



Kansas

Guidelines for Hearing Screening (Birth-21)

Kansas Department of Health & Environment
Kansas State Department of Education

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Introduction

In the most general terms, the ultimate goal of any screening program is to change the natural outcome of a condition by creating an opportunity to remediate any negative effects through early identification. According to the World Health Organization (WHO), screening is performed for conditions having serious consequences, with a reliable method for testing, and must offer a scientifically supported, effective treatment when detected early (Wilson & Jugner, 1968). Screening for hearing loss across the age span meets these criteria. Therefore, the Kansas State Department of Education (KSDE) and the Kansas Department of Health and Environment (KDHE) collaborated to develop hearing screening procedures for children aged birth through 21. The purpose of this collaboration is to provide a statewide standard for hearing screening, as part of legislated child find activities, across State-level entities where children receive medical and educational services and supports. Based on the needs of diverse communities across Kansas, a goal of statewide standards is to provide multiple layers of support across our medical and educational providers to capture as many children with hearing loss as possible. Multiple layers of support for child find activities begin with Universal Newborn Hearing Screening (UNHS) and Early Hearing Detection and Intervention (EHDI) programs which overlap with the Early Intervention (birth to three services) or Part C services of the Individuals with Disabilities Education Act (IDEA) 2004 and continue through school-aged (3 through 21 years of age) or Part B services covering preschool, elementary, and secondary educational programs. **Accounting for the needs and resources of diverse communities across Kansas and the multiple layers of support for hearing screening, these Guidelines for Hearing Screening (Birth – 21) are designed to be specific enough to clearly state the requirements across the age span while general enough to offer the flexibility for application across diverse settings.**

Continued hearing screening across the age span is essential in successful child find programs that seek to remediate or remove significant barriers to child development and student learning. We know that hearing loss is the most prevalent developmental disorder present at birth (White, 1997) AND early identification and intervention works (Yoshinaga-Itano, 1999; Yoshinaga-Itano, C., Coulter, D., & Thompson, V, 2001). We also know, due to injury, illness, or genetics, children who pass hearing screening at birth may be at risk for hearing loss that is progressive, transient, or acquired after newborn hearing screening occurs. It is estimated that by school age, the incidence of permanent sensorineural hearing loss more than doubles from the newborn period to approximately 9 to 10 per 1,000 (Bamford et.al., 2007, White, 2010) in the school-aged population. In addition, transient hearing loss as a result of ear infection affect up to 90% of children prior to entering school and continue to present educationally significant transient hearing loss for approximately 25% of school aged children (Tos, 1984; Lous and Fiellau-Nikolajsen, 1981). Finally, unsafe listening practices during recreational activities, including use of personal audio devices, place our adolescent population increasingly at risk for noise induced hearing loss (NAHIC, 2014). All told, unidentified and late-identified educationally significant hearing loss results in increased education costs to our system (CDC, 2004-2006) as well as increased lifelong medical costs, lower wages, and negative psychosocial effects for individuals with hearing loss (Holden-Pitt & Diaz, 1998; Ruben, 2000).

Hearing may be screened at various screening sites, such as:

- Birthing Facilities
- Schools
- Local Health Departments
- Community Sites
- Medical Facilities
- Clinically Certified Audiologists

Many Kansas early childhood programs routinely screen hearing, including:

- tiny-k Services [Part C of the Individuals with Disabilities Education Improvement Act (IDEA)]
- Head Start Programs
- Parents as Teachers
- Child Health Assessments/Kan Be Healthy
- Community Child Find Strategies
- Special Education
- General Education

Kansas Hearing Screening Goals

The goals of a hearing screening program are:

- Early detection and identification of hearing loss in children.
- Access to professional care for all children suspected of having a hearing loss, regardless of financial limitations.
- Education for children and their parents/caregivers about the sources and consequences of dangerous sounds, as well as how to protect themselves from dangerous sounds. The activities of a school hearing screening program that are necessary to accomplish the goals as listed above are:
 - Perform hearing screenings according to state guidelines.
 - Notify parent/caregiver prior to child's hearing screening.
 - Notify parent/caregiver of the child's hearing screening results and the need for further medical/audiological examination; if necessary.
 - Provide referral assistance to hearing professionals.
 - Follow-up with parent/caregiver to make sure the child has received medical/audiological examination.
 - Inform educational staff of the student's hearing status following a comprehensive examination.

State and Federal Laws Pertaining to Hearing Screening

KSA 65-1,157a, every child born in the state of Kansas, within five days of birth, unless a different time period is medically indicated, shall be given a screening examination for detection of hearing loss. The screening shall be conducted in accordance with accepted medical practices and in the manner prescribed by the secretary of health and environment.

K.S.A. 72-6228-6231, every pupil enrolled in a school district, or an accredited nonpublic school shall be provided basic hearing screening without charge during the first year of admission and not less than once every three years thereafter. In addition, [K.S.A. 72-6229(d)] makes clear all tests shall be performed by a person competent in the use of a calibrated audiometer and who has been designated by the board of education which provides the basic hearing screening. [K.A.R. 91-40-7 (b)(1) and K.A.R. 91-40-7(b)(2)] are the state regulations that relate to child find activities, which include hearing and vision screenings conducted in schools. This applies to students from birth through age 21.

Head Start Program Performance Standards Child Health Status and Care, 45 CFR § 1302.42, within 45 days after the child first attends the program or, for the home-based program option, receives a home visit, a program must either obtain or perform evidence-based hearing screenings.

Individuals with Disabilities Education Act (IDEA) 2004, 20 U.S.C. §1412(a)(3), 34 CFR § 300.301(a), 20 U.S.C. §1435 (a)(5) require school districts to identify, locate, and evaluate all children with disabilities and states that "each public agency must conduct a full and individual initial evaluation" to identify a disability and subsequent eligibility for special education services. In addition, IDEA 2004, requires states to have a comprehensive child find system that ensures rigorous standards for appropriately identifying infants and toddlers with disabilities that will reduce the need for future services.

Recommended Hearing Screening Procedures

Screening Methods

Visual Ear Inspection

The purpose is to check for signs of ear disease or abnormal development. An inspection examines the external canal, surrounding tissue, ear canal, and tympanic membrane.

Equipment

Internal inspection: Otoscope*

Procedure

External: Inspect the pinna and the area around it for any abnormalities such as preauricular sinuses, skin tags, or atresia; check for position (set or tilt) of the ears, tenderness, redness or edema, signs of drainage, foul odor, wax build-up in the outer ear canal, or dermatitis.

Internal: With the otoscope, inspect the ear canal and tympanic membrane for signs of drainage, wax buildup, foreign bodies, redness of the ear canal, and other abnormalities; note presence or absence of normal tympanic membrane landmarks.

Referral Criteria:

PASS

Children with normal appearance of all structures and no complaints of pain in the pinna or the tissue around the ear do not require referral.

REFER

Refer children with any abnormality to a medical provider. Do not proceed with audiometer screening if tenderness, signs of drainage, or foul odor is present; this should be an automatic referral.

*If the screener has training and experience in using an otoscope. If the screener lacks training and experience in using an otoscope, the visual inspection should be limited to the external aspect of the ears.

The screener shall note on the hearing screening form any reported symptoms such as:

- Not hearing well.
- Better hearing in one ear.
- Ear pain or tenderness.

Direct observation of the following:

- Discharge from a child's ear canal.
- Complaining of ear pain/discomfort.
- Soreness or tenderness in or about the ears.
- Foul odor from ear.

Paper Screening

Providers may use a paper hearing screening to identify children who may need further hearing testing. These forms identify a child's risk factors for hearing loss, monitor speech and auditory developmental milestones, and help discover caregiver concerns. Paper screening forms are found in the [Appendices](#).

Referral Criteria:

PASS

Children for whom no risk factors for hearing loss are identified do not require referral.

REFER

Children who pass their newborn hearing screen but have a risk factor for hearing loss should be referred to an audiologist (ideally one specializing in pediatrics) for at least one diagnostic audiology assessment by age 24 to 30 months or as soon as a concern is identified. Infants and children with specific risk factors, such as those who received ECMO therapy and those with CMV infection, have a higher risk of delayed onset or progressive hearing loss and require ongoing monitoring by an audiologist as soon as a concern is identified.

Automated Auditory Brainstem Response

Ages: Infant

Overview: Automated ABR is an electrophysiological measure of the auditory system's response to sound. A soft (low level) click is presented to the ear through an earphone. Surface electrodes, placed on the infant's head, record the response as the signal travels from the ear through the auditory nervous system to the brain. It is recommended that the screening level be 35 dB nHL or softer.

Automated ABR (AABR) is fully automated and elicits a pass/refer result. An audiologist is not required for interpretation of these screening results; trained hospital personnel (e.g., nurses, hospital technicians, support staff) can perform the AABR screening.

Equipment: AABR hearing screener; approximate cost \$20,000; requires annual calibration.

Procedure: Place electrodes on patient's head and place headphones on patient's ears as instructed in equipment manual. Check impedance levels and begin testing.

Referral criteria:

PASS

Equipment reads "PASS" for both ears.

REFER

Refer if either ear displays a "REFER" result; refer if unable to screen due to excessive noise, movement or inability to complete testing.

Helpful tips:

- Conduct the AABR in a quiet environment.
- Infant should be sleeping or very calm. Immediately after feeding is a good time to test.
- Swaddle the infant to minimize startling movements.
- Minimize electrical interference by unplugging other devices nearby.
- Use a pacifier to calm the infant, if necessary, but the sucking motion can also cause myogenic interference, so use pacifiers sparingly.

Otoacoustic Emissions (OAE)

Ages: 0 to 5; appropriate for older students unable to perform pure tone screening

Overview: Otoacoustic emission screening (OAEs) are performed on newborns and children who cannot be conditioned for pure tone testing. OAEs are low-intensity sounds produced by normal, healthy ears. These sounds are produced either spontaneously or in response to an acoustic signal. The OAE originates in the inner ear (cochlea) from the outer hair cells in the cochlea. The response also requires normal or near-normal middle ear functioning. A small probe (foam or rubber) is placed in the child's ear. A soft sound is presented, and the ear produces an emission or echo response. This response is measured with a small microphone that is in the probe.

Otoacoustic emissions (OAE) hearing screening has been approved as an alternative test for students who are unable to complete a pure-tone screening either due to young age or physical or developmental challenges. OAE testing is not a substitute for pure-tone screening for other students. It is important to document why the child was not tested with pure-tone screening. OAEs are approved as an optional test procedure. They are not required. Some school districts with large preschool and/or special education populations may want to consider utilizing OAE testing.

Equipment: Automated DPOAE or TEOAE screening device; approximate cost \$3400-4000; requires disposable probe tips; requires annual calibration.

Procedure:

1. Select the appropriate environment.
 - a. Choose a time and setting comfortable to the child and where movement by the child will be minimal. If doing other health screenings, conduct OAE screening first.
 - b. Reduce noise from external (loud talking, toys, fans, etc.) and internal (sounds from child being screened such as talking, laughing, etc.) sources as much as possible for faster and easier screening.
2. Visually inspect the outer ear to make sure there are no obvious signs of infection, blockage or physical anomaly.
3. After noting the size of the ear canal opening, select a probe tip that will fit snugly in the child's ear.
4. Place probe in the child's ear canal. The probe delivers a low-volume sound into the ear. In approximately 30 seconds, the result is displayed on the computer screen.
5. Read the results on the screen (Pass or Refer).

