

**GUIDELINES FOR
HEARING SCREENING
In the School Setting**





ACKNOWLEDGEMENTS

Contributors

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I. Introduction

A. Purpose

The purpose of any screening program is to detect those individuals with a suspected deviation that requires further examination at the earliest age possible in order to refer for diagnosis and treatment, if required.

In the United States, one to three children per 1,000 are born with hearing loss each year (CDC, 2010). Hearing deficits in children can interfere with normal speech and language development, communication, and the ability to learn. It is important to detect even a mild hearing loss in order to treat the problem or compensate for the loss when possible. The earlier a child who is deaf or hard of hearing starts getting services, the more likely the child's speech, language, and social skills will reach their full potential. Children with mild to moderate hearing deficits may be at a disadvantage educationally, emotionally, and socially. Thus, ongoing review of hearing and speech age-appropriate milestones, risk factors, and routine hearing screening is critical.



Hearing screenings should be done in schools for the following reasons:

- Large numbers of children of many ages are readily accessible;
- Can be accomplished in a short period of time with relative ease;
- Far less expensive than a comparable service performed in another sector of the health care system;
- Allows an ongoing opportunity to observe, assess, and investigate potential areas of concern; and
- Provides the opportunity to screen children who have not been previously identified.

B. Characteristics of Screening Programs

Screening is a brief or limited evaluation of a group of individuals presumed to be normal, but at risk of developing a problem. The extent of a screening program should be based on documented health needs of the population to be served. This may have been determined by an outside agency, e.g. state health department, or identified on a local basis. The value of early detection of a problem must be weighed against the time and human resources required to conduct the screening. The value of the screening process depends on how well the program is carried out and how the findings are used.



Results must be communicated, and follow-up on referrals for those “at risk” continued, until the problem is resolved in some manner.

Screening programs must be evaluated in terms of:

- Validity–ability to identify those who have the condition;
- Reliability–consistency of results of screening process;
- Yield–number of persons identified;
- Cost–personnel and equipment;
- Acceptance–informed parents agree to value of screening; and
- Follow-up–communicating results to parents who respond with appropriate actions to get necessary diagnosis and treatment, if indicated.

C. Evaluation of Hearing Screening Programs

To determine the effectiveness of the hearing screening program, careful evaluation of the planning, implementation, referral process, and referral outcomes must be completed with each hearing screening. Much of this information is essential for reports to the board of education and the school health advisory committee.

Evaluation is an on-going process. Keeping outcome data about the hearing screening program and referrals helps the school nurse evaluate the effectiveness of the program.

Ongoing evaluation must include the following tasks:

- Quantify the pass/refer rates;
- Estimate the sensitivity and specificity of the screening; and
- Assure effectiveness of follow-up protocols for children failing the screening.

Many questions can be answered from the acquired data. Information that can be gathered in the evaluation process includes the number of students screened, the number of referrals, the types of hearing problems identified, and the utilization of insurance and/or payment method.

D. Setting Up a School Based Screening Program

The school or community health nurse should coordinate a school-based hearing screening program. The planning should occur with school administration. Hearing screening programs should be a part of an overall hearing conservation program. This program should:



- Establish procedures and standards (best practices) for training nurses and others who will be conducting the screenings;
- Establish procedures and standards (best practices) to determine whether or not the client may have a significant need for hearing health care;
- Provide personnel and facilities to reach the target population;
- Enter the client into a health care system which can provide follow-up care including rescreening, monitoring, and further diagnosis and/or treatment;
- Provide counseling and education about hearing health to prevent the development or recurrence of hearing impairments, and to prevent or reduce the handicap resulting from that impairment; and
- Reach all children at the earliest age possible.

Screening programs in schools are conducted by a variety of personnel from speech-language professionals to trained volunteers.

II. Screening Protocol

A. Screening Schedule

Schools develop screening schedules based on a variety of situations; e.g. school board policy, special education plans, and tradition.

It is estimated that up to 15 percent of students will have at least a transient loss of hearing at some time during their school years. The individuals or grades to be screened should be based on the availability of trained screeners, the environment available in which to screen, and the ability to complete a high percentage of the referrals. Emphasis is always placed on the youngest population.

- Students in Pre-K, K, 1st, 2nd, and 3rd grades; and all new students;
- Any student referred by the teacher, parent, or self;
- Special education evaluation requests; and
- Students in 7th grade—for educational purposes regarding noise exposure if time permits.

B. Use of Volunteers

Volunteers may be useful during the initial sweep screening to assist with the flow of students through the screening procedure. Some volunteers may be trained to conduct the



initial sweep screen. Holding a volunteer instruction session is helpful for all new volunteers, and should be scheduled close to the day of the screening. During the training session, familiarize volunteers with the equipment, screening forms, and procedures. Having volunteers who feel comfortable with the equipment increases the accuracy during the screening procedure. All volunteers should be counseled regarding confidentiality.

