>
<td>PAPER SCREENING</td>
</tr>
<tr>
<td>Annual rescreen</td>
<td>– Audiological referral</td>
</tr>
<tr>
<td></td>
<td>– Rescreen in 6 months unless otherwise indicated by the audiologist or primary care physician</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIX MONTHS THROUGH TWO YEARS: INITIAL SCREENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASSES</td>
</tr>
<tr>
<td>PAPER SCREENING + OTOSCOPY + TYMPANOMETRY</td>
</tr>
<tr>
<td>Annual rescreen</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tympanometry + Has NO History of Otitis Media</td>
</tr>
<tr>
<td>Tympanometry + Has a history of otitis media + is receiving routine medical management of the otitis media</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Tympanometry + has a history of otitis media + is NOT receiving routine medical management of the otitis media</td>
</tr>
</tbody>
</table>
### SIX MONTHS THROUGH TWO YEARS: RESCREENING (2 TO 4 WEEKS, 6 MONTHS, AND ANNUALLY)

<table>
<thead>
<tr>
<th>Passes</th>
<th>Does Not Pass</th>
</tr>
</thead>
</table>
| **Paper Screening + Otoscopy + Tympanometry**  
–Annual Rescreen | The Developmental Scales Form  
–Audiological referral  
–Rescreen in 6 months unless otherwise indicated by the audiologist |
| **The Risk Indicators Checklist**  
(presents a different risk indicator from a previous screening)  
–Audiological referral  
–Rescreen in 6 months unless otherwise indicated by the audiologist | Otoscopy at the:  
–2 to 4 week rescreen - Medical **AND** audiological referrals  
–6 month rescreen - Medical referral and rescreen in 2-4 weeks  
–Annual rescreen - Medical referral and rescreen in 2-4 weeks |
| **Tympanometry at the:**  
–2 to 4 week rescreen - Medical **AND** audiological referrals  
–6 months rescreen (See referral for initial screening.)  
–Annual rescreen (See referral for initial screening.) |

### J. RENEWAL TRAINING REQUIREMENTS FOR LEVEL 2

- Hearing screening renewal training should be attended every two years.
- Satisfactory completion of the hearing screening renewal workshop, “Current Issues in Hearing Screening,” required to renew the current level of training.
- Renewal should be at the highest level of training completed. (When participants attend the initial Level 2 training, Level 1 is automatically renewed.)
- If a Hearing Screening Technician cannot renew at the higher level, the audiologist responsible for the training should renew the Hearing Screening Technician at the level of competency demonstrated, even if that is a lower level of training.
- A minimum of 6 clock hours of instruction, which must include at least 75 minutes of discussion concerning current issues, must be addressed.
- Demonstrate skill competencies for each type of hearing screening.
- Mastery of the written test must be demonstrated by a minimum score of 80%.
- Mastery of practical skills must be demonstrated by a score of 100%.
- Previous initial Level 2 training can be renewed by attending Level 2 renewal training (effective July 1, 2001).

Level 2 renewal is valid for two years. There is a 6 clock hour minimum renewal training requirement for the training; however, the instructor can determine if additional information or practice opportunities need to be added to the minimum time allotment.
### K. COURSE CONTENT FOR LEVEL 2 HEARING SCREENING RENEWAL

<table>
<thead>
<tr>
<th>Topic</th>
<th>Suggested Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Issues in Hearing Screening</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Overview of Auditory Development</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Care of Equipment</td>
<td>30 minutes</td>
</tr>
<tr>
<td>▪ Audiometer</td>
<td></td>
</tr>
<tr>
<td>▪ Tympanometry</td>
<td></td>
</tr>
<tr>
<td>Tympanometry Hearing Screening Procedures</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Otoacoustic Emissions (OAE) Hearing Screening Procedures</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Review of Otoscopy, Tympanometry, and Play Audiometry</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Risk Factor Information and an Infant-Toddler Screening Protocol</td>
<td>45 minutes</td>
</tr>
<tr>
<td>Hearing Screening Procedures</td>
<td>45 minutes</td>
</tr>
<tr>
<td>▪ Record keeping</td>
<td></td>
</tr>
<tr>
<td>▪ Referral criteria</td>
<td></td>
</tr>
<tr>
<td>Written Examination</td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

Objectives of the Level 2 Hearing Screening Renewal Training Session are as follows:

- Recognize current issues in hearing screening.
- Explain the hearing screening laws and the rationale for mandatory hearing screening.
- Review visual inspection, pure-tone screening, audiometry, tympanometry, play audiometry, and otoacoustic emissions screening.
- Explain the need for early identification.
- Identify and explain factors that detect an infant or toddler at risk for hearing loss.
- Describe the various components of an infant-toddler screening protocol.
- Explaining the hearing screening process and results.
- Discuss normal auditory development.
- Perform a paper screen including the *Risk Indicators Checklist* (KDHE, 2010), hearing health history, and the *Developmental Scales Form* (KDHE, 2010).
- Determine if there is a need for a referral based on the results of the hearing screening.
- Keep accurate records of hearing screenings.
REFERENCES


GLOSSARY

Acoustic Environment: Listening surroundings.

Acoustic Reflex: The objective measurement of the contraction of a small muscle within the middle ear in response to a loud sound.

Acoustics: The science of sound including its production, transmission, and effects.

Acquired Deafness: Hearing loss not present at birth, but developed in an individual as a result of environmental or other factors (e.g., severe illness, head trauma, or noise exposure).

Acute Otitis Media: Active inflammation and/or infection of the middle ear space of recent onset or repeated occurrence, often bulging tympanic membrane and/or evidence of pus, discoloration or discharge through a perforation. Usually resulting from infection of fluid within middle ear space which in turn causes Eustachian Tube dysfunction, develops over a short period of time and either resolves (either spontaneously or with medical treatment), or progresses to otitis media with effusion.

Acoustic Reflex: The objective measurement of the contraction of a small muscle within the middle ear in response to a loud sound.

Adventitiously Deaf: Individuals who were born with normal hearing who acquired a hearing loss later in life.

Air Conduction: Process by which sound waves normally reach the inner ear via the external canal, tympanic membrane, and ossicular chain.

Ambient Noise: Surrounding noise from all directions encompassing a combination of sources (e.g., lighting, heating, air conditioning systems, people moving about, or use of equipment/facilities).

APGAR Score: A quantitative estimate of the condition of an infant 1 minute and 5 minutes after birth, derived by assigning 0-2 points each to the quality of heart rate, respiration, color, muscle tone, and response to stimulation. The score is expressed as the sum of these points (maximum = 10).

Atresia of External Canal: A collapsing or closing of the outer ear canal.

Atresia: A deformity of the outer ear.