Referral Criteria: Pass/Refer criteria on OAE screening differs among manufacturers based on test protocol and normative data. Use the manufacturer's default pass/refer criteria specific to the equipment used.

PASS

Equipment reads "PASS" for both ears.

REFER

Refer if either ear displays a "REFER" result; refer if unable to screen due to excessive noise, movement or inability to place probe.

Helpful Tips:

- Check the equipment, including all cords, at the beginning of each screening day either by screening your own ear or using the equipment's probe calibration check procedure. Discontinue if any problems are found.
- Engage the child in a quiet distraction such as a visually interesting toy or elicit help from another adult to keep the child still, quiet, and hands away from their ears. Try to create a fun feeling if possible.
- If the child is afraid or unsure of the probe, familiarize by gently touching it to the child's arm, hand or cheek to point out how soft it is. Have the child "help" screen a doll or stuffed animal.
- Do not hold the probe in the ear canal for an extended period of time as that increases the potential for high noise level or movement.
- Screener may screen a sleeping child during nap time.

Pure Tone Screening

Ages: 5+; appropriate for younger students who can be reliably conditioned to respond

Overview: Pure tone signals are presented across different frequencies, and responses to the signals typically include a hand raise or a conditioned response such as dropping a block in a bucket.

Equipment: Pure tone audiometer; approximate cost: \$1000; requires annual calibration; cleaning cloths for headphones are recommended.

Procedure:

1. Select an appropriate environment.
 - a. Choose a quiet setting; evaluate your test environment during normal hours so concerns can be identified; test away from halls, windows, cafeterias, gyms, HVAC equipment, bathrooms, and play areas; limit visual distractions.
 - b. Consider checking noise level with a sound level meter (SLM) or SLM smartphone app.
 - c. DO NOT PROCEED with screening if noise levels are too loud (greater than 50dBA).
2. Visually inspect the outer ear; remove glasses or headbands; tuck hair or headscarf behind ears.
3. Instruct or condition the child.
4. Place headphones; red headphone on right ear, blue headphone on left ear.
5. Perform age-appropriate pure tone sweep at 20 decibels (dB) at the recommended frequencies. (Speech stimuli are not recommended for use.)
6. Present a tone (approximately 3 seconds long) more than once but no more than 4 times.
7. Lack of responses at any frequency in either ear constitutes a failure.

Helpful Tips:

- Perform a daily listening and visual check of the audiometer; inspect the headphones, cords and buttons; listen for noise while pressing buttons; ensure screening tones can be heard; if any problem is found, discontinue screening.
- Use conditioned play techniques with younger children who need more concrete response options (drop a block in the bucket or put a peg in the pegboard when sound is heard).
- Use of warble tone stimulus (instead of steady pure tone stimulus) is acceptable and may be helpful in certain situations.
- Repositioning the headphones may be necessary in some individuals.

Referral Criteria:

PASS

The child responds at each frequency at the screening level.

REFER

Refer if the child fails to respond to one or more tones presented.

Tympanometry

Ages: Any age, but particularly useful in early childhood (not appropriate for infants under 6 months)

Overview: Not a test of hearing. Used to screen outer and middle ear functions (ear canal, eardrum, bones of middle ear and Eustachian tube) and helps delineate referral for a medical evaluation versus an audiology evaluation. Should be used after OAE or pure tone referral as an optional second-stage screening.

Equipment: Automated tympanometer; approximate cost \$4000; requires disposable probe tips; requires annual calibration; some combined into device with audiometer.

Procedure:

1. Conduct a visual inspection.
2. Select the appropriate size probe tip.
3. Place against the ear canal and hold steady to maintain seal.
4. Review and interpret results based on type of equipment.
 - a. Automated equipment will report “pass” or “refer”
 - b. Non-automated equipment refer criteria: >250 daPa tympanometric width for children 3–12 years of age and >275 da Pa tympanometric width for children below age 3. If the use of tympanometric width is not possible, <0.2 mmhos static compliance is recommended (AAA, 2011).

Helpful Tips:

- Check calibration of machine daily, inspect all cords, and discontinue if problems are found.
- Use tympanometry as an immediate “next step” screening following failure of pure tone or OAE screening to help clarify the nature of the failure and most efficient referral protocol.
- Repeat the screening if a flat tympanogram (no observable peak on graph) is obtained.
- A flat tympanogram in conjunction with ear canal volume greater than 1.0 cm³ can indicate patent pressure equalizer (PE) tubes or perforated eardrum.
- A flat tympanogram with a small ear canal volume (less than 0.4 cm³) may indicate occlusion of the ear canal, possibly due to cerumen (earwax) build-up.
- An airtight seal may not be obtained in the presence of PE tubes or a perforated eardrum; do not keep trying to obtain the seal.
- Tympanometry screening may be most appropriately performed by audiologist during rescreening, especially for public school screening programs.
- Referrals should not be made on failed tympanometry screening alone.

Referral Criteria:

A refer on OAE or pure tone screening PLUS a referral on tympanometry screening warrants medical referral and/or rescreening in 6-8 weeks (depending upon specific program referral protocol).

State Hearing Screening Programs

Universal Newborn Hearing Screening

Overview: Early Hearing Detection and Intervention (EHDI) refers to the practice of screening every newborn for hearing loss prior to hospital discharge. Infants not passing the screening receive diagnostic evaluation before three months of age and, upon diagnosis, are enrolled in early intervention programs by six months of age.

Trained personnel at each medical care facility shall provide an initial hearing screening using ABR, AABR, and OAE, in combination or alone. Infants with a well-nursery status born in a birthing facility shall be screened for hearing prior to hospital discharge. Infants in the Neonatal Intensive Care Unit shall be screened when medically able, prior to hospital discharge. Infants born outside of a hospital setting or by a birthing attendant shall be screened for hearing loss within one month of age.

Universal newborn hearing screening makes a difference for all children and their families, and information about hearing and typical hearing milestones is valuable for all parents in the care of their child. Newborn hearing screening allows us to successfully screen for potential hearing loss in infants within the first 24 hours of life. Each screening method takes about five minutes per ear and is done while the infant sleeps. When the infant does not pass hearing screening, follow-up takes place after discharge from the hospital and includes testing to confirm hearing loss, determine the degree of hearing loss, and complete other audiologic procedures (JCIH, 2019; AAP, 2007).

I. ESSENTIAL REQUIREMENTS

All newborns in Kansas shall have their hearing screened before one month of age, preferably prior to discharge from the birthing facility. The birthing facility is the most efficient and cost-effective environment for newborn hearing screening. Audiologists can train and direct other health care personnel in the implementation of a newborn hearing screening program.

II. TRAINING AND CERTIFICATION

Support personnel are individuals who are selected and trained to operate devices used to screen the hearing of newborns. Support personnel may include nurses, audiology assistants, technicians, health care assistants, other allied health personnel, and other persons specifically trained to screen newborns for hearing loss. The roles of the support personnel should be clearly defined.

A formal training program for support personnel should be in place under the direction of the supervising/consulting audiologist or qualified physician. The content of the training program should exceed basic instruction in the operation of the screening equipment and should address all aspects of screening responsibilities. Specific competency-based training through formal instruction and supervised practice should be included. Individual observation/assessment to determine the ability of the support person to perform duties associated with newborn hearing screening safely and competently should be completed with documentation. Personnel should have ongoing assessment of proficiency and retraining as needed.

III. SCREENING METHODS AND FOLLOW UP

- A. [Automated ABR \(AABR\)](#) - REQUIRED FOR INFANTS IN NICU (JCIH, 2019; KSA 65-1,157a)
- B. Auditory Brainstem Response (ABR)
- C. [Otoacoustic Emissions \(OAE\)](#)

IV. NEWBORN HEARING SCREENING PROTOCOLS

It is essential that there be formal hearing screening protocols that are followed closely. Formal protocols will usually be in policy format for the hospital. The purpose of any screening program is to identify the population that needs to have more in-depth (diagnostic) testing. The screening protocol(s) that will be used in any given hospital will vary according to the screening equipment and personnel doing the screening. A two-step screening process (a second hearing screening for infants who do not pass the first birth admission screening) prior to hospital discharge is recommended. This two-step process is considered “the initial hearing screening.” The purpose of the second screening prior to hospital discharge is to reduce the overall referral rate for follow-up testing.

A. Informed Consent

Most hospitals ask that blanket consent for treatment be signed at admission. This type of consent includes the newborn hearing screening. It is important that parents are given information in advance (e.g., in preadmission packet, at prenatal classes, in admission packet) about the hearing screening process. KSA 65-1,157a states that if parents object to the screening, their child is exempt from the screening. A birthing facility should have a standardized form available for the parents to sign if consent for hearing screening is not given; the signed form should be retained by the hospital as a medical record for that infant and sent to the KDHE-EHDI.

B. Initial Hearing Screening (Prior to Hospital Discharge) Stage One

- i. Screen all infants if medically able.
- ii. Notify the infant’s primary care physician of the infant’s hearing screening results (both pass and did not pass/refer results) based on facility protocol.
- iii. Give all parents information about their child’s hearing screening results and the role of hearing in the infant’s development.
- iv. If the infant needs to be referred for further testing, give parents information about the importance of an outpatient hearing screening, and, with permission of the family, the hospital may assist the family and the primary care physician with scheduling the outpatient screening appointment.
- v. Report all initial hearing screening results to KDHE-EHDI program via electronic birth certificate.

NICU/Medically Fragile Infants

Infants who are transferred immediately after birth to the NICU at another hospital generally will not have completed hearing screening prior to hospital transfer. It is the responsibility of the facility that releases the infant to the home to ensure that the initial and/or outpatient hearing screening has been completed and that the results are reported to KDHE. Specific NICU hearing screening protocols should be developed outlining use of AABR at each facility. Infants who are transferred from one facility to another may have more than one hearing screening due to the changing health status of the infant.

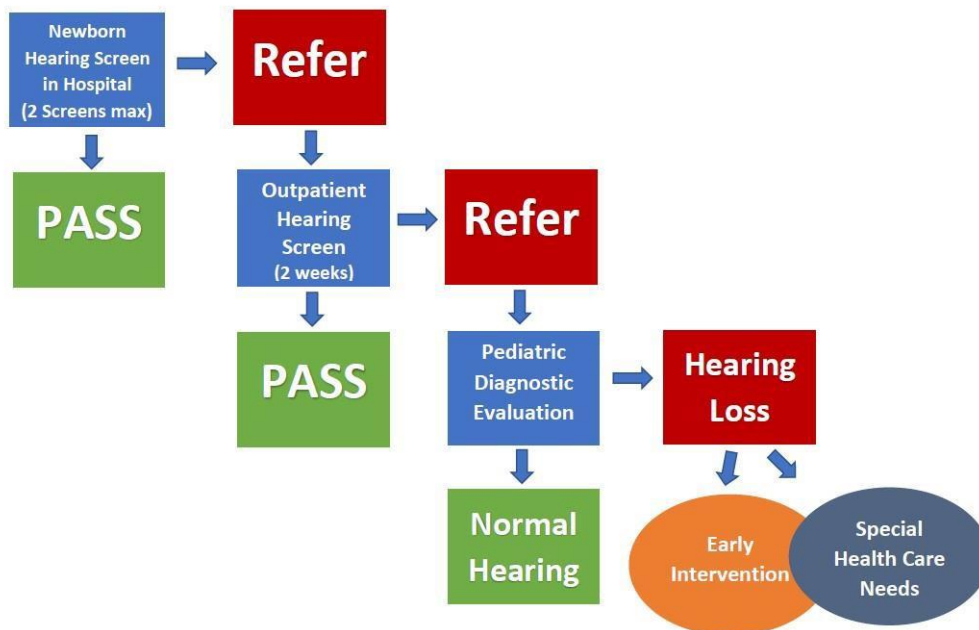
C. Outpatient Screening Stage Two

- i. The outpatient screening should be completed no later than one month of age.
- ii. Outpatient screening may take place at the birthing facility, an outpatient clinic/physician's office, or community organizations serving the birth to three population.
- iii. Notify the infant's primary care physician of the infant's hearing screening results (pass, did not pass/refer or missed appointment).
- iv. Give parents information about their infant's hearing screening results and the role of hearing in infant development.
- v. Outpatient hearing screening results must be reported to KDHE-EHDI within seven days according to Kansas Administrative Regulation 28-4-605-611.
- vi. If the infant does not pass the outpatient screening:
 - the outpatient facility shall give parents a list of professionals who identify themselves as capable of providing diagnostic audiologic testing.
 - the outpatient facility and/or primary care physician may assist the parents in obtaining referral for diagnostic audiologic testing; and the outpatient facility and/or primary care physician may assist families by identifying state or community resources available for assistance in the evaluation process.