C. Care of Equipment

Equipment should be stored in an area that is climate controlled, and should be calibrated annually. Headphones should not be transferred from one audiometer to another without an additional calibration being performed, and should be cleaned between students. Avoid using alcohol to clean the headphones.

D. Prescreening Education

The nurse responsible for the screening should meet with kindergarten children as a group to orient them to the equipment and procedures in the screening program. This can be accomplished by taking the audiometer to the classroom for visual inspection. Demonstrate how they will have headphones placed over their ears in order to hear the sounds. Tell them they will hear a tone or sound like the one being demonstrated, only softer. Set the frequency at 1000 hertz (Hz) and the decibel level at 90-100 decibel (dB). Hold the earphone with the openings facing the children. Instruct them to raise their hand when they hear the sound. When the sound stops, instruct them to lower their hand. They can also say, "I hear it" when the sound is presented. The extra time spent conducting these practice sessions will reap benefits during screening, as the children will have a better idea of what is expected of them.

In the primary grades, it is helpful to visit the classroom prior to screening, to review the procedure. At this time, the nurse can provide age-appropriate information about noise in their daily lives.

E. Preparing the Child for Screening

Preparing the child for his or her hearing screening is extremely important. Simple instructions should be given to the child face-to-face prior to placing the earphones on him/her. Stress the importance of responding quickly to the tone, even if it is very faint.



1) Standard instructions can be as follows:

“You are going to hear some sounds (beeps, whistles, bells, etc.). Every time you hear one, raise your hand or say, yes. Raise your hand as soon as you hear the sound, even if it is very soft. Do you understand?”

2) Instructions often must be modified for younger children and individuals with any developmental delay. Pantomime, where the examiner illustrates listening, then hearing the sound, and finally responding as directed, may help train the individual to the task. To be a successful screener, the words you choose to describe what is going to happen, as well as the tone of your voice, play a big part in eliciting cooperation.

For younger children, standard instruction can be as follows:

- “Let’s play a listening game. I’m going to put this on your ear so you can hear the birdie.” This directive approach can be more reassuring to a child than a question.
- If you feel the child needs to see and touch the earphone prior to placement, you may let the child feel while commenting “These are like an airplane pilot’s hat” or “It’s very soft like a pillow.”
- For very young children; however, it is sometimes better not to draw attention to the equipment by not saying anything about it at all. Instead, help maintain focus on something they enjoy. The last thing you want to do is direct attention to the sensation of the equipment being placed on them.
- Hand raising or verbal response cannot always be elicited from the younger population. When this happens, a “play” technique is implemented. If a play technique is necessary, it is important that he/she can do the “listen and drop” task without frustration.
 - Blocks and buckets
 - Peg boards – choose ones with large pegs for easy manipulation
 - Use simple toys that are easily sanitized

3) Demonstration of the procedure can be presented to a group of children who have been brought to the screening area. Using the audiometer, set the frequency selector to 2000 Hz, the attenuator to 90 dB, and the output selector to the right earphone. Having gained the group’s attention, turn the right earphone toward the children and present the tone. Tell them: “This is what you are to listen for.



Each time you hear the whistle, raise your hand. Put your hand down when it stops. Later when you wear the earphone, the whistles will be tiny little ones. Let's practice.”

Present the tone several more times until the group responds as requested. The tone's intensity may be reduced, or the frequency changed, if more demonstration appears to be needed.

F. School Screening Environment and Ambient Noise Level Check

The choice of the hearing screening environment is very important.

- The area must be reasonably quiet. The screening site should be selected during school hours, so noise problems can be identified. The site should be away from stairs, windows, street noise, hall traffic, cafeterias, gyms, heating/cooling vents and equipment, bathrooms, play areas, etc.
- Sound treated areas may be available in school libraries or band/music rooms. These areas should be utilized when available.
- Each screening room should accommodate a three-foot by four-foot table, two chairs, and have an electrical outlet (if audiometer requires electrical plug in).
- The screening environment should have limited visual distractions (i.e. windows, bulletins boards, etc.).
- Ideally, there will only be one screener per room.

Noise levels in the test environment must be checked prior to any hearing screening procedure. The person performing the check should have normal hearing sensitivity. A sound meter can also be used to determine the room noise. Ambient noise levels for hearing screening environments should not exceed those listed below when measured with a sound level meter with octave band filters centered on the screening frequencies. It is recommended that schools or districts invest in a basic inexpensive sound level meter to accurately assess noise levels. It is important to note that these levels were derived from the American National Standards Institute (ANSI) current standards for pure tone threshold testing, and have been adjusted for the 20 dB Hearing Level screening level.

Sound meter chart
1000 Hz – 49.5 dB
2000 Hz – 54.5 dB
4000 Hz – 62.0 dB



The noise level can also be checked easily with the audiometer. Wearing the audiometer earphones, the screening frequency pure tones (1000 Hz, 2000 Hz, and 4000 Hz) should be heard at a level of 10 dB (screening level for a child is 20 dB and for adults is 25 dB).