Attenuation: Weakening or reduction of sound energy. Thus, a sound that is attenuated by 10 decibels has been made 10 dB weaker (less intense).

Audiogram: A graph that shows hearing threshold level for pure-tones at each test frequency.

Audiology: The science of measurement and interpretation of normal and impaired hearing, as well as intervention.

Audiologist: A specialist in audiology who administers audiometric tests, conducts hearing aid evaluations, and contributes to the rehabilitative needs of individuals who are hard of hearing.

Audiometer: An electronic instrument for measuring hearing threshold levels with pure-tones or speech.

Audiometric Zero (or “0” dB hearing level): A set of values representing average hearing threshold for healthy young adult ears.

Auditory Brainstem Response (ABR): An electronic method of making an objective measurement of the auditory pathway response to acoustic stimuli (may also be referred to as BAER, BAEP, or EP).

Auditory Training: Methods to teach individuals with hearing loss to take full advantage of the sound clues that are still available through the use of their residual hearing. These methods are usually used in conjunction with a hearing aid that provides appropriate sound amplification.

Aural Rehabilitation: Numerous teaching methods designed specifically for improving a child's auditory speech perception performance. Methods include auditory experiences of spoken language that are meaningful and appropriate to the child's age and interests.

Auricle (Pinna): The most visible part of the ears that is an ovoid-formed, skin-covered fibro cartilaginous plate attached to the head. The auricle is believed to be most useful in gathering and localizing of sound.

Behavioral Observation Audiometry (BOA): Observation of responses to auditory stimuli (e.g., change in breathing, limb movement, grimacing, or turning the head towards the sound stimuli).

Bone Conduction: The process by which sound is conducted to the inner ear through the cranial bones. Bone conduction threshold is a direct measure of the sensorineural components of the hearing mechanism, relatively unaffected by the condition of the conductive mechanism.

Calibration: The electroacoustic or psychoacoustic determination that an audiometer is performing properly in terms of its acoustic output, attenuation linearity, frequency accuracy, or harmonic distortion.

Cerumen: Wax secreted in the outer portion of the external auditory canal that keeps out foreign objects, and keeps skin in the canal and tympanic membrane moist.

Cholesteatoma: A cyst that invades the middle ear, mastoid bone and sometimes the external ear canal; it frequently originates from a perforation in Sharpnell membrane (pars flaccid) of the tympanic membrane; also called keratoma.

Chronic Otitis Media: Condition persists beyond the normal period of time; often relatively little pain is present.
Cochlea: A coiled spiral, tapered bony tube of about 2 3/4 turns located in the inner ear. It contains the receptor organs essential to hearing.

Cochlear Implant: An electrode is placed in the cochlea and attached to the coil under the skin near the ear. An additional unit is placed on the outside of the body. This device provides the ability to hear to people who cannot benefit from conventional hearing aids. However, the ability to hear has a quality different from natural, unaided hearing.

Compliance: The reverse of stiffness. A measurement of how mobile the tympanic membrane and the middle ear system is at a given time.

Conductive Hearing Loss: Produced by pathologies of the external and/or the middle ear. The audiogram, in such a loss, is characterized by normal bone conduction thresholds, but depressed air conduction that also is referred to as the “air-bone” gap.

Congenitally Deaf: Individuals who were born with degrees of hearing loss or deafness.

Cross-Over (Contra Lateralization): Occurs during a hearing test when a tone delivered to one ear is carried either around or through the head in sufficient intensity to stimulate the opposite ear.

Cytomegalovirus (CMV): A member of the group of DNA viruses closely related to the Herpes viruses, which may cause progressive hearing loss.

Deafness: “…means a hearing impairment that is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification, that adversely affects a child’s educational performance” [34 CFR § 300.8(c)(3)]. Retrieved from: http://www.law.cornell.edu/cfr/text/34/300.8

Decibel (dB): A unit used to measure the relative loudness of sounds; 0.0 dB re 0.0002 dynes/cm2 is considered to be the faintest sound that can be heard by a normal hearing person; 140 dB (sound pressure level): a pressure 10 million times as great, a 0.0 dB SPL decibel is considered to be the pain threshold of the normal ear.

Dermatitis: Inflammation of the skin.

Developmental Scales: A graded series of performances used in rating individual development.

Effusion: Fluid collected in a middle ear cavity.

Eustachian Tube: A canal that connects the middle ear with the back of the throat. It supplies air to the middle ear and serves to equalize the air pressure on the two sides of the tympanic membrane.

External Auditory Meatus (or Ear Canal): The canal that conducts sound vibrations from the auricle to the tympanic membrane.

Frequency: The rate of repetition of the cycles of a sound wave. The unit is called hertz (Hz) or cycles per second (cps). The frequency of a tone largely determines pitch.

Gradient: A change in the value of static admittance relative to the tympanometric width. Gradient measures are used to describe the shape of the tympanogram in the vicinity of the peak.

Habilitation: Education of individuals who are deaf or hard of hearing to function in society.

Habituate: Becoming accustomed to a sound or noise to the degree that it is ignored.

Hair Cells: The sensory receptor cells for hearing. They are ciliated epithelial cells located within the cochlea at the Organ of Corti.

Hearing Aid: A device used to amplify sound.

Hearing-Impaired (Hard of Hearing): “…means an impairment in hearing, whether permanent or fluctuating, that adversely affects a child’s educational performance but that is not included under the definition of deafness in this section.” [34 CFR § 300.8(c)(5)]. Retrieved from: http://www.law.cornell.edu/cfr/text/34/300.8

Hearing Level (HL): The difference in decibels between the threshold for that sound and the corresponding normal threshold or audiometric zero. The numerical value of the intensity attenuator in audiometry.

Hearing Screening Technician: An individual trained to perform audiometric sweep frequency screening and tympanometry screening according to level of training.

Hereditary Hearing Loss: Hearing loss resulting from inherited characteristics.

Hertz (Hz): The unit of frequency (i.e., cycles per second).

Immittance: An audiological term to describe measurements made of tympanic membrane impedance, compliance, or admittance.

Immittance Measurements: The term used to describe the acoustic immittance test battery of tympanometry, compliance, and acoustic reflex. It measures the function and integrity of the middle ear system.

Impedance: The opposition to sound at the surface of the tympanic membrane. It is comprised of frictional resistance and stiffness influenced by frequency.

Infant State: The status of an infant characterized by a particular condition or set of behaviors.

Intensity: The amount of energy in a sound. The intensity of a sound is perceived by the ear as its loudness. The noise of a jet engine is a high-intensity sound and to the ear it seems very loud. A whisper is a low-intensity sound and it seems very weak as it is heard. Intensity is measured in decibels (dB).