Missed Appointments

All families who do not return for a follow-up appointment must be contacted and at least two attempts at contacting the family to reschedule the appointment should be documented (e.g., by phone and by mail). The infant's primary care physician should be notified after the second missed appointment, or after two unsuccessful contacts to reschedule the missed appointment.

Newborn Hearing Screening Process



V. BIRTHING FACILITY AND MANAGER/COORDINATOR RESPONSIBILITIES IN NHS PROGRAMS

Each birthing facility should designate an on-site Manager/Coordinator of the Newborn Hearing Screening program. The on-site Manager/Coordinator of the Newborn Hearing Screening program should be responsible for the following: budgeting, ordering, and maintaining necessary equipment and supplies; coordinating/supervising personnel providing screening including ongoing monitoring of competency; training all screening personnel; assessing the performance of the program on a regular basis; and overseeing data management and transfer as required.

Birthing Facility Newborn Hearing Screening Program Goals:

1. One hundred percent of infants with parental consent receive a hearing screening.
2. Using AABR, the percent of well-baby infants referred for further testing should be less than 4%.
3. Using OAE, the percent of well-baby infants referred for further testing should be less than 8-10%.
4. Document 100% of attempted contacts with families of infants needing follow-up.

VI. NOTIFICATION OF RESULTS

The hearing screening results, and audiological evaluations must be communicated effectively. Following the hearing screening, there are four primary settings where communication is significant.

- A. Newborn's Primary Care Physician** There should be a letter or copy of the hospital documentation record of the hearing screening sent to the infant's primary care physician. Physicians should also be notified if the infant's hearing was not screened, and when appointments for outpatient hearing screening were missed. Facilities may choose to provide monthly lists of infants screened and results.
- B. Birthing Facility to Family Communication** In communicating screening results to parents, it is important that they know if the child passed or was referred for additional testing. It is just as important that parents know what the screening results mean and what they need to do next. The best time to communicate the screening results is immediately following the screening so questions can be answered immediately. Communication to the family should include information in as many different forms as possible. Possible forms of communication include: brochures or pamphlets that have a space to record screening results and provide information about speech-language and auditory developmental milestones, cards or forms to schedule follow-up appointments, and letters sent to parents who missed the rescreening appointment.
- C. Birthing Facility Documentation** It is important to make sure that the screening results are documented in the permanent hospital medical record.
- D. Kansas Department of Health - Early Hearing Detection and Intervention Program (KDHE-EHDI)** Screening results shall be reported on the birth certificate, either electronically (Electronic Birth Certificate System or "EBC") or to the state by fax or email. For those infants in newborn intensive care units (NICU), the Newborn Hearing Screening Report form will be used. Data can be transmitted via secure internet or byfax.

Outpatient screening results and audiological diagnostic evaluation reports must be reported to the KDHE-EHDI program **within 7 days** of the evaluation as mandated in K.A.R 28-4-605-611.

tiny-k Services (Part C)

Overview: tiny-k Services are a statewide system of coordinated, comprehensive, multidisciplinary early intervention services under IDEA Part C. Their services support infants and toddlers with developmental delays and disabilities (birth to three) and their families. Infants and toddlers may also be screened through child find activities. Infants and toddlers who have a confirmed hearing loss are considered 'established risk' and may qualify for services. For children who qualify, these services are free to families.

I. ESSENTIAL REQUIREMENTS

Infants and toddlers are screened upon initial evaluation processes and, if receiving services, at least annually. All children who receive an initial Part C evaluation who have not had hearing screening within the last six months should be screened for hearing loss using OAE technology with or without integrated tympanometry.

Children enrolled in tiny-k Services shall be screened at least **each year** he/she is enrolled in the program because there is a possibility of progressive, late-onset, and newly acquired hearing losses in children.

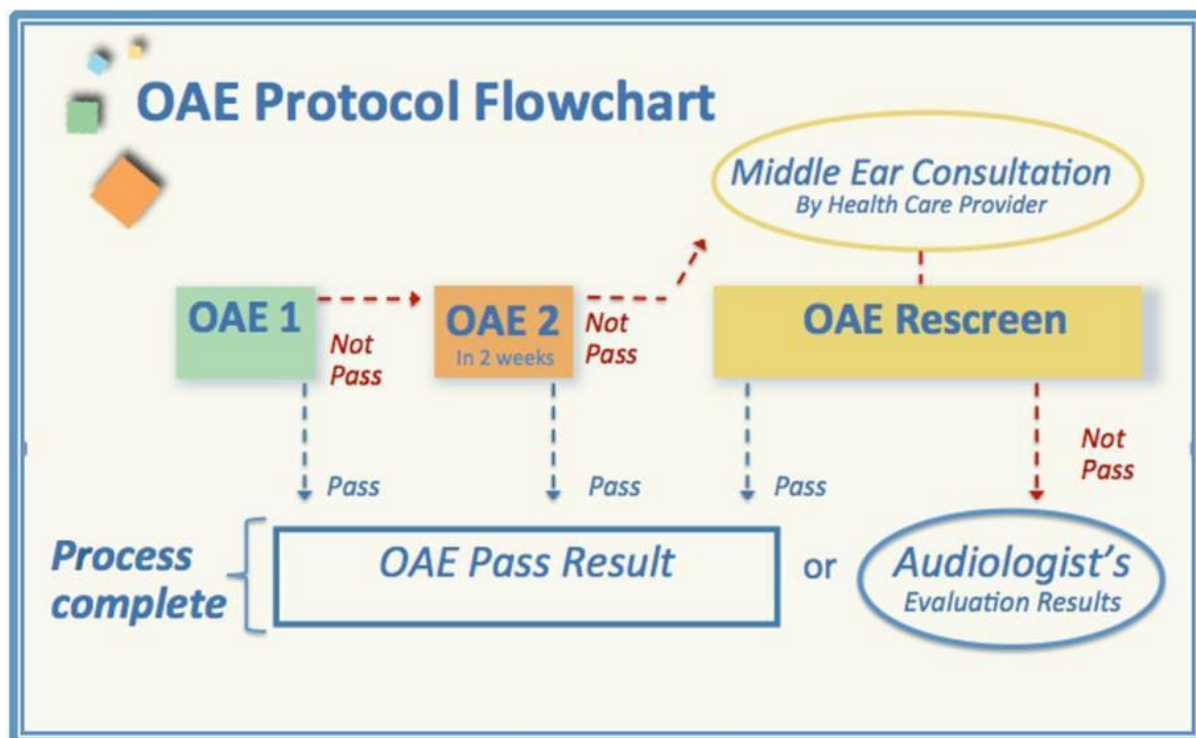
II. TRAINING AND CERTIFICATION REQUIREMENTS

Any person who is conducting tiny-k hearing screenings should be certified as a hearing screening technician.

- A. **tiny-k Screening Technician** is defined as any *tiny-k Services* employee trained by a licensed audiologist with pediatric experience to perform OAE hearing screenings. The certified technician administers hearing screens and an initial screening of the health and function of the ear. The training designates the level of competency. Any person assigned to do hearing screening is required to hold the appropriate certification.
- B. **Training:** Any person who is assigned to do hearing screening is required to hold the appropriate level of certification. *tiny-k* Screening Technician certification should be conducted by a licensed audiologist with pediatric experience. Questions regarding training and educational materials can be directed to the Kansas Department of Health and Environment Part C Coordinator.
- C. **Recertification:** Participants shall repeat certification training if they have not been actively performing hearing screening in the past twelve months.

III. SCREENING METHODS AND FOLLOW-UP

- A. [tiny-k Services Paper Hearing Screening](#) -REQUIRED
- B. [Otoacoustic Emissions Screening](#) - REQUIRED
- C. [Visual Ear Inspection](#) - RECOMMENDED
- D. [Tympanometry](#) - RECOMMENDED



IV. NOTIFICATION OF RESULTS

A. The hearing screening results and audiological evaluations must be communicated effectively to the following entities.

1. **Program to Family Communication** In communicating screening results to parents, it is important that they know if the child passed or was referred for additional testing. It is just as important that parents know what the screening results mean and what they need to do next. The best time to communicate the screening results is immediately following the screening so questions can be answered immediately. Communication to the family should include information in as many different forms as possible. Acceptable forms of communication include: brochures or pamphlets that have a space to record screening results and provide information about speech-language and auditory developmental milestones, cards or forms to schedule follow-up appointments, and letters sent to parents who missed the rescreening appointment. Parents are encouraged to share hearing screening results with the child's primary care provider.

2. **Program Documentation** It is important to make sure that the screening results are documented in the early intervention record.

V. RECORDKEEPING, DATA COLLECTION, AND QUALITY IMPROVEMENT

Kan Be Healthy

Overview: Kan Be Healthy Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) is a state and federally funded insurance plan that provides comprehensive and preventive health care services for Kansas children who are enrolled in Medicaid. Title XIX EPSDT provides services to children under age 21, Title XXI serves children under age 19 who are enrolled in the Children's Health Insurance Plan (CHIP). In Kansas, the EPSDT program is called Kan Be Healthy (KBH). KBH members are typically enrolled in one of three Managed Care Organizations (MCOs) that provide all state Medicaid services. There is a small percentage of members that will be fee-for-service (FFS) for short periods of time, which requires providers to follow the FFS billing guidelines and processes.

I. ESSENTIAL REQUIREMENTS

Kan Be Healthy hearing screenings include identification of diagnosis, referral and treatment for defects in hearing, including hearing aids and are a required component of each Kan Be Healthy (KBH)/Early and Periodic Screening, Diagnostic, and Treatment program visit based on the American Academy of Pediatrics (AAP) Periodicity Schedule. Kansas follows the [Bright Futures periodicity schedule from the AAP](#), which is a CMS-approved schedule of pediatric preventive services. The [hearing screening schedule](#) is located on the Bright Futures website.

Providers who may screen KBH members include:

- Physicians
- Advanced Practice Registered Nurses
- Physician Assistants
- Registered Nurses (supervised by physicians or mid-level practitioners)

II. TRAINING AND CERTIFICATION REQUIREMENTS

Any person who is conducting KBH hearing screenings should be trained as a hearing screener appropriate for their work setting and population served.