If the tones cannot be heard at 10 dB at each screening frequency, do not screen in that environment.

If ambient noise exceeds the above values, the noise level will effectively mask the reference threshold level. This will cause pure tone threshold levels to be inaccurate. Possible solutions to this problem include:

- Selection of alternate screening site;
- Modification of the existing screening environment, including, for example:
 - covering floor with carpet;
 - applying absorptive acoustical treatment to walls and ceiling;
 - placing baffles in ventilation system; or
 - positioning the ballast for fluorescent lamps outside the test room.
- Use of a completely enclosed screening room, including, for example:
 - small single wall booth—thin walls, 1000 lbs.;
 - single wall sound room—one 4” thick wall; or
 - double wall sound room—two isolated 4” thick walls.

Alternatives that may be considered are sound enclosures that are similar to music practice rooms or a mobile hearing screening van, which can often be obtained through a variety of sources including:

- Speech-language or audiology budget;
- Discretionary funds;
- Regular education monies;
- Monies slotted for building improvements;
- Grants;
- Monies received from third party billing (Mo HealthNet);
- Parent teacher organizations; or
- Increased monies via Individuals with Disabilities Education Act (IDEA).

NOTE: If an appropriately quiet test environment cannot be found, the screening procedures should not be implemented. If noise levels become too high during the screening, the test should be discontinued. Do not increase tone levels to compensate for background noise.



III. Screening Procedures

Always check equipment before using it. Never use equipment that is not functioning properly. Do not screen hearing using any equipment with an expired calibration date.

Before any screening, always make certain the child does not have draining or bloody ears. If this is observed, do not screen the child. A medical referral is indicated if the child is not already receiving treatment.

For students who are difficult to test, unable to respond to pure tone audiometry, or do not understand instructions, refer to Appendix D; Observational Screening for Hearing Problems.

Conventional Pure Tone Audiometry Screening

Description—Electronic device capable of generating discrete tones of varying frequency (pitch) and intensity (loudness).

Age Ranges—Children whose developmental age is 3 years or older.

1. Listening Check of the Audiometer

Prior to providing hearing screenings, the examiner should perform a listening check of the audiometer. The recommended procedure is as follows:

- Plug in the audiometer (if electrical). Turn the power “on” and leave the unit “on” for the day.
- Examine the earphones. Check the cushions for cracks or splits.
- Examine the earphone cords for breaks. Gently untwist the cords if they are tangled.
- Examine the audiometer controls and be certain that all are functioning.



- Perform a listening check while wearing the headphones:
 - 1) Set the level at 50 dB, frequency selector to 1000 Hz, output selector to right ear, and press the tone presentation switch. Tone should be clear with no noise present. Check other screening frequencies in a similar manner.
 - 2) Set the frequency selector to 1000 Hz and output selector to the right ear. While pressing the tone presentation control, slowly rotate the dial from 0 dB to 50 dB. Listen for abrupt increases in loudness or “dead spots.” If either of these conditions is present, the instrument must be serviced before further use.
 - 3) Set the level at 0 dB, then press and release tone presentation control. No audible click should be heard upon depressing and/or releasing this switch.

2. Pure Tone Audiometry Screening Sequence

- Seeing the child’s eyes and facial expression is helpful in determining the accuracy of the responses. However, it is important that the child does not see the tester’s hands, the audiometer, or the screening record form.
- After giving instructions, the earphones should be placed on the child by the individual who is performing the screening. The red earphone covers the right ear and the blue earphone covers the left ear.
- The earphones should be placed over bare ears (remove glasses, earrings or move hair out of the way). The earphone headband should be adjusted so that each earphone fits snugly against the ear.
 - 1) Start screening the right ear (if the child reports greater hearing problems in the right ear, begin with the left ear).
 - 2) Pre-set 1000 Hz at 40 dB
 - a) If there is no response, re-instruct.
 - b) If the child continues to not respond, rescreen at a later time. If again he/she does not respond, he/she is considered to have not passed the screening. Mark the screening form appropriately.
 - c) If there is a response, proceed as described below.



- 3) Move the dial to 20 dB
 - a) Present the tone three times at this level noting the child's response or lack of such.
 - b) Mark the screening form appropriately for the right (left) ear at 1000 Hz.
- 4) Change frequency selector to 2000 Hz and present tone at 20 dB. Follow procedure used for 1000 Hz and record results.
- 5) Change the frequency selector to 4000 Hz and present the tones at 20 dB as described above. Record the results.
- 6) Switch audiometer output to left (right) ear and then repeat steps three through five. Be certain to record results.

It is not appropriate to make any adjustment for a noisy environment (ambient noise level above 20 dB (sound pressure level 49.5 at 1000 Hz). You should not increase the decibels above 20 for the screening.