Inter-Stimulus Interval (ISI): The period of time occurring between presentation of two stimuli.
Jaundice: Yellowness of the skin, mucous membranes, and secretions, due to hyperbilirubinemia that is sometimes seen in premature newborns.

Listening Check: A daily listening check of the audiometer using the audiometric technician’s own hearing sensitivity as a reference for proper function.

Local Education Agency (LEA): “...means a public board of education or other public authority legally constituted within a State for either administrative control or direction of, or to perform a service function for, public elementary or secondary schools in a city, county, township, school district, or other political subdivision of a State, or for a combination of school districts or counties as are recognized in a State as an administrative agency for its public elementary or secondary schools” [34 CFR§ 300.28 (a)]. Retrieved from: http://www.law.cornell.edu/cfr/text/34/300.28

Localization: Determination of the source of a sound made possible partly by the difference in loudness and partly by the difference in time of reception by the two ears.

Middle Ear: An air-filled cavity bordered by and including the tympanic membrane, ossicles, and Eustachian Tube and ending at the Cochlea.

Middle Ear Effusion: An accumulation of fluid (liquid) in the middle ear.

Myringotomy: Small incision of the tympanic membrane to allow drainage of fluid from the middle ear.

Neoplasm: An aberrant new growth of abnormal cells or tissues; a tumor.

Occlusion: A closing or shutting off of the external ear canal.

Octave: The interval between two tones which are separated by a frequency ratio of 2:1.

Operant Conditioning: Training a response to a stimulus that can be recognized by its effect on the child.

Ossicles: The three small bones in the middle ear (the malleus or hammer, the incus or anvil, and the stapes or stirrup). These bones transmit sound vibrations from the tympanic membrane to the cochlea.

Ossicular Fixation: Fixation of the malleus and/or the incus, frequently caused by tympanosclerosis, a complication of chronic otitis media.

Otitis Externa: Inflammation of the external ear.

Otitis Media: Generically, the inflammation of the middle ear cavity, synonymous with ear infection.

Otitis Media with Effusion: Inflammation of the middle ear accompanied by an accumulation of fluid (liquid).

Otoacoustic Emissions (OAE): An audiologic test that verifies cochlear activity; often is used in screening for hearing loss and in evaluating infants suspected of hearing loss.

Otolaryngologist (ENT): A physician who specializes in disorders of the ear, nose, and throat.

Otolologist: A medical doctor whose specialty is the science of the ear, its diseases, structure, and function.

Otoscclerosis: A genetic abnormality of the temporal bone, frequently causing fixation of the stapes, and conductive hearing loss.

Otoscope: A flashlight-like device with a funnel-like speculum on the end, designed for visualization of the tympanic membrane.

Otoscopy: Visual inspection of the ear canal and tympanic membrane by means of an otoscope.

Paper Screening: A questionnaire format for separating children into different groups.

Patent: Open, unobstructed, not closed.

Physical Volume Test: A test involved in immittance measuring the size of the cavity, determines if tube is patent, possible tympanic membrane perforation, wax, or normal volume.

Pinna: The external ear.

Pitch: The attribute of auditory sensation in terms of which sounds may be ordered on a scale extending from low to high. Pitch depends primarily upon the frequency of the sound stimulus, but it also depends upon the sound pressure and wave form of the stimulus.

Presbycusis: The loss of hearing associated with aging.

Pressure Equalization Tubes (PE Tubes): Tubes placed in the tympanic membrane to equalize air pressure in the middle ear cavity with air pressure outside the head.

Probe Ear: Describes the ear in which the probe tip is inserted.

Pure-Tone: A sound wave of a single frequency component whose sound sensation is characterized by its singleness of pitch.

Purulent: A festering, forming, or discharging pus.

Recruitment: A large increase in the perceived loudness of a signal produced by a relatively small increase in intensity above threshold.

Recurrent Otitis Media: When infection occurs repeatedly over a defined period of six months or a year.

Residual Hearing: The range of useful hearing above the threshold of sensitivity.

Resonance: A vibrating air column, string, membrane, rod, or an electric circuit (oscillator) is excited by a small energy source at or near the same frequency of the mechanical or electrical system.

Rubella: An acute, benign, viral, contagious disease of children characterized by fever and rash. Associated with fetal abnormalities when maternal infection occurs in the first trimester of a pregnancy.
Screening Thresholds: A pure-tone audiometric technique used by an audiometric technician to identify the faintest intensity level of a given frequency that a person can detect on fifty percent of a number of trials. Tones above the threshold are audible; those below are inaudible.

Secretory Otitis Media: Also called mucoid otitis media; glue-like consistency caused by chronic inflammation and by mucous production in the lining of the middle ear space, usually following an acute infection.

Sensorineural Hearing Loss: Hearing loss resulting from a pathological condition in the inner ear or along the nerve pathway from the inner ear to the brain stem. The audiogram in such a loss is characterized by depressed air conduction and bone conduction thresholds of generally equal amounts.

Serous Otitis Media: Otitis media with effusion, indicates presence of thin watery, clear fluid seen relatively early in Eustachian Tube dysfunction.

Sound: An oscillation in pressure or molecular vibration in an elastic medium (e.g., air, water, or metals) that results in transmission of vibratory energy in a wave-like manner. It is also the auditory sensation evoked by such an oscillation.

Sound Pressure: The average difference between the air pressure that occurs during sound transmission and the ambient air pressure.

Speech Pathology: The study and treatment of functional and organic speech defects.

Stenosis: An abnormal narrowing, as of the external auditory canal.

Suppurative Otitis Media: (See Acute Otitis Media).

Supra-Threshold Response: Above the lower limit of a stimulus capable of evoking a response.

Sweep Frequency Screening: An audiometric technique to identify those individuals whose thresholds do not fall within the normal limits of hearing from those individuals whose thresholds fall at or within the limits of normal hearing; using pure-tone as stimuli.

Temporary Threshold Shift (TTS): A change of hearing threshold primarily due to exposure to high-intensity noise which recovers in 48 to 72 hours. Any loss which remains after this period is termed permanent threshold shift (PTS).

Threshold of Hearing: The lowest intensity of sound that is capable of evoking an auditory sensation in a specified fraction of trials (usually 50% or more).

Tinnitus: The ringing sensation in the ear(s) which generally follows an exposure to hazardous noise, but may be due to numerous other causes.

Tympanic Membrane: (Eardrum): Cone-shaped semi-transparent membrane that separates the external auditory meatus from the middle ear cavity and transmits sound vibrations to the ossicles.

Tympanogram: A graphic representation of a pressure compliance function of the middle ear.

Tympanometer/Bridge: The instrument used to make acoustic immittance measurements.