- A. **OAE Screening Technicians** - OAE Screening Technician certification should be conducted by an approved licensed audiologist. [KU AHEC](#) includes this in Level 1 training. Questions regarding training and educational materials can be directed to the [Kansas Department of Health and Environment](#).
- B. **Audiometry** – [KU AHEC](#) provides this in Level 1 training.
- C. **Tympanometry** - [KU AHEC](#) provides this in Level 2 training.

III. SCREENING METHODS

A. Paper Screen

Providers are free to use whatever documenting forms they prefer as long as all of the elements required by Bright Futures periodicity schedule screenings are met. The State does not dictate which forms providers must use. Suggested forms are available at the [KMAP website](#) should providers choose to use them.

For **birth to age 4**, the following checklists may be used:

[Kan Be Healthy - Risk Indicators for Hearing Loss Checklist - Birth to Age Four](#)

[Kan Be Healthy - Developmental Scales Checklist - Birth to Age 4](#)

For children **age 5 through age 20**, the following form can be used: [Kan Be Healthy - Hearing Health History Form - Age 5 and Up](#). Any “Yes” answers on this form require a referral for further evaluation. Referrals must be documented, and documentation must include the component referred and the provider to whom the child was referred.

The paper hearing screening forms listed above (or documentation listing same criteria) must be maintained in the child’s permanent medical record.

In the event the KBH screener determines the child has not passed the paper hearing screen, a referral for further evaluation is required.

While the minimum required for Kan Be Healthy assessments is a paper screen, if a provider has staff trained and certified and calibrated equipment to perform the following, these methods may be used for screening:

- B. [Visual Ear Inspection](#)
- C. [Otoacoustic Emissions](#)
- D. [Pure Tone Screening](#)

The following procedures qualify as allowed KBH hearing screens:

- Play audiometry for age 2-4
- Audiometric sweep screen for age 4 and older
- Screening test, pure tone and air only
- Pure tone audiometry
- Pure tone audiometry – air and bone
- Speech audiometry – threshold only
- Speech audiometry with speech recognition
- Comprehensive audiometry threshold evaluation
- Conditioned play audiometry

Note: Documentation must include testing parameters, interpretation and results.

i. Rescreen

A child whose test results indicate “refer” on the rescreen shall be referred for a medical evaluation.

ii. Medical Evaluation

An evaluation by the child's primary care physician to rule out infection, fluid, or blockage is required. The family receives a letter which includes a form for the parents to take to the doctor to fill out and return. It includes any findings the doctor found and whether further treatment is needed. Rescreening after medical clearance is extremely important. If the child "refers" after the medical evaluation, he/she shall be referred for an audiological evaluation with a pediatric audiologist.

E. Audiological Evaluation

The pediatric audiologist will conduct further tests to determine if the child has hearing loss and, if so, to what extent.

F. Ongoing Care

A program must implement periodic observations or other appropriate strategies for program staff and parents to identify any new or recurring hearing concerns.

G. Extended Follow-up Care

A program should provide referral sources to assist with facilitation of further diagnostic testing, evaluation, and treatment when a child has abnormal hearing screening results. A program should develop a system to track referrals and services provided and monitor the follow-up plan. A program may assist parents, as needed, in obtaining equipment for diagnosed hearing loss, such as hearing aids.

IV. NOTIFICATION OF RESULTS

The hearing screening results, rescreens and audiological evaluations must be communicated effectively. Following the hearing screening, there are three primary settings where communication is significant.

- A. **Primary Care Physician** Notify primary care physician of hearing screening results and any follow-up care, including referrals to outside providers, if necessary. If the child does not have a PCP, connect them with available providers in their area.
- B. **Program to Family Communication** In communicating screening results to parents, it is important that they know if the child passed or was referred for additional testing. It is just as important that parents know what the screening results mean and what they need to do next. The best time to communicate the screening results is immediately following the screening so questions can be answered immediately. Communication to the family should include information in as many different forms as possible. Possible forms of communication include: brochures or pamphlets that have a space to record screening results and provide information about speech-language and auditory developmental milestones, cards or forms to schedule follow-up appointments, and letters sent to parents who missed the rescreening appointment.
- C. **Program Documentation** It is important to make sure that the screening results are documented in the permanent medical record.

V. RECORDKEEPING, DATA COLLECTION, AND QUALITY IMPROVEMENT

Preschool Children

Head Start/Early Head Start

Overview: With over 40,000 Kansas children--our most vulnerable citizens--living in poverty, Kansas Head Start/Early Head Start programs are dedicated to overcoming the risk factors that perpetuate multi-generational poverty. Local programs may be a part of the school district, an Indian tribe, or a local non-profit. Head Start/Early Head Start programs provide comprehensive services for children ages 0-5.

I. ESSENTIAL REQUIREMENTS

Each program must either obtain hearing screening results or perform a hearing screening within the first 45 days of a child's program attendance. Children who continue in Early Head Start are not required to be screened again until they enter Head Start. Screenings may be completed by health assistants, nurses or nursing students.

II. TRAINING REQUIREMENTS

OAE Screeners must complete the online training provided by the Early Childhood Hearing Outreach (ECHO) Initiative through the National Center for Hearing Assessment and Management, provided by Utah State University.
<https://www.infanthearing.org/earlychildhood/>

III. SCREENING METHODS AND FOLLOW-UP

- A. [Visual Ear Inspection](#) - REQUIRED
- B. [Otoacoustic Emissions](#) OR [Pure Tone Screening](#) - REQUIRED

IV. NOTIFICATION OF RESULTS

The hearing screening results, rescreens and audiological evaluations must be communicated effectively. Following the hearing screening, there are two primary settings where communication is significant.

- A. **Program to Family Communication** In communicating screening results to parents, it is important that they know if the child passed or was referred for additional testing. It is just as important that parents know what the screening results mean and what they need to do next. The best time to communicate the screening results is immediately following the screening so questions can be answered immediately. Communication to the family should include information in as many different forms as possible. Possible forms of communication include: brochures or pamphlets that have a space to record screening results and provide information about speech-language and auditory developmental milestones, cards or forms to schedule follow-up appointments, and letters sent to parents who missed the rescreening appointment.
- B. **Program Documentation** It is important to make sure that the screening results are documented in the child's permanent record.

V. [RECORDKEEPING, DATA COLLECTION, AND QUALITY IMPROVEMENT](#)

Parents as Teachers

Overview: Parents as Teachers (PAT) promotes the optimal early development, learning and health of children by supporting and engaging their parents and caregivers. Parents as Teachers builds strong communities, thriving families and children who are healthy, safe and ready to learn by matching parents and caregivers with trained professionals who make regular personal visits during a child's earliest years in life, from prenatal through kindergarten.

I. ESSENTIAL REQUIREMENTS

Child health review, including hearing screening, is completed within 90 days of family enrollment or child's birth, and at least annually thereafter.

II. TRAINING REQUIREMENTS

Any person who is conducting PAT hearing screenings should be trained as a hearing screener at the level appropriate for their work setting and population served.

- A. Hearing Screening Technician** is defined as any parent educator trained by a licensed audiologist with pediatric experience to perform OAE hearing screenings. The certified technician administers hearing screens and an initial screening of the health and function of the ear. The training designates the level of competency. Any person assigned to do hearing screening is required to hold the appropriate certification.
- B. Training:** Any person who is assigned to do hearing screening is required to hold the appropriate level of certification. Hearing Screening Technician certification should be conducted by a licensed audiologist with pediatric experience. Questions regarding training and educational materials can be directed to the Kansas Department of Health and Environment Part C Coordinator.
- C. Recertification:** Participants shall repeat certification training if they have not been actively screening in the past twelve months.

III. SCREENING METHODS AND FOLLOW-UP

- A. [Child Health Record \(Hearing Review\)](#) - REQUIRED**
- B. [Otoacoustic Emission](#) - REQUIRED**

IV. NOTIFICATION OF RESULTS

The hearing screening results, rescreens and audiological evaluations must be communicated effectively. Following the hearing screening, there are two primary settings where communication is significant.

- A. Program to Family Communication** In communicating screening results to parents, it is important that they know if the child passed or was referred for additional testing. It is just as important that parents know what the screening results mean and what they need to do next. The best time to communicate the screening results is immediately following the screening so questions can be answered immediately. Communication to the family should include information

in as many different forms as possible. It is the parent's responsibility to inform the child's primary care provider of the screen results.

Possible forms of communication include:

1. [OAE Hearing Screening Form](#)
2. Printed results from OAE screening equipment
3. Brochures/pamphlets with a place to enter results and next steps for follow-up.

B. Program Documentation It is important to make sure that the screening results are documented in the child's permanent record.

V. [RECORDKEEPING, DATA COLLECTION, AND QUALITY IMPROVEMENT](#)

School-Aged Children (Part B)

Overview: School-age hearing screenings are an integral tool in identifying children with hearing loss who were not identified at birth, lost to follow-up, or who developed hearing loss later in life. Without mandated routine hearing screenings in schools, students with unilateral, less severe or late onset hearing loss may not be identified or will be misdiagnosed and managed. Efforts to provide consistent protocols, screener training and follow-up through school-age help ensure that children with hearing loss are identified and managed in a timely manner, and thereby minimize negative academic consequences.

I. ESSENTIAL REQUIREMENTS

PRESCHOOLERS: Preschoolers attending a school-based program shall be screened each year he/she is enrolled in preschool. Children who cannot be screened using approved and/or optional methods shall be referred for a complete medical/audiological evaluation. Between the ages of 2 ½ and 5 years (not yet in kindergarten), [tympanometry](#) is recommended for students who do not pass OAE screening or do not pass pure tone screening at 20 dB at 500 Hz.

KINDERGARTEN - AGE 21: [Pure Tone 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)]. More frequent screening (e.g., every two years) is recommended, especially through second grade.

In addition, the following school children shall be screened annually or upon occurrence:

- Students new to a school (and not tested within the past 12 months).
- Students returning to school after an extended absence.
- Students who are undergoing initial evaluation for special education services.
- Students referred by a teacher or other school personnel.
- Students who were referred within the past year with no documented follow-up, regardless of grade.
- Students absent during the previous hearing screening.
- Students who request a hearing screening.
- Students whose parent/caregiver requests a hearing screening.

Children who should not be included in school hearing screening programs

Students who wear hearing aids and/or cochlear implants **should not be screened** and should be seen by an audiologist for assessment and ongoing monitoring, preferably annually. It is critical that the school collaborates with the child's parents, the child's clinical audiologist, and/or the school district's educational audiologist/nursing services for any recommendations and modifications.

II. TRAINING

Any person who is conducting school hearing screenings should be competent as a trained hearing screener appropriate for their work setting and population served.

Hearing Screening Technicians are individuals trained to perform Otoscopy, Pure tone Screening, Tympanometry, and Otoacoustic Emission Screenings. Questions regarding the Hearing Screening Technician training and educational materials can be directed to the [University of Kansas Area Health Education Center \(KU AHEC\) Program Manager](#) or a licensed audiologist with pediatric experience. Training may include one or more of the following procedures: Otoscopy, Pure tone Audiometry, Otoacoustic Emission Screenings, and Tympanometry.

The School Hearing Screening Certification Training Manual is under revision.