3. Results

- If the child does not respond at the recommended screening level at any frequency in either ear; immediately remove headphones, reinstruct the child, reposition, and rescreen. If other screeners are available, you may want to have another screener perform the screening.
- If the child continues to miss at any frequency in either ear, the child should be rescreened in 14-21 days. If the child fails the rescreening at that time, he/she should be referred for further evaluation.

4. Special Considerations for Pure Tone Audiometry

- Avoid exaggerated, noisy depression of the tone presentation switch; the child may see or hear this and respond to the movement or sound rather than the tone. A minimum amount of pressure and movement is required to operate the switch.
- Avoid establishing a rhythm of tone presentation. Vary the length of the tones and the interval between the tones.
- Avoid looking down at the audiometer and then up at the child every time a tone is presented.
- Do not ask the child during the screening, "Did you hear it?"



- Expect the child to respond to the tone with the specified response (i.e. raise hand, drop block). Be very cautious about accepting changes in facial expression or “smiles” as responses to the tones. Reinstruct the child as to the required response. If the lack of reliable response persists, discontinue screening. If this is the child’s first screening, schedule him for a rescreening. If this is the child’s second screening, refer him to an audiologist for assessment.
- Do not allow the child to chew gum during the screening.

The range of normal hearing is -10 to 20 decibels. Screening for hearing problems during “health fairs” is not productive unless the facility provides a quiet environment in which to screen, e.g., sound treated booth or van.

IV. After the Screening Has Been Completed

Referrals

Referral criteria in this manual may be used, but it is important to have a consensus of the medical and audiological professionals in the community, regarding what they consider the need for further examination. The medical professional in your area providing further evaluation and assessment needs to be aware of, and in agreement with, the district’s screening program, including the referral criteria. The nurse has the responsibility of follow-up of referred students. The family should be notified of the results of the failed hearing screening and any other evaluations conducted, as well as, the need to obtain professional care. Ideally, a telephone call or personal visit to the parent should precede a written referral. This provides an opportunity to determine the parents’ understanding of the referral, to gather any pertinent information about prior history or outcome of previous referrals, and to determine whether the family has the information and resources to complete the referral.

The nurse or speech language pathologist should be prepared to explain the results of the screening and the importance of a thorough follow-up examination to the parent/guardian, or student, as appropriate. Parents should understand the extent of the examination needed, i.e., primary health care provider; ear, nose, and throat specialist; audiologist; or speech-language professional. The nurse should inform the parent that the screening was not conducted in a sound-treated environment and provide written



information regarding the findings on any screening or evaluations done by school personnel. The parent should expect that the health care provider might need to do an evaluation that is more comprehensive. The referral form should communicate the findings of the screening, as well as any additional observations made in the school setting. The nurse should request a written report from the professional with the results of the examination and any recommendations for the school setting. Referrals should be on school district or school health services letterhead.

It is helpful to provide information about the appropriate services available in the area, the average cost of a visit, what to expect from the examination, etc. Families of students in managed healthcare programs may need to contact their health insurance plan for information on how to access the appropriate services, including treatment available to them.

Follow-Up

The nurse should develop a method of tracking the referrals made. It is not unreasonable to expect a response from the parent/guardian within a two-week period, demonstrating that the parent/guardian understands the referral and has made an appointment for the evaluation. The parent/guardian should be contacted periodically until the nurse knows the disposition of the referral. Many times the parent/guardian is reluctant to say they cannot afford the cost of the evaluation. The nurse should be aware of community resources for those who need this financial assistance and offer this when indicated.

Tracking Referrals

Tracking logs should make note of the date of the referral, how and when the parent was contacted, the date of professional evaluation, and result of follow-up. This will allow for evaluation of the screening program for validity (identified children who have a hearing deficit), reliability (consistency of results of screening process), and yield (number of students identified with a problem). This would include inability to follow-up due to financial constraints (need to work on resources), parent inattention (need for more education about the screening program and the impact of hearing deficit on schoolwork), and lack of providers to complete the referral (need to develop assistance to get student to closest provider).

Positive findings occur much more often, in early elementary grades (Pre-K through grade three) and less often in older students. For this reason, it is not considered productive to screen large groups of students beyond third grade. Students screened at the secondary level may be screened as part of a hearing conservation program educating them about the causes of high-frequency hearing loss due to noise pollution. It is important to identify the reasons for incomplete follow-up so the cause may be addressed.



Following an evaluation, the nurse has the responsibility to see that any recommendations that have been made are implemented. Any child that has been referred for a hearing evaluation needs to be put on a “watch list,” and monitored at least annually, to determine their status. Ideally, a repeat audiometric screening should be done two-to-four weeks after treatment. The nurse could perform this screening if the provider of the treatment does not.