Tympanometric Peak Pressure: The value of ear canal pressure at which the tympanometric peak occurs.

Tympanometry: The measurement of the ability of the ear drum and ossicular chain to transmit sound pressure waves. An intact tympanic membrane is subjected to air pressure changes to determine its stiffness (impedance) and compliance (admittance). The results may be charted on a tympanogram.

Tympanoplasty: Surgery involving the tympanic membrane.

Tympanosclerosis: A complication of otitis media that is characterized by sclerotic regions involving the tympanic membrane, ossicles, and middle ear mucosa. Tympanosclerosis increases the stiffness of the middle ear system.

Tympanostomy Tubes: Very small polyurethane tubes inserted in the tympanic membrane to provide ventilation to the middle ear (see Pressure Equalization Tubes).

Visual Reinforcement Audiometry: The quantitative and qualitative evaluation of hearing by conditioning the desired response with visual rewards.

Warble Tone: A tone resulting from rapid modulations of frequency within fixed limits around basic pure-tone frequency.
APPENDIX
FORMS, REPORTS, AND RESOURCES

THE HEARING SCREENING ENVIRONMENT

A. ACOUSTIC ENVIRONMENT CRITERIA [American National Standards Institute (ANSI, 2010)]

When it is the responsibility of an agency to provide hearing screening for students, it is also the responsibility of the agency to provide a suitable screening environment.

Finding a suitable acoustic environment is a very important part of the screening program. Frequently, school environments are sufficiently quiet for screening above 1000 Hz, but not quiet enough for accurate screening at 500 Hz and 1000 Hz. For that reason, the screening site must be evaluated yearly or before screening is conducted. A sound-level meter and a frequency analyzer in the screening environment may be used to measure the noise level in the environment. Analysis of the ambient noise level should be conducted by someone experienced in noise measurements with the following:

1. Sound-pressure level measurements are to be taken with a sound-level meter, or its equivalent, and a frequency analyzer. (A sound-level meter must meet the requirements of ANSI S1.4-1971.)
2. The sound is to be measured in one-third or full octave bands that include the audiometric test frequency (500, 1000, 2000, 3000, 4000, 6000 Hz).
3. Measurements are to be taken with a sound-level meter microphone where the subject's head would be positioned.
4. Measurements of ambient noise are to be made with the same number of people in the room as in a test situation.
5. Measurements of ambient noise are to be made under the same noise level conditions (i.e. air conditioning/ventilation system running, typewriting, bells, footsteps, traffic noise occurring) as will exist when audiometric testing is being conducted.

If each of the sound-pressure-levels is less than the level stated in Table 1, the ambient noise level should not interfere with pure-tone screening procedures.

MAXIMUM ALLOWABLE AMBIENT NOISE DURING SCREENING*

This Standard specifies maximum permissible ambient noise levels (MPANLs) allowed in an audiometric test room that produce negligible masking (less than or equal to 2 dB) of test signals presented at reference equivalent threshold levels specified in American National Standard S3.6-1996 American National Standard Specification of Audiometers. The MPANLs are specified from 125 to 8000 Hz in octave and one-third octave band intervals for two audiometric testing conditions (ears covered and ears not covered) and for three test frequency ranges (125 to 8000 Hz, 250 to 8000 Hz, and 500 to 8000 Hz). The Standard is intended for use by all persons testing hearing and for distributors, installers, designers, and manufacturers of audiometric test rooms. This standard is a revision of ANSI S3.1-1991 American National Standard Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms. ANSI S3.1-1999 R 2003 American National Standard Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms.


6. Listen to each frequency to be screened and be sure tone can be heard at 20 dB HL or below by someone with "normal" hearing. Check daily or more often as needed.
7. If screening cannot be conducted at 20 dB HL because of noise, DO NOT SCREEN.
B. SUGGESTIONS FOR MEETING SCREENING SITE CRITERIA
   1. If ambient noise exceeds the value provided in the above information the noise level will effectively mask the reference threshold level. This will cause pure-tone threshold levels to be inaccurate. Possible solutions to this problem include:
      a. Selection of an alternate screening site.
      b. Modification of the existing screening environment, including:
         • Covering floor with carpet.
         • Applying absorptive acoustical treatment to walls and ceiling.
         • Placing baffles in ventilation systems.
         • Positioning ballast for fluorescent lamps outside the test room.
      c. Use of a completely enclosed screening room, including:
         • Small single wall booth - thin walls, 1000 lb.
         • Single wall sound room - one 4” thick wall.
         • Double wall sound room - two isolated 4” thick walls.

   2. When selecting a screening site, avoid the following:
      a. Location near an air conditioning/heating unit.
      b. Interference of typewriter/printer, clock, pop machine, and copier noise. If possible, unplug any of these items prior to screening.
      c. Screening sites near a gymnasium, construction site, bathroom, lawn mowing, or where heavy traffic noise is heard.
      d. Interference of florescent lighting. If sunlight provides adequate lighting and the room lighting system is noisy, room lights may need to be turned off during screening.

C. AMBIENT NOISE LEVELS
   If each sound-pressure level is less than the level stated in the chart below, the ambient noise level should not interfere with pure-tone screening procedures. If there are concerns about ambient noise levels, analysis of the site should be conducted by someone experienced in noise measurement.
   1. Maximum Allowable Ambient Noise during Screening
      Maximum allowable sound-pressure levels in decibels for ambient noise during screening audiometry utilizing TDH-39 headsets encased in MX-41/AR cushions.
   2. Possible modifications to sites to solve noise problems. (See Section B in this appendix.)

### AUDIOMETER MAINTENANCE CHECK

<table>
<thead>
<tr>
<th>CHECK</th>
<th>PROBLEM</th>
<th>THE AUDIOMETER IS IN NEED OF REPAIR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press interrupter switch and elicit tone.</td>
<td>Click in earphone?</td>
<td>if a “click” is heard.</td>
</tr>
<tr>
<td>Present a 70 dB HL continuous tone through one phone.</td>
<td>Cross talk?</td>
<td>if the tone can be heard in the opposite phone.</td>
</tr>
<tr>
<td>Present a 2000 Hz tone at 90 dB HL, decrease intensity in 5-10 dB HL steps.</td>
<td>Linearity of attenuator (one ear)?</td>
<td>if the tones do not get steadily weaker.</td>
</tr>
<tr>
<td>Present 1000 Hz tone at 20, 15, 10, 5 dB HL.</td>
<td>Low intensity function of the attenuator (one ear)?</td>
<td>if the tone is not presented at the intensity levels expected.</td>
</tr>
<tr>
<td>Present a 50 dB HL continuous tone through each phone and run fingers over the length of entire cord.</td>
<td>Cords, connections to phones?</td>
<td>if static, crackling sound, or cutting off and on are heard.</td>
</tr>
<tr>
<td>Present a 60 dB HL continuous tone - run through octaves and half octaves.</td>
<td>Frequencies (one ear)?</td>
<td>if the frequencies do not sound like what is expected.</td>
</tr>
<tr>
<td>Switch signal from one phone to the other.</td>
<td>Signal equal in intensity (matched earphones)?</td>
<td>if the signals are not equal in intensity.</td>
</tr>
</tbody>
</table>
# HEARING SCREENING REPORT