III. SCREENING METHODS AND FOLLOW UP

Accounting for the needs and resources of diverse programs across Kansas, the test protocol for students may vary. The following different types of hearing screenings are available to identify children who may require further evaluation.

A. [Pure-Tone Screening](#)

1. 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.72-6229(a)]. More frequent screening (e.g., every two years) is recommended, especially through second grade.

REFERRAL CRITERIA:

PASS

Child responds at 20 dB at all required frequencies.

REFER

Failure to respond at any one frequency in either ear.

B. [Tympanometry](#)

1. Preschoolers: If OAE screen or 500 Hz pure tone screen is not passed, tympanometry should be performed.
2. Kindergarten through age eight (or 3rd grade): If 500 Hz pure tone screen is not passed, tympanometry should be performed.

REFERRAL CRITERIA:

PASS

Automated equipment will report “pass.” Non-automated equipment pass criteria: <250 daPa tympanometric width for children 3–12 years of age and <275 da Pa tympanometric width for children below age 3. If the use of tympanometric width is not possible, >0.2 mmhos static compliance is recommended (AAA, 2011).

REFER

Automated equipment will report “refer.” Non-automated equipment refer criteria: >250 daPa tympanometric width for children 3–12 years of age and >275 da Pa tympanometric width for children below age 3. If the use of tympanometric width is not possible, <0.2 mmhos static compliance is recommended (AAA, 2011).

C. Otoacoustic Emissions (OAE) Screening

1. Otoacoustic Emissions (OAE) Screening is:

- a) conducted with an initial OAE on both ears if the child is between the ages of 2 ½ and 5 if pure tone screening is not performed.
- b) conducted with an initial OAE on both ears if a child cannot be conditioned to pure tone screening at any age.

REFERRAL CRITERIA: Pass/Refer criteria on OAE screening differs among manufacturers based on test protocol and normative data. Use the manufacturer’s default pass/refer criteria specific to the equipment used.

PASS

Equipment reads “PASS” for both ears.

REFER

Refer if either ear displays a “REFER” result; refer if unable to screen due to excessive noise, movement or inability to place probe.

Age of Child	Decibel Level	Frequencies to Screen using Pure Tone Screening	Alternative test method	Tympanometry
2½ to 5 years (Not yet in kindergarten)	20 dB	500, 1000, 2000, 4000 Hz	OAE	Required only for students who do not pass OAEs or pure tone screening at 500 Hz
5-8 years (or 3rd grade)	20 dB	500, 1000, 2000, 4000 Hz	OAE	Required only for students who do not pass pure tone screening at 500 Hz or OAEs
9 years (4th grade) and up	20 dB	1000, 2000, 4000, 6000 Hz	OAE/500 Hz	Not necessary

IV. NOTIFICATION OF RESULTS

- A. Program to Family Communication** 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.72-6229(d)].
- B. Program Documentation** It is important to make sure that the screening results are documented in the child’s permanent educational record.

V. RECORDKEEPING, DATA COLLECTION, AND QUALITY IMPROVEMENT

Referral Protocol and Follow Up

Hearing screening is an effective method of identifying children at risk for hearing loss. Screening programs should stress that screening is not a diagnostic hearing evaluation and will not detect all hearing problems. Parents/caregivers of children screened should be informed of the limitations of the screening.

Routinely, referrals should be made only following a second screening. In general, some children will pass the second screening, reducing the over-referral rate. Use the referral chart to determine the appropriate referral indicated.

Next Steps after Screening:

Otoscopy	Pure Tone Screen or OAE	Tympanometry	Next steps after Initial Screening:	Next steps after Rescreening:
Pass	Pass	Pass	None	N/A
Pass	Pass	Fail/Abnormal	Medical referral	Rescreen after medical clearance
Fail	Pass or fail	Pass or fail	Medical referral	Rescreen after medical clearance
Pass	Fail	Fail	Rescreen in 2-4 weeks	Medical referral
Pass	Fail	Fail	Rescreen in 2-4 weeks	Refer to pediatric audiologist

a. Rescreen

- Students who fail initial pure tone/OAE screening should be rescreened in 2-4 weeks. If students continue to fail pure tone/OAE screening, a referral should be made for medical evaluation or audiological evaluation according to the chart above.
- Students with abnormal otoscopy findings should be referred immediately for medical evaluation. Rescreening occurs after medical intervention.

b. Medical Evaluation

An evaluation by the child’s primary care physician to rule out perforation, infection, fluid, or blockage is required. The family receives a letter which includes a form for the parents to take to the doctor to fill out and return. It includes any medical findings and whether further treatment is needed. Rescreening after medical clearance is extremely important. If the child fails pure tone/OAE screening after the medical evaluation, he/she shall be referred for an audiological evaluation with a pediatric audiologist.

c. Audiological Evaluation

Following failed pure tone or OAE screening, the pediatric audiologist will conduct further tests to diagnose hearing loss, if present. In addition, if the screening technician is unable to obtain reliable results, referral to the audiologist is recommended.

d. Extended Follow-Up Care

A program should provide referral sources to assist with facilitation of: further diagnostic testing, evaluation, and treatment when a child has abnormal hearing screening results. A program should develop a system to track referrals and services provided and monitor the follow-up plan. A program may assist parents, as needed, in obtaining equipment for diagnosed hearing loss, such as hearing aids.

Screening Program Management

Screener Qualifications and Training

Any person who is assigned to conduct hearing screening is required to hold the appropriate level of certification. This includes nurses, audiology assistants, technicians, health care assistants, other allied health personnel, and other persons specifically trained to screen children for hearing loss.

Personnel with the appropriate training who may conduct the hearing screening:

- Physicians (Audiometry, Tympanometry, OAE)
- Audiologists
- Speech-language pathologists (Audiometry, Tympanometry, OAE)
- RNs and LPNs (Audiometry, Tympanometry, OAE)
- Support Personnel (OAE, AABR)
- Hearing Screening Technician (Audiometry, Tympanometry, OAE)
- OAE Screening Technician (OAE and Tympanometry)

Support personnel are individuals who are selected and trained to operate devices used to screen the hearing of newborns. Training is performed by the birthing facilities under the direction of the Kansas Department of Health, Early Hearing Detection and Intervention Program.

OAE Screening Technicians are individuals trained to perform Otoacoustic Emissions screening. Questions regarding the OAE Screening Technician training and educational materials can be directed to the Kansas Department of Health, Early Hearing Detection and Intervention Program or a licensed audiologist with pediatric experience.

tiny-k Part C Screening Technicians are individuals trained to perform Tympanometry and Otoacoustic Emissions screening. Questions regarding the OAE Screening Technician training and educational materials can be directed to the Kansas Department of Health, Early Hearing Detection and Intervention Program or a licensed audiologist with pediatric experience.

Hearing Screening Technicians are individuals trained to perform Pure tone Audiometry, Tympanometry, and Otoacoustic Emissions Screenings. This includes RNs, LPNs, Speech-Language Pathologists, Physicians, and other individuals who have completed Hearing Screening Technician training. Questions regarding the Hearing Screening Technician training and educational materials can be directed to the Area Health Education Center Program Manager or a licensed audiologist with pediatric experience.

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)].

Hearing Screening Training

tiny-k Part C Screening Technicians and OAE Screening Technicians – OAE screening renewal training should be attended only if the technician has not been actively screening for over 12 months.

Hearing Screening Technicians - 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)].

Equipment Selection and Calibration

Annual calibration of hearing screening equipment is recommended by the U.S. Occupational Health and Safety Administration (OSHA), the National Institutes of Health (NIH) and the Kansas Department of Health. Different factors such as age of the machine, frequency of use, exposure to extreme temperatures, and handling and storage of the machine can cause the instruments to become non-compliant to specifications set forth by the American National Standard Specification for Audiometers (ANSI). Annual calibration, regardless of frequency of use of the equipment, ensures the accuracy of the machine's readings. A signed and dated sticker should be affixed somewhere on the hearing screening equipment to indicate the date of the last calibration. Regardless of how often equipment is serviced, it is recommended to perform daily listening checks prior to conducting hearing screening.

Inaccurate results can result in a missed diagnosis, treatment that is unnecessary, and the possibility of causing further damage to your patients' hearing. Equipment problems that are detected and resolved before testing begins will avoid the consequences of having to follow-up on inaccurate results and bringing patients back in for retesting. As a hearing healthcare practitioner, you must be confident in the results of the tests you administer. Important hearing healthcare decisions are made based on those results.

Screening Environment

Finding an appropriate hearing screening environment can be challenging as noise levels in childhood and school settings are often less than ideal. The importance of this task, however, cannot be stressed enough and every effort should be made to select and confirm an appropriate screening environment. Test settings should meet the specifications detailed in national standards (ANSI, 2008), which specify the maximum permissible ambient noise levels allowed in a test room. Based on these standards, it is recommended that the background noise during pure tone screening be no greater than 50dB SPL as measured by a calibrated sound level meter or an app-based sound level meter on your mobile device. There are currently no standards regarding the OAE screening environment.

Infection Control/Universal Precautions

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

Universal Precautions Best Practices

The following recommended procedures are considered universal precautions to avoid cross contamination that may occur between children. These recommendations include:

- Screener should wash his/her hands with medical-grade antibacterial soap and water or use an antibacterial hand sanitizing gel before screening each child.
- Remove rings to eliminate contamination by microorganisms,
- Surfaces such as headphones and conditioned play toys used during screening should be cleaned and disinfected with a wipe before each use.
- Other surfaces such as tabletops, chairs, other toys, and any equipment that may have come in contact with microorganisms should be disinfected with a wipe as needed throughout the day and at minimum once a day.

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

Disinfect the OAE, Tympanometer Probe Tips and 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.

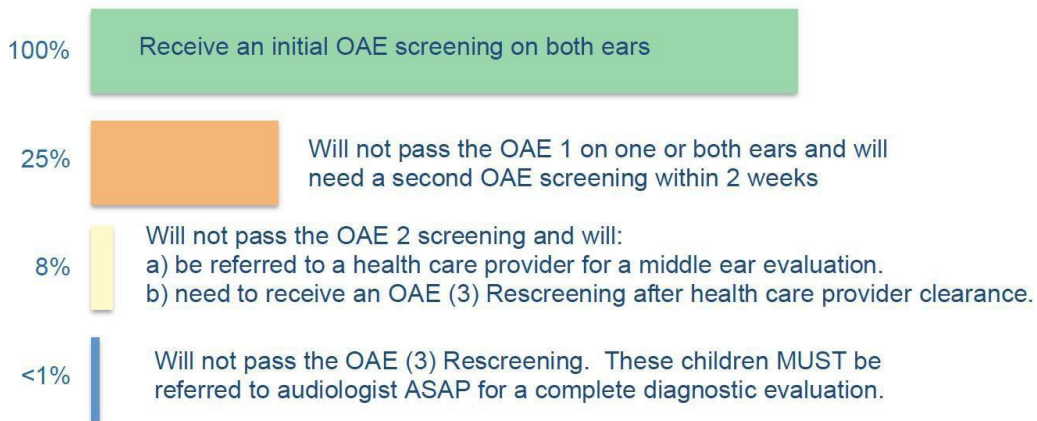
Recordkeeping, Data Collection, and Quality Improvement

Data should be collected in order to evaluate the effectiveness of the hearing screening. The following are recommended data points and should be used in on-going monitoring of program performance:

- Total number of children screened
- Number and/or percentage of children who did not pass the initial screening and/or rescreening
- Number and/or percentage of children who missed the initial screening and/or rescreening
- Number and/or percentage of children referred for follow up (audiological, medical, educational)
- Number and/or percentage of children diagnosed with hearing problems
- Data validating appropriate equipment calibration and performance

The Early Childhood Hearing Outreach Initiative (ECHO) has developed this [Hearing Screening & Diagnostic Log](#), which may be helpful for tracking and data management purposes.