Teacher Notification

The nurse should notify the child’s teacher(s) that the child has been referred for a possible hearing impairment. In addition to being alert to the possibility the child is having hearing difficulty, the school personnel are often in a position to reinforce the need to follow through on the referral. It is important to monitor the child closely; documenting the nurse and teacher concerns for the effect the suspected hearing impairment is having on the child’s education. These concerns need to be communicated to the parent. Trying to establish the reason for failure to have the child examined will often uncover the need for additional resources or information.

Watch List

School nurses should make note of students who would benefit from monitoring for hearing difficulty. Some of the reasons to include a student are:

- Family history of risk factors;
- History of frequent ear problems in infancy and preschool period;
- History of allergic responses affecting the ear, nose, and throat;
- History of academic failures, i.e., repeating grades;
- Enrolled in special education programs;
- Repeated concerns of teacher;
- Behavior that might be due to a transient problem with decreased hearing, i.e., allergies; and
- Students that consistently fail a frequency in the speech range but do not meet referral criteria.

The nurse would not necessarily generate a referral for evaluation, but could communicate the findings to parents and teachers, especially regarding any change in status.

The following information should be recorded in the individual’s health record:

- The results of the screening and any rescreening;



- Notification of parents about the need to seek an evaluation from a medical or audiological professional; and
- Results of the professional evaluation and recommendations.

School Nurse Program Management

The school nurse is the appropriate person to assume management of the hearing screening program. It is very important that school nurses be provided the necessary orientation and training to perform the hearing tests as indicated in this manual. Additionally, school nurses can ensure that volunteers who assist with, or perform hearing screenings, are also appropriately trained.

Almost as important as conducting the training is documenting the fact that it occurred. A sample form has been developed to serve as a guide that schools can use in creating their own training record (see Resources section). It is strongly recommended that initial and routine training be conducted for all personnel involved in a school hearing screening program.

In schools where the speech-language specialist does the screening, the nurse may refer students for screening, and assist with follow-up. It is important to see that results of the screening are recorded in the student's health record. If the nurse is doing the screening, he/she will need to determine which groups and individuals will be screened, schedule and conduct the screenings, and then evaluate the overall effort.

School nurses may develop or adapt forms for their use in screening programs. Forms may include:

- Screening worksheet;
- Pertinent history/observation for use in re-screening/referral;
- Parent notification of normal/abnormal results;
- Tracking logs by type of screening;
- Reminder forms to re-contact parent/guardian, and;
- Statistical reports by screening for use in program evaluation.

A number of sample forms have been included. All sample forms may be duplicated. Referral forms should include district information (e.g., on letterhead).

Screening programs must continually be reviewed for quality assurance purposes if they are to produce valid results and appropriate referrals. To assure quality, the school nurse should:

- Have equipment calibrated at least yearly, and maintain it properly;



- Document adequate training of volunteers and paraprofessionals;
- Ensure the best environmental conditions for screening, e.g., minimal ambient noise;
- Adhere to established screening protocol;
- Complete follow-up of referrals to extent possible; and
- Periodically evaluate the screening program for validity and reliability.



Resources

The nurse has a responsibility to identify the health professionals at the local, regional, and state levels that are qualified to evaluate suspected hearing problems. In addition to local health care providers, families may need a referral to an audiologist. These professionals usually work in hospitals and ear, nose, and throat (ENT) physician offices. Major hospitals with extensive audiology services; i.e., Children's Mercy in Kansas City, St. Louis Children's, St. John's in Springfield, and University Hospital in Columbia; have audiologists on staff. These offices could also make referrals for audiologists in private practice. Other resources for assistance with hearing problems include:

- MO HealthNet (state subsidized children's health insurance for low-income families)
- Speech and hearing clinics, university based and private
- Missouri School for the Deaf

MO HealthNet

If a parent indicates there is a financial barrier to following up on the recommendation, the first step is to determine if the student is financially eligible for assistance through the Mo HealthNet program operated by the Missouri Department of Social Services, Division of Medical Services. This is a program for low-income families. Access to the program is through the local Division of Family Services (DFS). If a parent/guardian does not have a Medicaid card for the student and is interested in exploring this, they should be provided with an application to complete and send to the DFS office. Many children eligible for the free/reduced lunch program will qualify. Many schools have personnel trained to facilitate this process. The Managed Care Plus (MC+) program will pay for evaluation, diagnosis, and treatment. The financial criteria changes on a yearly basis. The current eligibility requirements may be obtained through the local DFS office.