Name: ____________________________________________  D.O.B.: __________________________

Location of Screening: ________________________________________________________________

## SWEEP FREQUENCY SCREENING

<table>
<thead>
<tr>
<th>Check (✓) One:</th>
<th>Pass</th>
<th>Rescreen</th>
<th>Date: __________________________</th>
<th>Screened by: ____________________</th>
</tr>
</thead>
</table>

## SWEEP FREQUENCY RESCREENING

<table>
<thead>
<tr>
<th>Check (✓) One:</th>
<th>Pass</th>
<th>Rescreen with threshold screen</th>
<th>Date: __________________________</th>
<th>Screened by: ____________________</th>
</tr>
</thead>
</table>

## THRESHOLD SCREENING

<table>
<thead>
<tr>
<th>RE</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
<th>6000 Hz</th>
<th>LE</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
<th>6000 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Check (✓) One:</th>
<th>Pass</th>
<th>Refer</th>
<th>Date: __________________________</th>
<th>Screened by: ____________________</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Does not meet referral criteria.</td>
<td>Rescreen in one year</td>
<td></td>
</tr>
</tbody>
</table>

## VISUAL INSPECTION

Does child have ventilation tubes?  Yes □  No □  Comment(s):

<table>
<thead>
<tr>
<th>If yes, indicate which ear(s)</th>
<th>Right □</th>
<th>Left □</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Check (✓) One:</th>
<th>Pass</th>
<th>Refer</th>
<th>Date: __________________________</th>
<th>Screened by: ____________________</th>
</tr>
</thead>
</table>

## TYMPANOMETRY SCREENING

<table>
<thead>
<tr>
<th>Physical Volume:</th>
<th>Compliance:</th>
<th>Tube Patent:</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Right Ear:</th>
<th>Yes □ No □ NA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Left Ear:</th>
<th>Yes □ No □ NA</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Check (✓) One:</th>
<th>Pass</th>
<th>Refer</th>
<th>Date: __________________________</th>
<th>Screened by: ____________________</th>
</tr>
</thead>
</table>

## RECOMMENDATIONS

Check (✓) One:

- Pass □ Rescreen in 2 to 4 weeks □ Medical Referral & Rescreen
- Medical & Audiological Referral □ Audiological Referral

Comment(s):

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

KSDE

43
HEARING HEALTH HISTORY

Children who have had many ear infections and periods of hearing loss are more likely to have language, vocabulary, and listening difficulties. Some history is beneficial for a more complete evaluation. Parent(s) or Guardian(s), please answer the following questions:

Child’s Name: ___________________________________________ Birthdate: ________________

Primary Care Physician: ____________________________________________

1. Did your child have any ear problems* before the age of 1?       YES   NO
2. Has your child ever had a draining ear? _______ ______
3. Approximately how many ear problems has your child had in life?
   0-2 □  3-5 □  6-10 □  10 or more □
4. Does your child tend to have 4 or more ear problems each year?   _______ ______
5. Has your child had an ear problem in the last 6 months?         _______ ______
6. Has your child ever had an ear problem that lasted 3 months or longer? _______ ______
7. Has anyone related to the child had many ear problems?          _______ ______
8. Has your child ever been seen by an ear specialist?
   If yes, what doctor? _____________________________________________
   Month/Year of last visit? ________________________________
9. Has your child ever had tubes placed in his/her eardrum?  _______ ______
   If yes, how many times? ___________________________________________
   At what age(s)? ________________________________________________
   Which ear? ____________________________________________________
10. Are you concerned about your child’s hearing?  _______ ______
11. Please mark all that apply to your child:
   chicken pox □  head injury □  meningitis □  episode of very high fever □
   other serious health condition, such as cancer □
   Please describe the condition:
   ___________________________________________________________________
   ___________________________________________________________________

* Ear problem= ear infection, earaches, draining from ears, medicine taken for ears, doctor noticed fluid behind the eardrum, hole in eardrum, etc.
# RISK INDICATORS CHECKLIST

**CHILD’S NAME:** __________________________________________ 

**DOB:** ________________

**PARENT’S NAME:** __________________________________________ 

**PHONE:** __________________

**ADDRESS:** ________________________________________________ 

**DATE:** ________________

**SCREENED BY:** ____________________________________________ 

---

**What was your child’s birth weight?**

- **Was child premature?**
  - **How many weeks?**

**Was the child's hearing screened as a newborn?**

- **Yes**
  - **No**
  - **Unknown**

**Results of the testing/screening:**

---

**Has your child’s hearing been tested or screened since birth?**

- **Yes**
  - **No**
  - **Unknown**

**Results of the testing/screening:**

---

**Name of child’s primary care physician:**

---

**Directions:** Mark an X in the appropriate column. **If an indicator exists but had been referred in a previous screening, note to whom the child was referred and note the follow-up recommendations.**

[N = indicator for infants birth through 28 days old who did not have newborn hearing screening; for children older than 28 days, answer all questions.]

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N. Do you have a concern about your child’s hearing, speech, language, or other development delay? List concerns:</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>N. As a newborn, did your child have an illness/condition requiring 48 hours or more in an NICU? Explain:</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N. Was child exposed to any of the following during mother’s pregnancy? Check (□) all that apply:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toxoplasmosis</td>
<td>Syphilis</td>
</tr>
<tr>
<td></td>
<td>Cytomegalovirus</td>
<td>Herpes</td>
</tr>
<tr>
<td>4</td>
<td>N. Does child have any abnormal features of the outer ear, ear canal, mouth, nose, neck, or head? Explain:</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>N. Have any of your child’s relatives had a permanent hearing loss before the age of 5? Explain:</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>N. Was your child diagnosed at birth as having a syndrome or condition known to include a sensorineural or conductive hearing loss or Eustachian Tube dysfunction? Explain:</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>N. Has your child been diagnosed as having any syndromes associated with progressive hearing loss such as Down, Usher, or Waardenburg; a neurodegenerative disorder, such as Hunter Syndrome; or sensorimotor neuropathies, such as Friedreich Ataxia or Charcot-Marie-Tooth Syndrome? Explain:</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>N. Has your child had bacterial meningitis (or other post-natal infections) associated with hearing loss? If yes, at what age? Hearing testing since then?</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>N. Has child ever had any head trauma? Explain:</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>N. As a newborn, did your child need an exchange transfusion because of hyperbilirubinemia, or have the need for mechanical ventilation, or conditions requiring ECMO? Explain:</td>
<td></td>
</tr>
</tbody>
</table>
| 11 | N. Has your child had otitis media with effusion that lasts for more than 3 months? Yes ___ No ___
  - If yes, were tubes placed? Yes ___ No ___ If yes, when? _________________________________
  - Are they in place now? Yes ___ No ___

**NOTE:** The presence of any risk indicator denotes need for screening every 6 months up to age 3, or as otherwise indicated by the audiologist.