The approximate percentages of children in the early education setting who are likely to need subsequent steps in hearing screening protocol are as follows:



In elementary schools, especially the lower grades, the referral rate ranges from 15-25%, largely due to the increased incidence of otitis media in this population.

Appendices

Appendix A: Glossary

Acuity – Sharpness or clarity of hearing ability in humans that is measured and recorded on an audiogram in decibels (sound level) and hertz (sound pitch or frequency).

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).

ANSI S3.6-2010 – The American National Standards Institute’s specification which defines the technical characteristics of audiometers and calibration procedures.

ANSI, 2008 – The American National Standards Institute’s specification which defines the allowable ambient noise levels for hearing test environments.

Appropriate environment – An acceptable hearing screening setting that is free from excess noise and visual distractions; when noise levels exceed 50dB, the hearing screening environment is deemed inappropriate and should not occur.

Audiology – The study of hearing disorders, including evaluation of hearing function and rehabilitation of individuals with hearing loss

Audiologist – The professional who provides care in the prevention, identification, diagnosis, and evidence-based treatment of hearing, balance, and other auditory disorders for people of all ages. An educational audiologist refers to audiologists practicing in the school setting; pediatric audiologists are audiologists specializing in services to children.

Audiogram – a graphic record of hearing ability for various sound frequencies; used in diagnostic audiology evaluations.

Audiometer – An instrument for gauging and recording acuity of hearing.

Calibration – The electroacoustic (physical measurement) or psychoacoustic (listening check) determination that an audiometer is performing properly in terms of its acoustic output, attenuation linearity, frequency accuracy, or harmonic distortion.

Cerumen (also called Earwax) – The yellow, waxy matter secreted in the outer portion of the ear canal that keeps out foreign objects, and keeps skin in the canal and tympanic membrane moist.

Cochlea – The spiral-shaped cavity of the inner ear and the main organ of hearing. The cochlea contains the nerve endings that transmit sound vibrations from the middle ear to the auditory nerve and are responsible for producing otoacoustic emissions.

Conditioned play audiometry (also called play audiometry) – A hearing test technique that uses behavioral conditioning to teach children to respond to sound; it makes a game of the hearing test by using activity-related toys such as blocks or pegs.

Conductive hearing loss – hearing loss produced by pathologies of the external and/or the middle ear.

Decibel (dB) – A unit used to measure the relative loudness or intensity of sounds; 0.0 dB (HL) 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, is considered to be the pain threshold of the normal ear.

Diagnostic audiometry – Performed by an audiologist to determine precise hearing abilities and includes hearing thresholds for both tonal stimuli and speech stimuli.

Early childhood – Stage in human development that generally includes the toddler (ages 1-3) and preschooler (ages 3-5).

Ear canal (also called external auditory canal) – The narrow, tube-like passage through which sound enters the ear.

Eardrum – The thin, semitransparent, oval-shaped membrane that separates the middle ear from the external ear. Also called tympanic membrane.

Educationally significant hearing loss (ESHL) – A typically permanent hearing loss diagnosed by an audiologist and potentially determined to have a negative impact on listening and learning in the educational setting. In Kansas, ESHL can be bilateral (both ears), unilateral (one ear), high frequency (bilateral, occurring in high-frequency range of hearing), or transient (ESHL that is present for more than 3 months due to a treatable condition such as OME).

Eustachian tube – A slender tube that connects the tympanic cavity with the nasal part of the pharynx and serves to equalize air pressure on either side of the ear drum.

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.

Hearing loss – General term for the partial or total inability to hear, also called hearing impairment. Hearing loss has many different causes, degrees, and types.

Hertz (Hz) – The standard unit of frequency (i.e., cycles per second) in the International System of Units, equal to one cycle per second.

Inner ear – The portion of the ear within the temporal bone that is involved in hearing and balance and includes the semicircular canals, vestibule, and cochlea. Also called internal ear, labyrinth.

Mass-population screening – examination of a large group or population to determine the presence of disorder or disease.

Middle ear – An air-filled cavity bordered by and including the tympanic membrane, ossicles, and Eustachian tube and ending at the cochlea.

Middle ear condition (or pathology) – Disorder of the middle ear space that can cause hearing loss or abnormal function of the structures of the middle ear; may include but is not limited to Eustachian tube dysfunction, ear infections, perforated eardrum, and impacted earwax.

Normal hearing – The ability to perceive sound within the normal range; typically defined as hearing levels between 0 to 20dB.

Occlusion – A closing or shutting off of the external ear canal. May occur due to a blockage of cerumen or be caused in some individuals by tight fitting headphones.

Otitis media – a general term indicating inflammation of the middle ear.

Otitis media with effusion (OME) – Inflammation of the middle ear accompanied by an accumulation of fluid (liquid).

Otoacoustic emissions (OAE) – Sounds given off by the inner ear when the cochlea is stimulated by sound, and which can be measured with a small probe inserted into the ear canal. People with normal hearing produce emissions. Those with hearing loss greater than 25-30 decibels (dB) do not produce these very soft sounds. The recommended type of OAE to be used in childhood screening programs is distortion product otoacoustic emissions (DPOAE), which refers to sounds measured in response to 2

simultaneous tones of different frequencies.

Outer ear (also called external ear) – the outer portion of the ear including the auricle (pinna) and the passage leading to the eardrum (ear canal).

PE tubes (pressure equalization tubes) – ear tubes inserted into the eardrum to keep the pressure equal across the eardrum thereby preventing a vacuum forming in the ear which contributes to infection; also called ventilation, tympanostomy, myringotomy tubes.

Perforated eardrum – A hole or rupture in the eardrum.

Probe tip – Refers to the slender instrument inserted into the ear canal opening to perform an OAE or tympanogram test; most often has disposable cover to use, disinfect, and replace between tests to prevent spread of microorganisms which can cause infection.

Pure tone – A sound wave of a single frequency whose sound sensation is characterized by its singleness of pitch.

Pure tone audiometry – The key hearing test used to identify hearing threshold levels of an individual, enabling determination of the degree, type and configuration of a hearing loss. Thus, providing the basis for diagnosis and management.

Pure tone sweep – 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.

Referral – Notification of parent/guardian/caregiver regarding results of hearing screening and the recommendations for follow up.

Risk factors – Attribute or exposure of an individual that increases the likelihood of causing or developing hearing loss.

Sensorineural hearing loss (SNHL) – Hearing loss resulting from a pathological condition in the inner ear or along the nerve pathway from the inner ear to the brain stem.

Stimulus button (also called interrupter) – The control on an audiometer that when pressed presents the signal to the listener; can be turned “continuously on” using a separate control also on the audiometer.

Threshold – The sound level below which an individual is unable to detect sound; also the lowest point at which a person can hear; hearing thresholds are also referred to as hearing levels are stated in decibels (dB) at various frequencies.

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

Warble tone – A stimulus tone available on many audiometers whose frequency varies periodically several times per second over a small range and can be slightly easier to hear in certain environments; may be reliably alternated with pure tone stimulus.

Appendix B: [tiny-k Services Paper Hearing Screening](#)

Appendix C: [tiny-k/Parents as Teachers OAE Screening Form](#)

Appendix D: [Kan Be Healthy - Risk Indicators for Hearing Loss Checklist - Birth to Age Four](#)

Appendix E: [Kan Be Healthy - Developmental Scales Checklist - Birth to Age 4](#)

Appendix F: [Kan Be Healthy - Hearing Health History Form - Age 5 and Up](#)

Appendix G: [Kan Be Healthy - Early and Periodic Screening, Form](#)

Appendix H: [Hearing Screening Report for Schools](#)

Appendix I: [School Hearing Screening Certification Training Manual](#) - *under revision*

Appendix J: [SoundBeginnings Newborn Hearing Screening Form](#)

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School Hearing Screening Certification Procedure Manual: Supplementary Training Materials

INTRODUCTION

School-age hearing screenings are an integral tool in identifying children with hearing loss who were not identified at birth, lost to follow-up, or who developed hearing loss later in life. Without mandated routine hearing screenings in schools, students with unilateral, less severe or late onset hearing loss may not be identified or will be misdiagnosed and managed. Efforts to provide consistent protocols, screener training and follow-up through school-age help ensure that children with hearing loss are identified and managed in a timely manner, and thereby minimize negative academic consequences.

It is the responsibility of every school district to develop a hearing screening program that meets the requirements outlined by state and federal laws. These laws, as well as the Kansas Hearing Screening Goals, are outlined in the Kansas Guidelines for Hearing Screening (Birth-21). The guidelines were written in general terms to allow flexibility in screening programs based on the diverse needs and resources in communities and settings across Kansas.

“Accounting for the needs and resources of diverse communities across Kansas and the multiple layers of support for hearing screening, these Guidelines for Hearing Screening (Birth – 21) are designed to be specific enough to clearly state the requirements across the age span while general enough to offer the flexibility for application across diverse settings.”

This supplementary manual has been developed to provide suggested training material for audiologists conducting training/certification sessions and as a reference for Certified Hearing Screening Technicians. Essentially, information that has been helpful under previous guidelines has been restructured to operate within the new 2022 guideline framework. It is assumed that preferred practice patterns and ethical standards will guide the professionals conducting training sessions to include content that exceeds basic instruction in the operation of the screening equipment and address all aspects of screening responsibilities. Specific competency-based training through formal instruction and supervised practice should be included to meet the individual needs of each school district or program. This means that each Hearing Screening Technician will be certified to show competency only in the areas or procedures required by their hearing screening program.

Once the hearing screening technician has successfully completed training, certification should be granted with documentation of competencies demonstrated. All personnel completing school hearing screenings should have ongoing assessment of proficiency and retraining as needed.

SCREENING METHODS FOR SCHOOL-AGED CHILDREN (PART-B)

Visual Inspection

- I. Define/overview: The purpose is to check for signs of ear disease or abnormal development. An inspection examines the external canal, surrounding tissue, ear canal, and tympanic membrane.
 - A. External: Inspect the pinna and the area around it for any abnormalities. This may be completed with the naked eye.
 - B. Internal: Inspect the ear canal and tympanic membrane using an otoscope.
- II. Equipment: Otoscope with appropriate sizes of disposable specula if completing an internal inspection
- III. Procedure

A. Position the Child

1. 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.)
2. The child's head needs to be still and steady.

B. Examination Procedure

1. 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.
2. 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.
3. Grip the 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.)
4. Stabilize the child's head.
5. Insert the speculum to a comfortable depth without touching the canal walls. Make sure your hands rest against the student's head appropriately to help with stabilization. It is always best to watch with both eyes while setting the otoscope in place before moving closer to complete the actual visual inspection.
6. Pull back the ear with the hand not holding the otoscope to straighten the canal.

C. Normal Observations:

1. 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.
2. 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.
3. 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.