University Speech Pathology and/or Audiology Programs

Central Institute of the Deaf
Speech and Hearing Clinic
818 South Euclid
St. Louis, MO 63110
(314) 454-2613

St. Louis University
Department of Communication Disorders
Speech and Hearing Center
3750 Lindell Blvd.
St. Louis, MO 63108
(314) 977-3365



Central Missouri State University
Speech and Hearing Clinic
Warrensburg, MO 64093
(660) 543-4993

Southeast Missouri State University
Center for Speech and Hearing
One University Plaza
Cape Girardeau, MO 63701
(573) 651-2150

Fontbonne College
6800 Wydown Blvd.
St. Louis, MO 63105
(314) 889-1458

Missouri State University
Speech and Hearing Clinic
901 South National
Springfield, MO 65804
(417) 836-5274

Lincoln University
Lafayette and Marshal
Jefferson City, MO 65101
(573) 751-2325

Cardinal Glennon Children's Hospital
1465 S. Grand Blvd.
St. Louis, MO 63104
(314) 577-5671

Northeast Missouri State University
Speech and Hearing Clinic
Health Sciences Building
Kirksville, MO 63501
(660) 785-7414

University of Missouri- Columbia
Speech and Hearing Clinic
301 Lewis Hall
Columbia, MO 65201
(573) 884-2940

St. Joseph Institute for the Deaf
1809 Chesterfield
St. Louis, MO 63017
(636) 532-3211

Missouri School for the Deaf

The Missouri School for the Deaf has a number of resources available to schools and families. Any Missouri resident, 0-21 years of age, can receive an audiological evaluation at no charge. In addition, there is an outreach coordinator who assists schools with children who have hearing impairments. Individuals can rent hearing aids, and schools can rent sound field frequency modulation systems and auditory trainers by the school year. If a family has hearing needs, they can be directed to contact:

Missouri School for the Deaf Resource Center
505 East 5th Street
Fulton, MO 65251
Phone 573-592-2543
www.msd.k12.mo.us/resources



In addition, some school health programs have developed resources at the local level to assist families in obtaining care for which no other source of funding has been identified. This may be medical emergency funds, church groups, or local organizations, such as Optimist Clubs. It is helpful to provide the parents with a list of appropriate referral sources as part of the referral process.

Websites related to hearing:

General information:

www.nlm.nih.gov/medlineplus/
www.noah.health.org
www.entcolumbia.org/childscrn.htm
www.aafp.org/afp/20030601/practice.html
www.kidshealth.org/kid/health
www.health.discovery.com/diseases
<http://specialchildren.about.com>
www.lib.uiowa.edu/hardin/md/oto
www.teachersfirst.com/deaf
www.hearingloss.org
www.otikids.com

Hard to test (infants and children):

www.med.umich.edu/childhearinginfo
<http://www.cincinnatichildrens.org/patients/child/health>

Noise induced hearing loss:

Nidcd.nih.gov/health/hearing/

Hearing aids:

<http://deafness.about.com/cd/hearingaids/>
www.hearingaidhelp.com



HEARING GLOSSARY

Ambient Noise—Background noise present in the screening area.

Amplification—The use of hearing aids and other electronic devices to increase the loudness of a sound so that it may be more easily received and understood.

ANSI—American National Standards Institute.

ASHA—American Speech-Language-Hearing Association.

Audiogram—A graph on which a person's ability to hear the safest sound at different frequencies is recorded.

Audiologist—A professional who specializes in preventing, identifying and assessing hearing impairments as well as managing any non-medical rehabilitation of individuals with hearing loss.

Audiometer—An instrument used to measure hearing.

Auditory Nerve—The eighth cranial nerve in the human body. The auditory nerve is the nerve of hearing that sends signals from the cochlea to the brain.

Automated Auditory Brainstem Response/ABR—A non-invasive test that measures responses in the brain waves to auditory stimulus. This test can indicate whether or not sound is being detected, even in an infant. This test may also be referred to as Brainstem Auditory Evoked Response (BAER), Brainstem Evoked Potential (BSEP), and Brainstem Evoked Response (BSER).

Binaural—Pertaining to both ears.

Calibration Checks—Methods to determine the accuracy of an audiometer. The two primary methods are:

- Biological - Checking the hearing in one ear with the right and left headphones.
- Electronic - Measurement of the absolute sound pressure levels of each frequency and other characteristics, e.g. harmonic distortion, frequency count, rise-fall time.

Cerumen—The wax like secretion found within the external auditory canal; ear wax.

Cochlea—Snail shaped, fluid-filled capsule, which contains the organ of hearing.



Cochlear Implant—An electronic device surgically implanted in the inner ear to stimulate nerve endings (cochlea) in order to receive and process sound and speech.

Compliance—A measurement taken during tympanometry showing the excursion of the eardrum as a function of sound reflected back to the tympanometer under varying pressures.

Conductive Hearing Loss—A hearing impairment due to “problems” in the outer and/or middle ear, which prevents air-borne sound from being conducted to the cochlea.

Congenital Hearing Loss—Hearing loss present at birth or associated with the birth process, or which develops in the first few days of life.

Decapascals (daPa)—The unit of measurement of the pressure used in tympanometry. The usual measured range is from +200 daPa to –400 daPa.

Decibel (dB)—Logarithmic unit that expresses the intensity of a sound.