Pass=All “NO” responses Refer=One or more “YES” response(s)

Check (√) One: Pass Refer If other, explain: ____________________________

---

KSDE 45
DEVELOPMENTAL SCALES FORM

Please check questions in the appropriate age category - use adjusted age (if appropriate).
Child's Chronological Age ______  Premature ______ months  Adjusted age ______

DOES YOUR CHILD:

YES  NO  Birth to 4 months
____  ____ startle or cry to loud noises?
____  ____ awaken to loud sounds?
____  ____ respond to a familiar voice?
____  ____ stop moving when a new sound is made?
____  ____ stop crying when talked to?

4 to 8 months
____  ____ stir or awaken when sleeping quietly and someone talks or makes a loud noise?
____  ____ try to turn head toward an interesting sound or when name is called?
____  ____ listen to a soft musical toy, bell, or rattle?
____  ____ cry when exposed to a sudden or loud sound?
____  ____ make several different babbling sounds?

8 to 12 months
____  ____ respond in some way to the direction “no”?
____  ____ react to name when called?
____  ____ turn head toward the side where a sound is coming from?
____  ____ stir or awaken when sleeping quietly and someone talks or makes a loud sound?
____  ____ try to imitate you if you make familiar sounds?
____  ____ use variety of different consonants and vowels when babbling (cononical babbling*)?

12 to 18 months
____  ____ say “mama” or “dada” and imitate many words you say?
____  ____ respond to requests such as “come here” and “do you want more?”
____  ____ turn head to look in the direction where the sound came from when an interesting sound is presented?
____  ____ wake up when there is a loud sound?

18 to 24 months
____  ____ try to sing?
____  ____ point to several different body parts?
____  ____ respond to simple commands, such as “put the ball in the box”?
____  ____ speak at least 20 words?
____  ____ request by name items, such as milk or cookies?

2 to 5 years
____  ____ point to a picture if you say “Where’s the ________________?”
____  ____ talk in short sentences?
____  ____ notice most sounds?
____  ____ listen to TV or radio at same loudness level as other family members?
____  ____ hear you when you call child’s name from another room?

(*Cononical babbling is defined as non-repetitive babbling using several consonant and vowel combinations, such as “itika,” “dabata,” or “omada.” It is quite different from common babbling, such as “dada,” “mama,” or “baba.”)

Pass=All “YES” responses or only one “NO” response  Refer=Two or more “NO” responses

Check (✓)One:  Pass  Refer  If other, explain:
## HEARING SCREENING REPORT - Birth through Two Years

**Child's Name:**

**Date of Birth:**

**Phone:**

**Parent's Name:**

**Address:**

**City/State/Zip:**

<table>
<thead>
<tr>
<th>Screen #1</th>
<th>Screen #2</th>
<th>Screen #3</th>
<th>Screen #4</th>
<th>Screen #5</th>
<th>Screen #6</th>
<th>Screen #7</th>
<th>Screen #8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Child:</td>
<td>Date of (Re)Screen:</td>
<td>Screened by:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1. Paper Screening (Circle One): Risk Indicators

- **Developmental Scales**
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer

### 2. Otoscopy (if >6 mo.) (Circle One):

- **Right Ear**
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer

- **Left Ear**
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer
  - Pass Refer

### 3. Tympanometry (if >6 mo.):

#### Right Ear:

- **Tympanogram:**
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat

- **Tube present:**
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No

- **Physical Volume (write in):**
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______

#### Left Ear:

- **Tympanogram:**
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat
  - Normal Flat

- **Tube present:**
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No
  - Yes No

- **Physical Volume (write in):**
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______
  - P.V. ______

### Referral:

- Passed*
- Passed*
- Passed*
- Passed*
- Passed*
- Passed*
- Passed*
- Passed*

### Physical Volume (write in):

<table>
<thead>
<tr>
<th>#1</th>
<th>Screened by:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#6</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#7</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#8</td>
<td>Screened by:</td>
<td>Date:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCREENING QUICK REFERENCE CARDS

Procedure for Sweep Frequency Screening
Children age 2 through age 8 or Grade 3
1. Set audiometer - Right ear - 1000 Hz - 40 dB HL (identification tone).
2. Reset to 20 dB HL - screening level.
3. Right ear - 1000, 2000, 4000 Hz; Left ear - 4000, 2000, 1000, 500 Hz*; Right ear-500, 1000 Hz.
4. Student must hear every tone at 20 dB HL to pass. If the student does not hear a tone, it may be repeated.
*When tympanometry screening is conducted, 500 Hz does not have to be screened.
Tympanometry screening is recommended for all children 6 months to age 5; optional for students above age 5.

Procedure for Sweep Frequency Screening
Age 9 and above (or Grade 4 and above)
1. Set audiometer - Right ear - 1000 Hz - 40 dB HL (identification tone).
2. Reset to 20 dB HL - screening level.
3. Right ear - 1000, 2000, 4000, 6000 Hz; Left ear - 6000, 4000, 2000, 1000 Hz (return to right ear).
4. Student must hear every tone at 20 dB HL to pass. If the student does not hear a tone, it may be repeated.

Procedure for Threshold Screening
1. Begin testing at 1000 Hz.
2. Present the tone at 40 dB HL.
3. If the tone is not heard, increase the intensity in 20 dB steps. Do not present past 80 dB HL.
4. If the tone is heard, decrease the tone in increments of 10 dB below initial response until no response.
5. Continue to increase in 5 dB increments and decrease in 10 dB increments until the faintest signal that can be heard at least 50% of the time has been identified.
6. Record the threshold.
7. Test 1000, 2000, 4000, 6000, and 500 Hz in each ear. Complete one ear before proceeding to the other ear.