D. Abnormal Observations that will require medical intervention

1. External abnormalities
 - a) Abnormal pinna shape or absence of ear
 - b) preauricular sinuses, skin tags, or atresia
 - c) check for position (set or tilt) of the ears
 - d) tenderness, redness or edema
 - e) signs of drainage, foul odor
 - f) wax build-up in the outer ear canal, or dermatitis
2. Internal abnormalities:
 - a) Tumor, cholesteatoma or unknown growth
 - b) Drainage, effusion, or bleeding
 - c) Perforation of tympanic membrane
 - d) Impacted wax
 - e) Presence of foreign object
 - f) Fungal growth

g) Dermatitis

E. Complete the Hearing Screening Report

1. Always report if you completed an internal or external inspection
2. Document any abnormalities observed
3. Note the presence of tubes

IV. Referral Criteria

- A. PASS: Children with normal appearance of all structures and no complaints of pain in the pinna or the tissue around the ear do not require referral.
- B. REFER: Refer children with any abnormality to a medical provider. Do not proceed with audiometer screening if tenderness, signs of drainage, or foul odor is present; this should be an automatic referral.

V. Helpful Tips

- A. 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.
- B. Some ear canals will collapse when headphones are placed on a child's head. Check for collapsing ear canals by pressing the pinna against the head and monitoring the size of the ear canal during the external inspection.
- C. NEVER try to remove wax or a foreign object from the child's ear canal unless you have the proper medical training or it is within the scope of practice for your professional license. Most schools refer children to an outside private medical practitioner.
- D. If a tympanostomy tube is found lying in the ear canal, typically children do not need to be referred to the doctor to have it removed unless it is irritating the ear canal. It should eventually fall completely out of the ear on its own. Just note the finding on the paperwork.
- E. If the child will not hold still during the inspection, it may be helpful to have another adult gently brace the child's head against their shoulder or distract the child with a toy.
- F. When a student does not respond to sounds during the hearing screen, and there is excessive cerumen in the ear canal, a medical referral to have the ears cleaned should come before referring to an audiologist for a full hearing evaluation.

Pure Tone Sweep Screen

- I. Define/overview: The pure tone 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. Pure tone signals are presented across different frequencies, and responses to the signals typically include a hand raise or a conditioned response such as dropping a block in a bucket.
 - A. 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.72-6229(a)].
 - B. The American Speech-Language-Hearing Association recommends screening all children on initial entry into school and annually in preschool through 3rd grade, and in the 7th and 11th grades.
 - C. The American Academy of Audiology recommends standard screening protocols should include preschool, kindergarten, and grades 1, 3, 5 and either 7 or 9 at a minimum to identify approximately 70% of cases of newly identifiable hearing loss.
 - D. Screen children in the response to intervention process or upon request or referral from an educator, administrator, parent, or physician.
 - E. Rescreen children who were referred for medical care during previous hearing screenings and after any medical interventions.
- II. Equipment:
 - A. Calibrated audiometer
 - B. Play audiometry items (e.g., blocks)
 - C. Alcohol-free disinfectant wipes for headset and earphone cushion
- III. Procedure: Pure Tone and Play Audiometry
 - A. Preparation
 1. Select an appropriate environment.
 - a) Choose a quiet setting; evaluate your test environment so concerns can be identified; test away from halls, windows, cafeterias, gyms, HVAC equipment, bathrooms, and play areas; limit visual distractions.
 - b) Consider checking noise level with a sound level meter (SLM) or SLM smartphone app.
 - c) DO NOT PROCEED with screening if noise levels are too loud (greater than 50dBA).
 2. Complete a daily listening and visual check of the audiometer
 - a) Inspect the headphones, cords and buttons; listen for noise while pressing buttons
 - b) Ensure screening tones can be heard; if any problem is found, discontinue screening.
 - c) Position the child
 - (1) 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 where they may not be distracted by other students.
 - (2) remove glasses or headbands; tuck hair or headscarf behind ears.
 - B. Complete a visual inspection
 - C. Instruct or condition the child for pure tone screening.
 1. Give the instructions as simply as possible before the earphones are placed on the ears and answer any questions they might have.
 2. 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.)

3. Instruct the child to remain very quiet during the hearing screening.
 4. Tell the child to raise either hand when they hear the tone.
 5. The following are suggestions to say to the child (adapt to the age of the child):
 - a) "You will hear a tone."
 - b) "Every time you hear the tone, raise your hand high. When the tone stops, put your hand down quickly."
 - c) "Raise your hand every time you hear a tone, even if the tone is different, or if you just barely hear the tone."
- D. Place headphones; red headphone on right ear, blue headphone on left ear. Be sure the earphones are properly placed over the ear canals. Position the earphone cords behind the child to prevent noise.
- E. Screen hearing: Set the audiometer frequency dial at 1000 Hz and the intensity dial at 40 dB HL.
1. Present one tone for identification purposes only to verify that the student understands the instructions you have given. If the student does not respond, you may increase the volume by 20 dB and present another tone. Do not exceed 80 dB HL on the dial. You may also need to try Play Audiometry as outlined below.
 2. Present a tone (approximately 3 seconds long) once. If the child does not respond, repeat the presentation of the tone, but not more than four times.
 3. Once it is clear the student understands the instructions, decrease the intensity dial to 20 dB HL and present tone at 1000 Hz.
 4. Perform age-appropriate pure tone sweep at 20 dB at the recommended frequencies.
 - a) Pre-k - 3rd Grade: 500, 1000, 2000, 4000 Hz
 - b) 4th Grade and above: 1000, 2000, 4000, 6000 Hz

Age of Child	Suggested order of frequencies during Pure Tone Screening
Pre-K through 3rd grade	Right: 1000, 2000, 4000 Hz
	Left: 4000, 2000, 1000, 500 Hz
	Right: 500, 1000 Hz
4th through 12th grade	Right: 1000, 2000, 4000, 6000 Hz
	Left: 6000, 4000, 2000, 1000 Hz
	Right: 1000 Hz

F. **PLAY Audiometry:** Used to condition students to respond to tones when they don't raise their hand consistently or seem confused. Often necessary for Pre-K students or students of any age with unreliable responses.

1. Establish a conditioned response by initially presenting an audible tone through the earphones when the earphones are placed on the table. (i.e., 4000 Hz set at maximum intensity)
2. Make the response activity fun to hold the student's attention, but not too exciting that they forget the task. Examples include putting a cotton ball in a can, putting a ring on a spindle, dropping a block in a box, connecting snap beads, or similar activities that will keep the child motivated during the session.
3. Sometimes clapping hands, pointing to their nose, giving a thumbs up, or giving a high five is also motivating.
4. Keep the instructions simple. Show the child how to respond appropriately. It may be necessary to hold the child's hand while performing the task initially. Then allow the student to respond without help, but while watching the technician listen and respond the same way, so that the child and the technician are responding together. Then allow the child to respond independently without prompting to determine complete understanding of the given task.
5. Be generous with verbal and physical reinforcement. Verbal reinforcement, such as "Good! You are doing a nice job," or physical reinforcement, such as applause, high five, or fist bump may be effective ways to increase response rates in the presence of stimuli. Just be careful not to give any hints during the actual screening.
6. Sometimes, instructions can be modified as well. For instance, you could ask the child to listen for the "birdie whistle". The approach can then be related to the size of birds. A big bird, or Daddy bird, sounds low for the 1000 Hz pitch. A tiny bird, or baby bird, sounds high for the 4000 Hz tone.
7. 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 500, 1000, 2000, and 4000 Hz in each ear.

IV. Referral Criteria

A. **PASS:** Child responds at 20 dB at all required frequencies.

B. **REFER:**

1. **FIRST SCREEN:** If the child does not respond to any one tone at the 20 dB HL, rescreen at school no more than 2-4 weeks later.
2. **RESCREEN:** If the child does not pass the second sweep frequency screening, notify the child's family and refer to the physician or audiologist.

V. Helpful Tips

- A. Remember, as part of the pure tone screen, tympanometry is recommended as an immediate "next step" if the student does not hear the 500 Hz tone.
- B. Otoacoustic Emissions are an acceptable substitute for pure tone screening for young children or students that will not, or cannot, complete conditioned play audiometry. Tympanometry should also be performed if OAE results are abnormal.
- C. Avoid clicking the tone interrupter switch.
- D. Vary the time interval between tone presentations. Avoid presenting a pattern of tone presentations.

- E. Some audiometers come with response buttons for the child to use during screening, however, this usually slows down the screening process and is typically not developmentally appropriate for children in elementary school.
- F. 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.
- G. During play audiometry, 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 ears, usually at 1000 Hz and 4000 Hz.
- H. 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.
- I. If your program would like to include Threshold Screening, please see the Appendix A: [Threshold Screening Protocol](#)

Otoacoustic Emissions

- I. Define/overview: OAEs are low-intensity sounds produced by normal, healthy ears. These sounds are produced either spontaneously or in response to an acoustic signal. The OAE originates in the inner ear (cochlea) from the outer hair cells in the cochlea. The response also requires normal or near-normal middle ear functioning. A small probe (foam or rubber tip) is placed in the child's ear. A soft sound is presented, and the inner ear produces an emission or echo response. This response is measured with a small microphone that is in the probe.
 - A. OAE hearing screening has been approved as an alternative test for students who are unable to complete a pure-tone screening either due to young age or physical or developmental challenges.
 - B. OAE testing is not a substitute for pure-tone screening for other students.
 - C. OAEs are not required to complete school screenings, however, some school districts with large preschool and/or special education populations may want to consider utilizing OAE measurements.
 - D. TEOAEs: Clicks or tone bursts are used as the stimuli at one level—for example, 80 dB SPL.
 - E. DPOAEs: Pure tones are used as the stimuli. AAA Guidelines state the primary DPOAE levels should be maintained at 65/55 dB SPL.
- II. Equipment
 - A. Automated DPOAE or TEOAE screening device
 - B. Probe tips
 - C. Distraction toys
 - D. Disinfectant solutions and wipes
- III. Procedure
 - A. Select an appropriate environment. One that is quiet and away from distractions. Typically, where you complete pure tone screening.
 - B. Before screening any students, complete calibration and a daily listening check. This may be done by screening your own ear or using the equipment's probe calibration check procedure. Discontinue if any problems are found.
 - C. When screening a student, complete a visual inspection, either external or internal, to make sure there are no obvious signs of infection, blockage or physical anomaly.
 - D. After noting the size of the ear canal opening, select a probe tip that will fit snugly in the child's ear.
 - E. Place the probe in the child's ear canal. The probe delivers a low-volume sound into the ear. In approximately 30 seconds, the result is displayed on the computer screen.
 - F. The OAE equipment will display the results of the screening as a PASS or REFER on the screen. Record results in records appropriately.
 - G. If the results indicate a REFER, it is recommended to complete tympanometry as a "next step" or second-stage screening to help clarify the nature of the failure and most efficient referral protocol.
 - H. It should be noted that many audiologists recommend combining OAEs and tympanometry for all children in preschool as best practice. To determine which protocol is best to follow in your area, speak to your supervising audiologist or trainer.
- IV. Referral Criteria: Pass/Refer criteria on OAE screening differs among manufacturers based on test protocol and normative data. Use the manufacturer's default pass/refer criteria specific to the equipment used.
 - A. PASS: Both ears produce emissions and the equipment indicates a pass in both ears.
 - B. REFER:

1. Refer to the audiologist if tympanometry is normal and OAEs are abnormal. Also refer to the audiologist if unable to screen due to excessive noise, movement or inability to place a probe.
2. Refer to the physician when tympanometry and OAEs are abnormal.