ENT—A medical doctor who specializes in the ears, nose, and throat. Sometimes referred to as an otolaryngologist, or otologist.

Electronic—Measurement of the absolute sound pressure levels of each frequency and other characteristics, e.g., harmonic distortion, frequency count, rise-fall time.

External Auditory Canal—Includes auricle and external meatus up to the tympanic membrane or ear canal.

Frequency—The number of vibrations per second of a sound. Frequency is expressed in Hertz.

Hertz (Hz)—The unit of measurement that specifies the frequency of a sound wave. Often referred to as the pitch of the sound.

Hearing Aid—An electronic device that conducts and amplifies sound to the ear.

Hearing Level—The amount of hearing loss indicated by audiometry and measured in terms of decibels for any given frequency; may be used synonymously with “hearing threshold level” (HTL).

Hearing Loss—Varies greatly from person to person. The American Speech-Language-Hearing Association (ASHA) classifies hearing loss as follows:

0-20 dB—normal

21-25 dB—slight

26-40 dB—mild



41-55 dB—moderate
56-70 dB—moderately severe
71-90 dB—severe
91+ dB—profound

High Risk—Children who have one or more of the risk factors known to impact hearing.

Incus (anvil)—The middle bone of the ossicular chain.

Inner Ear—Made up of the cochlea, semi-circular canals, and vestibules.

Intensity—The loudness of a sound, measured in decibels (dB).

Loudness—The psychological correlate of intensity.

Malleus (hammer)—The first bone of the ossicular chain; it is attached to the eardrum.

Mastoid—The hard bony area of the temporal bone just behind the auricle.

Middle Ear—The portion of the ear from the eardrum (tympanic membrane) to the inner ear.

Mixed Hearing Loss—A combination of conductive and sensorineural hearing loss.

Myringotomy—Surgical opening of the ear drum with or without insertion of a ventilating tube.

Noise—Any sound that is unwanted, undesired, or interferes with one's hearing.

Ossicles—Three small bones in the middle ear cavity; malleus, incus, and stapes.

Otitis Media—Inflammation of the middle ear or eardrum.

Otoacoustic Emissions (OAE)—This test evaluates hearing in infants and young children who cannot be tested using common methods. The test measures sound that is reflected back into the ear canal. It uses a computer to analyze responses.

Otoscope—Instrument to examine the ear canal and eardrum.

Outer Ear—The part of the ear from the pinna to the eardrum (tympanic membrane) consisting of the auricle and external auditory canal.

Pinna—Outer ear, sometimes called the auricle.



Pitch—The psychological correlate of frequency.

Play Audiometry—Special technique used to screen hearing of young children and/or developmentally delayed individuals.

Pure Tone—A tone of a single frequency produced by an audiometer. A pure tone contains no harmonics or overtones.

Screening Audiometry—Hearing test procedures used to identify individuals in need of further hearing evaluation. Also called Sweep Screening.

Sensorineural Hearing Loss—A type of hearing loss due to pathology of the inner ear (cochlea) or the nerve pathway from the inner ear (cochlea) and/or nerve of hearing to the brain stem. Sensorineural damage is usually irreversible.

Stapes (stirrup)—The third and smallest bone of the ossicular chain.

Threshold—The softest (minimum) hearing level at which an individual is able to respond to a tone at least 50 percent of the time.

Tubes—See Ventilation Tubes.

Tympanic Membrane—A thin membrane between the external auditory canal and the middle ear cavity, it moves in response to sound waves and sets the ossicular chain into motion.

Tinnitus—Inner ear sounds (ringing, buzzing, or roaring) perceived from possible damage to nerve cells.

Tympanogram—The visual representation (results) of tympanometry.

Tympanometry—An instrument that measures the movement of the tympanic membrane and middle ear system under varying air pressures.

Unilateral Hearing Loss—A mild to profound hearing loss in one ear.

Ventilation Tubes—Small plastic or metal tubes inserted through the eardrum to drain fluid from the middle ear cavity and to equalize air pressure in the middle ear.