Referrals
A. Referrals should be made from the threshold audiogram.
B. Refer when:
   1. There is a loss of 25 dB HL or greater at 500, 1000, or 2000 Hz in either ear.
   2. There is a loss of 35 dB HL or greater at 4000 or 6000 Hz in either ear.
### What test to use (suggested)

<table>
<thead>
<tr>
<th>Under 6 months</th>
<th>Age 6 months to 2 Years</th>
<th>Age 2 - 5 (not in kindergarten)</th>
<th>Age 5 and Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Screening</td>
<td>Visual Inspection</td>
<td>Visual Inspection</td>
<td>Visual Inspection</td>
</tr>
<tr>
<td>Paper Screening – The Risk Indicators Checklist &amp; The Developmental Scales Form</td>
<td>Tympanometry</td>
<td>Tympanometry (optional, recommended for children through age 8 or Grade 3)</td>
<td>Tympanometry</td>
</tr>
<tr>
<td>Tympanometry</td>
<td>Sweep Frequency Screening (using play audiometry if necessary)</td>
<td>Threshold Screening with play audiometry for those who fail sweep screening</td>
<td>Sweep Frequency Screening</td>
</tr>
<tr>
<td>Play Audiometry (if child can be successfully conditioned)</td>
<td>Paper Screening with <em>Developmental Scales and The Hearing Health History</em> (if unable to complete sweep frequency screening)</td>
<td>Paper Screening with <em>Developmental Scales and The Hearing Health History</em> (if unable to complete sweep frequency screening)</td>
<td>Threshold Screening for those who fail sweep frequency screening</td>
</tr>
</tbody>
</table>

### Tympanometry

<table>
<thead>
<tr>
<th>Volume</th>
<th>Compliance (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.3 ml</td>
<td>&lt;0.2 ml</td>
</tr>
<tr>
<td>0.3 to 2.0 ml</td>
<td>0.2 to 1.8 ml</td>
</tr>
<tr>
<td>&gt;2.0 ml</td>
<td>&gt;1.8 ml</td>
</tr>
</tbody>
</table>

### Referral Criteria Based on Otoscopy, Sweep Frequency Screening, and Tympanometry

<table>
<thead>
<tr>
<th>Otoscopy</th>
<th>Pure-tone hearing</th>
<th>Tympanometry</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass</td>
<td>Pass</td>
<td>Pass</td>
<td>Routine screening or as concerns arise</td>
</tr>
<tr>
<td>Pass</td>
<td>Pass</td>
<td>Abnormal</td>
<td>Rule out: PE tubes, perforation, equipment errors. Repeat tympanogram in 2-4 weeks and if failed refer to physician. Repeat hearing test if tympanogram is normal at rescreen. Follow annually if hearing remains normal.</td>
</tr>
<tr>
<td>Refer</td>
<td>Pass or Rescreen/Refer</td>
<td>Normal or Abnormal</td>
<td>Refer to physician. Rescreen in 2-4 weeks.</td>
</tr>
<tr>
<td>Pass</td>
<td>Rescreen/Refer</td>
<td>Abnormal</td>
<td>Repeat hearing test and tympanogram in 2 weeks; if both are failed, refer to physician and audiologist.</td>
</tr>
<tr>
<td>Pass</td>
<td>Refer</td>
<td>Normal</td>
<td>Refer to audiologist.</td>
</tr>
</tbody>
</table>
NOTES:
1. Right ear threshold marking=0
   Left ear threshold marking=X
   No Response=NR
2. REFERRAL CRITERIA:
   - At 500, 1000, or 2000 Hz - one or more thresholds
     at or poorer than 25 dB HL
   - At 4000 and 6000 Hz - one or more thresholds at or poorer
     than 35 dB HL
3. A total of 10 threshold markings should appear on a completed audiogram.
   Connect left and right ear threshold markings.
4. Be sure to sign and date the audiogram. Determine referral.
PURE-TONE THRESHOLD SCREENING WORKSHEET

Case 1 - Right ear at 1000 Hz

<table>
<thead>
<tr>
<th>Presentation Level</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 40 dB HL</td>
<td>R (response)</td>
</tr>
<tr>
<td>2. 30 dB HL</td>
<td>R</td>
</tr>
<tr>
<td>3. 20 dB HL</td>
<td>NR (no response)</td>
</tr>
<tr>
<td>4. 25 dB HL</td>
<td>R</td>
</tr>
<tr>
<td>5. 15 dB HL</td>
<td>NR</td>
</tr>
<tr>
<td>6.</td>
<td>NR</td>
</tr>
<tr>
<td>7.</td>
<td>R</td>
</tr>
<tr>
<td>8.</td>
<td>NR</td>
</tr>
<tr>
<td>9.</td>
<td>NR</td>
</tr>
<tr>
<td>10.</td>
<td>R</td>
</tr>
</tbody>
</table>

What is the threshold? 
Mark the audiogram.

Case 2 - Left ear at 4000 Hz

<table>
<thead>
<tr>
<th>Presentation Level</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 40 dB HL</td>
<td>R</td>
</tr>
<tr>
<td>2. 30 dB HL</td>
<td>R</td>
</tr>
<tr>
<td>3. 20 dB HL</td>
<td>R</td>
</tr>
<tr>
<td>4. 15 dB HL</td>
<td>NR</td>
</tr>
<tr>
<td>5. 15 dB HL</td>
<td>NR</td>
</tr>
<tr>
<td>6.</td>
<td>NR</td>
</tr>
<tr>
<td>7.</td>
<td>R</td>
</tr>
<tr>
<td>8.</td>
<td>NR</td>
</tr>
<tr>
<td>9.</td>
<td>NR</td>
</tr>
<tr>
<td>10.</td>
<td>R</td>
</tr>
</tbody>
</table>

What is the threshold? 
Mark the audiogram.

Case 3 - Right ear at 4000 Hz

<table>
<thead>
<tr>
<th>Presentation Level</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 40 dB HL</td>
<td>NR</td>
</tr>
<tr>
<td>2.</td>
<td>NR</td>
</tr>
<tr>
<td>3.</td>
<td>R</td>
</tr>
<tr>
<td>4.</td>
<td>R</td>
</tr>
<tr>
<td>5.</td>
<td>NR</td>
</tr>
<tr>
<td>6.</td>
<td>NR</td>
</tr>
<tr>
<td>7.</td>
<td>R</td>
</tr>
<tr>
<td>8.</td>
<td>NR</td>
</tr>
<tr>
<td>9.</td>
<td>NR</td>
</tr>
<tr>
<td>10.</td>
<td>NR</td>
</tr>
<tr>
<td>11.</td>
<td>NR</td>
</tr>
<tr>
<td>12.</td>
<td>R</td>
</tr>
<tr>
<td>13.</td>
<td>NR</td>
</tr>
<tr>
<td>14.</td>
<td>R</td>
</tr>
<tr>
<td>15.</td>
<td>NR</td>
</tr>
<tr>
<td>16.</td>
<td>NR</td>
</tr>
<tr>
<td>17.</td>
<td>R</td>
</tr>
</tbody>
</table>

What is the threshold? 
Mark the audiogram.