V. Helpful Tips

- A. Engage the child in a quiet distraction such as a visually interesting toy or elicit help from another adult to keep the child still, quiet, and hands away from their ears. Try to create a fun feeling if possible.
- B. If the child is afraid or unsure of the probe, familiarize by gently touching it to the child's arm, hand or cheek to point out how soft it is. Have the child "help" screen a doll or stuffed animal.
- C. Do not hold the probe in the ear canal for an extended period of time as that increases the potential for high noise level or movement.
- D. OAEs do not technically test an individual's hearing, but rather OAE results reflect the performance of the inner ear mechanics.
- E. OAEs may miss some cases of educationally significant mild and mild-moderate hearing loss or ANSD (AAA, 2011).
- F. Audiology trainers and OAE technicians are encouraged to view the OAE section in the Kansas Hearing Screening Guidelines for further information.

Tympanometry

- I. Define/overview: Tympanometry is not a test of hearing, but an assessment of middle ear efficiency. It provides additional information about the outer and middle ear function and can help delineate between medical and audiological evaluation referrals. During tympanometry, a tone is presented to the ear canal via a small probe attached to the tympanometer. When the probe tip is placed against the ear canal opening, an airtight seal is created, allowing the probe mechanism to vary the air pressure in the ear canal from a positive to a negative value. As these pressure changes occur in the ear canal, the ability for the middle ear to function as intended changes also, causing the probe tone response to be reflected or absorbed by the middle ear system. The instant where the pressure in the ear canal is equal to the pressure in the middle ear space is where sound will be transmitted through the system best. The probe tone response is measured by the probe microphone throughout the quick procedure to obtain a series of calculations. As a result, a graphic representation is produced called a tympanogram.
 - A. Should be used after OAE or pure tone referral as an optional second-stage screening.
 - B. Strongly recommended as part of the screening process for ages preschool through third grade.
- II. Equipment
 - A. Tympanometer
 - B. Disposable probe tips
 - C. Cleaning supplies
- III. Procedure
 - A. Turn on the machine.
 - B. Check the calibration of the tympanometer according to the manufacturer's operating manual. Newer tympanometers might complete this step automatically and older units will require a manual calibration check specified probe tip or cavity.
 - C. Conduct a visual inspection.
 1. 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.
 2. 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 it 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 tip against the ear canal, consider the following:
 1. Most new units obtain a seal rather easily. (It may be difficult to obtain a seal during the initial learning phase.)
 2. Tympanometer probes contain three parts to complete the measurement. One is a small speaker that emits a probe tone, the second is a microphone that measures the intensity of the tone as it bounces back from the eardrum, and the third is a pump that causes the air pressure in the canal to change from positive to negative.
 - 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, particularly when a medical referral is expected.

- L. Clean the probe tip after each child by doing the following:
 1. Remove the probe and use a disinfectant wipe (one wipe per use). Never clean it while it is still assembled.
 2. Soak the probe tips in disinfecting solution
 3. Use an ultrasonic cleaner with disinfectant solution

- IV. Referral Criteria: There are various ways to interpret tympanometry results, but it can be a valuable screening tool if used correctly. Automated machines will report “pass” or “refer”. Previous guidelines have used ear canal volume, static admittance, and peak pressure as criteria for referral. However, current best practice guidelines suggest that tympanometric width in conjunction with static admittance are more sensitive to middle ear effusion. Therefore, below you will see information for all four criteria to help with training purposes as each component complements the other.
 - A. Ear Canal Volume estimates the size of the ear canal from the tip of the probe to the eardrum. Measured in cubic centimeters (cm³) or milliliters (ml)
 1. This is the measure that helps determine if PE tubes are present and patent.
 2. Normal ECV is 0.3 - 2.0 ml
 3. Abnormally small or obstructed = <0.3 ml
 4. Abnormally large = >2.0 ml. This suggests there is a perforation in the eardrum or a patent PE tube.

 - B. Static admittance, sometimes referred to as compliance, measured in cubic centimeters (cm³) or milliliter (ml) or millimhos (mmhos). This refers to how well the middle ear system responds to sounds and is measured at the point of maximum height displayed on the tympanogram.
 1. Measured along the y-axis of the tympanogram
 2. Normal is 0.2 to 1.8 ml
 3. Abnormally low, stiff or middle ear fluid = <0.2 ml
 4. Abnormally high, hyper-flaccid = >1.8 ml

 - C. Tympanic peak pressure (point of greatest admittance, or where it is at rest) is the point at which air pressure is equal on either side of the eardrum and measured in decaPascal (daPa).
 1. Measured along the x-axis of the tympanogram
 2. Normal between +50 daPa to -200 daPa
 3. Abnormal, or Negative middle ear pressure when the peak falls between -200 daPa to -400 daPa
 4. 0 daPa is at or near atmospheric pressure and is the point where the greatest amount of sound is admitted to the middle ear system.

 - D. Tympanometric width (sometimes referred to as the gradient) is the distance in decaPascal (daPa) between the sides of the tympanogram at one-half of the peak admittance. It describes the steepness/shape of the slope of the tympanogram near the peak. The wider the peak, the greater the number.
 1. Ages 3-12 years = Refer if greater than 250 daPa
 2. Ages 6 months - 3 years = Refer if greater than 275 daPa

Summary of AAA tympanometry recommendations		
	Perform	Cut-off Criteria Negative Pressure
Initial screening	No	NA
1st Criteria: As part of an immediate follow-up or second tier screening (rescreening) <u>OR</u>	Yes <u>OR</u>	Tympanometric Width more than 250 daPa (preferred criteria upon which to base referral decisions) <u>OR</u>
2nd Criteria: As part of an immediate follow-up or second tier screening	Yes	Static Admittance: Flat or < 0.2 mmhos <u>OR</u>
3rd Criteria: As part of an immediate follow-up or second tier screening	Yes	Middle Ear Pressure > -200 daPa to -400 daPa (do not refer based on this criteria alone)

****This criteria would be applied to all children with the exception of those with large ear canal volumes who are known to have pressure equalization tubes (the latter who would be considered to pass screening when a flat tympanogram and large ear canal volume is present). A second exception would be for children of Asian heritage with tympanometric peaks with static admittance less than 0.2 mmhos.*

V. Helpful Tips

- A. A routine calibration check does not take the place of the full electroacoustic calibration, which is required annually.
- B. A combination of a large tympanometric width (>150 daPa) and a low compliance (<0.2 cc) is associated with greater likelihood of middle ear effusion.
- C. For quick reference and further explanation, the reader is directed to the Appendix B: [Tympanometry and Tympanometric Width Supplement](#)
- D. Examples of Tympanograms for purposes of training are found in Appendices C and D.

REFERRAL PROTOCOL AND FOLLOW UP

As stated in the current KS Guidelines, hearing screening is an effective method of identifying children at risk for hearing loss. However, there are limitations to all screening programs and it is the school district's responsibility to inform families of these limitations whether a student passes the hearing screen or is referred for diagnostic evaluation.

Most schools have their own method of reporting results. Some send home a form with every student that was screened. Some schools only send paper reports home with students that require further medical management or audiologic evaluation. For reference, the reader is directed to Appendix H: [Examples of Hearing Screening Reports](#). The report from the old guidelines can be found [here](#).

It is important that every school program has a clear understanding of the responsibilities for all professionals involved. Programs should provide resource options in the community when abnormal screening results are found. However, tracking referrals and monitoring that follow-up was completed will be facilitated by different individuals based on the resources in the area and the program itself.

The reader is directed to the KS Guidelines for suggested referral protocols and next steps after screening. Included here are other flowcharts that might be helpful when developing a screening program.

Appendix I: [KS Guideline Protocol Flowcharts](#)
[Childhood Hearing Screening Protocols Flowcharts](#)

SCREENING PROGRAM MANAGEMENT

Screening Technician Qualifications

- I. **Hearing Screening Technicians** - When participants have completed training and demonstrated competencies, they are ready to conduct hearing screenings, according to state law [K.S.A. 72-6229(d)]. Renewal training schedules should be determined by the instructor or the Program Manager. This is typically every 2-4 years. **Appendix J: Screening Day Checklist** provides a checklist that may be useful for technicians preparing to screen groups of children in the schools.

Training

- I. The KS Guidelines and this procedure manual contain a complete list of training material for Instructors teaching others to screen hearing and for Technicians learning how to screen hearing. There are no longer designated times allotted to each area or topic of discussion and every instructor must determine the best way for a Technician to demonstrate competency to conduct hearing screenings in the schools. An agenda and list of competencies are provided here as an example.
 - A. Appendix E: [Example of an Agenda for Training and Certification](#)
 1. [Hearing Loss Explained](#) AG Bell weblink
 2. [Types of Hearing Loss - My Baby's Hearing](#) Boystown web link
 - B. Appendix F: [Example Hearing Screening Competency Checklist - A](#)
 - C. Appendix G: [Example Hearing Screening Competency Checklist - B](#)

Data Collection and Quality Improvement

- I. Each screening program is strongly encouraged to collect data that will help evaluate the effectiveness and quality of program protocols. The reader is directed to the guidelines.

DOCUMENT LINKS AND HELPFUL RESOURCES

Documents, Links and Resources for Instructors

- Appendix A: [Threshold Screening Protocol](#)
- Appendix B: [Tympanometry and Tympanometric Width Supplement](#)
- Appendix C: [GSI 37 Manual Tympanogram Examples](#)
- Appendix D: [GSI 39 Manual Tympanogram Examples](#)
- Appendix E: [Example Agenda to use for Training and Certification Classes](#)
- Appendix F: [Example Hearing Screening Competency Checklist -A](#)
- Appendix G: [Example Hearing Screening Competency Checklist - B](#)
- Anatomy and Hearing Loss Explained: [AG Bell](#) or [Boystown](#)

Documents, Links and Resources for Technicians

- Appendix H: [Examples of Hearing Screening Reports](#)
- Appendix I: [KS Guideline Protocol Flowcharts](#)
- Appendix J: [Screening Day Checklist](#): What to bring, daily listening check steps, and documentation.
- ASHA: [Childhood Hearing Screening Protocol Flowcharts](#)

Screening & Practice Standards

- Educational Audiology Association ([EAA](#))
- American Speech-Language-Hearing Association ([ASHA](#))
- American Academy of Audiology ([AAA](#))
- National Center for Hearing Assessment & Management ([ECHO](#) website; [downloadable handout](#) on ECHO Initiative Pure Tone Protocol in Education Setting)
- Centers for Disease Control ([CDC](#) website; [downloadable handout](#) on EC screening)
- Joint Committee on Infant Hearing ([2019 JCIH Position Statement](#))

Screening Program Development & Training

- Early Childhood: ECHO Initiative: Implementing a Successful OAE Screening Program ([Website](#))
- ECHO Initiative: Pure-Tone Screening 3 years old and over ([Website](#))
- School-Age: Towson University: Pure Tone Hearing Screening in Schools ([Dr. Diana Emanuel](#))

Hearing Health & Prevention

- World Health Organization: [Make Listening Safe Campaign](#)
- Dangerous Decibels ([Website](#))
- ASHA: [Healthy Communication & Popular Technology Initiative](#)
- ASHA: [Other Noise and Hearing Loss Prevention](#) resources
- National Center on Early Childhood Health and Wellness: [Hearing Screening Fact Sheet](#)

Hearing Loss

- Centers for Disease Control (CDC): [Free Brochures on Hearing Loss in Children](#)