PURE-TONE AUDIOGRAM
Frequency in Hertz (Hz)

X=Left Ear  O=Right Ear
# EFFECT OF DEGREE OF HEARING LOSS ON UNDERSTANDING OF LANGUAGE AND SPEECH

<table>
<thead>
<tr>
<th>DEGREE OF HEARING LOSS (PURE-TONE AVERAGE)</th>
<th>EFFECT ON UNDERSTANDING LANGUAGE AND SPEECH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Hearing 0-15 dB HL (children)</td>
<td></td>
</tr>
<tr>
<td>Slight Loss 15-25 dB HL</td>
<td>May have trouble hearing faint or distant speech.</td>
</tr>
<tr>
<td>Mild Loss 25-40 dB HL</td>
<td></td>
</tr>
<tr>
<td>Moderate Loss 40-55 dB HL</td>
<td>Speech must be loud to be understood; will have increasing difficulty in group discussions; speech likely to be affected. Language usage and comprehension difficulties. Vocabulary limitations.</td>
</tr>
<tr>
<td>Moderately Severe Loss 55-70 dB HL</td>
<td></td>
</tr>
<tr>
<td>Severe Loss 70-90 dB HL</td>
<td>May be able to hear loud voice about one foot from ear, may be able to identify environmental sounds. May be able to discriminate vowels but not consonants. Speech and language will be affected and will not develop spontaneously if hearing loss is present before 12 months of age unless amplification is provided.</td>
</tr>
<tr>
<td>Profound Loss 90 dB HL</td>
<td>May be able to hear loud sounds but may be more aware of vibrations than of tonal patterns. May rely on vision rather than hearing as the primary sensory channel for communication; speech and language will not develop spontaneously if hearing loss is present before one year of age unless amplification is provided.</td>
</tr>
</tbody>
</table>
AUDIOGRAM OF FAMILIAR SOUNDS

FREQUENCY IN CYCLES PER SECOND (Hz)

HEARING LEVEL IN DECIBELS (dB)

Adapted from “Hearing in Children” by Northe and

Cronin-Wilson & Wilson 2011


TYMPANOGRAM EXAMPLES

NORMAL TYMPANOMETRY VALUES
Compliance 0.2 to 1.8 ml
Volume 0.3 to 2.0 ml

NORMAL TYMPANOGRAM (Type A)
Compliance 0.4 ml
Pressure -10 daPa
Volume 1.3 ml

ABNORMAL TYMPANOGRAM - possible otitis media or fluid in the ears (Type B)
Compliance 0.1 ml
Pressure NO PEAK
Volume 0.6 ml

ABNORMAL TYMPANOGRAM - possible Eustachian Tube dysfunction, incipient or resolving otitis media (Type C)
Compliance 0.5 ml
Pressure -250 daPa
Volume 0.5 ml

ABNORMAL TYMPANOGRAM - possible wax impaction or probe tip against ear canal wall (invalid screen) (Type B)
Compliance 0.0 ml
Pressure No Peak
Volume 0.2 ml
Tympanogram Examples (cont.)

ABNORMAL TYPANOGRAM - stiff middle ear, thickened tympanic membrane, scarred tympanic membrane, or otosclerosis
(Type As)

Compliance 0.1 ml  
Pressure 10 daPa  
Volume 1.6 ml

ABNORMAL TYPANOGRAM - flaccid tympanic membrane or ossicular disarticulation
(Type Ad)

Compliance 1.85 ml  
Pressure -10  
Volume 1.4 ml

ABNORMAL TYPANOGRAM - perforated tympanic membrane, tube in tympanic membrane and open

Compliance 0.2 ml  
Pressure no peak  
Volume 5.0 ml

ABNORMAL TYPANOGRAM - tube in place but occluded, middle ear status is normal at this time

Compliance 0.4 ml  
Pressure 0 daPa  
Volume 1.3 ml

Infant-Toddler Hearing Screening Flowchart

**Birth through 6 Months**
Chronological Age (CA)

1. Child Data
   - Refer
   - Paper Screen
     - Pass
     - Refer
     - Annual Hearing Screen
     - Audiological Referral

**6 Months to 2½ Years**

**Initial Screening**

1. Child Data
   - Refer
   - Paper Screen
     - Pass
     - Refer
     - Otoscopy
       - Pass
       - Medical Referral
         - Rescreen 2-4 weeks
         - Refer
         - Tympanometry
           - Pass
           - Annual Hearing Screen
           - Yes
           - History of OM?
             - No
             - No
               - Rescreen 2-4 weeks
               - Medical and Audiological Referral
             - Yes
               - Yes
                 - Receives Routine Medical Management of OM?
                   - No
                     - Medical and Audiological Referral
                   - Yes
                     - Medical Referral Rescreen 2-4 weeks

**Rescreening**

1. Child Data
   - Refer
   - Otoscopy
     - Pass
     - Refer
     - Tympanometry
       - Pass
       - Annual Hearing Screen
Diagram of the Ear

KSDE

(KSDE 2004, January). Diagram of the ear. Topeka: Kansas State Department of Education
This is to document that ________________________________, SSN: _______________, has satisfied the requirements of the Kansas State Department of Education, Kansas Department of Health and Environment, and the certified audiologist whose name appears on this document for approval as a Level 1 Hearing Screening Technician. The above named person is qualified to perform pure-tone air conduction sweep screening, threshold screening, visual inspection, and play audiometry as outlined in KSA 1969 Supplement 72-1204-1207 and qualifies the employing agency as meeting state requirements in compliance with said law.

This approval is valid from __________ until __________.
(month/day/year) (month/day/year) (Name), Audiologist

Renewal of Level 1 initial training is required every two years.
This is to document that ____________________________, SSN ____________, has satisfied the requirements of the Kansas State Department of Education, Kansas Department of Health and Environment, and the certified audiologist whose name appears on this document for approval as a Level 2 Hearing Screening Technician. The above named person is qualified to perform visual inspection, pure-tone sweep frequency screening, threshold screening, play audiometry; and Level 2 tympanometry and an infant-toddler paper screening as outlined in KSA 1969 Supplement 72-1204-1207 and qualifies the employing agency as meeting state requirements in compliance with said law.

This approval is valid from ____________ until ____________.
(month/day/year) (month/day/year) ____________________________
(Name), Audiologist

Renewal of Level 2 initial training is required every two years.
<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Level of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please Print or Type**

- Complete Address
- Street
- City
- Zip
- Phone Number (Daytime)
- Social Security Number
- Expiration Date
- Hearing Screening Technician Registry