References

- American Speech-Language-Hearing Association. (2002). *Appropriate School Facilities for Students with Speech-Language-Hearing Disorders* [Technical Report]. Available from www.asha.org/policy.
- American National Standards Institute. (2002). *Acoustical performance criteria, design requirements, and guidelines for schools (ANSI S12.60-2002)*.
- American Speech-Language-Hearing Association. (1995). *Acoustics in educational settings*. ASHA Suppl. 14, 15.
- American Speech-Language-Hearing Association. (1996). *Guidelines for audio logic screening*. Rockville, MD: Author.
- American Speech-Language-Hearing Association. (2002c). *Guidelines for audiology service provision in and for schools*. Rockville, MD: Author.
- Bess, F., Dodd-Murphy, J., & Parker, R. (1998). Children with minimal sensorineural hearing loss: Prevalence, educational performance, and functional status. *Ear and Hearing*, 19, 339–354.
- Crandell, C., & Smaldino, J. (1995). Acoustical modifications within schools. In C. Crandell, J. Smaldino, & C. Flexer (Eds.), *Sound-field FM amplification: Theory and practical applications* (pp. 83–92). San Diego: Singular Publishing.
- Crandell, C., & Smaldino, J. (2000). Room acoustics for listeners with normal-hearing and hearing impairment. In M. Valente, H. Hosford-Dunn, & R. Roeser (Eds.), *Audiology: Treatment* (pp. 601–623). New York: Thieme Medical Publishers.
- Educational Audiology Association. (2000, Spring). FAQs about classroom acoustics. *Educational Audiology Review*, 17(2), 8–9.
- Florida Department of Education. (1995a). *Improving classroom acoustics (ICA): In-service training manual*. Tallahassee: Author.
- Florida Department of Education. (1995b). *Improving classroom acoustics (ICA): In-service training transparency master manual*. Tallahassee: Author.
- Nisker, A., Kieszak, S., Holmes, A., Esteban, E., Rubin, C., & Brody, D. (1998). Prevalence of hearing loss among children 6 to 19 years of age: The third national health and nutrition examination survey. *Journal of the American Medical Association*, 279(14), 1071–1075.
- Rehabilitation Act of 1973. 29 U.S.C. § 792 et seq.
- Roeser, R. (1995). Screening for hearing loss and middle ear disorders in the schools. In R. Roeser & M. Downs (Eds.), *Auditory disorders in schoolchildren* (3rd ed., pp. 76–100). New York: Thieme Medical Publishers.
- Sieben, G., Gold, M., Sieben, G., & Ermann, M. (2000). Ten ways to provide a high-quality acoustical environment in schools. *Language, Speech, and Hearing Services in Schools* 31, 376–384.
- Oklahoma State Department of Health, (1994, revised 2012). *Guidelines: A School Hearing School Program*.



Appendix A

Ear Anatomy

The ear receives sound waves that are processed and transmitted to the hearing center in the brain for interpretation. The ear is divided into three parts: 1) outer, 2) middle, and 3) inner.

The outside ear consists of the auricle, or pinna, and external auditory canal. The auricle, or visible part of the ear, directs and concentrates the sound waves along the external ear canal to the tympanic membrane. The ear canal contains hairs and wax producing glands that serve to protect the eardrum from dirt, insects, or foreign matter. The tympanic membrane is a thin diaphragm that completely closes the end of the ear canal and separates the outer ear from the middle ear.

The middle ear is a tiny, air-filled cavity between the eardrum and the bony wall of the inner ear, and contains the three smallest bones, called ossicles. The first bone in the ossicular chain is the hammer (malleolus) which is attached to the eardrum. The anvil (incus) fits between the hammer and the third bone, known as the stirrup (stapes). The footplate of the stapes is set in the window of the inner ear. A passage between the middle ear and the back of the nose (eustachian tube) serves as a means for equalizing air pressure and ventilating the middle ear cavity.

The inner ear contains the sensory organ for balance (including the semi-circular canals), as well as, the organ for hearing known as the cochlea. The cochlea resembles a snail shell in appearance and is filled with fluid. Sound vibrations from the eardrum are transmitted through the ossicular chain to the oval window to the fluid in the cochlea. The sound sets in motion thousands of hair-like sensory cells in the cochlea called the organ of corti. These sensory cells transform fluid movements into electrical impulses and, by a series of complicated processes, transmit them to the auditory nerve to the brain, where they are perceived as sound.

The school nurse must know and understand the anatomy and physiology of the ear if she/he is to understand the results of hearing tests. Interpretation of the findings of the hearing test is often based on the structure and functioning of the ear and its many parts.

Normal Hearing and Hearing Loss–Defined

- **Normal Hearing**–Normal hearing occurs between -10 decibels and 20 decibels (loudness of sound). The ability to hear is more developed at birth than the ability to see. There is a normal developmental progression in the ability of an infant to respond to sound.
- **Description and Types of Hearing Loss**
 - 1) **Conductive Impairments**-Any dysfunction of the outer or middle ear is termed a conductive impairment of hearing. In other words, the difficulty is not with the



perception of sound, but with the conduction of sound to the analyzing system. Conductive hearing loss results from injury to the outer ear, the eardrum, the hearing bones, or the middle ear space. This type of hearing loss can usually be corrected by medicine or surgery. Hearing aids are often helpful with this type of loss if not otherwise corrected.

Causes of conductive hearing impairments:

- Wax buildup;
- Objects lodged in the ear drum (plastic toys, seeds, insects, etc.);
- Damage to the ossicles behind the ear drum;
- Infections of outer or middle ear; and
- Fluid buildup in the middle ear.

2) **Sensorineural Hearing Impairment**-When the loss of hearing function is due to pathology in the inner ear, or along the nerve pathway from the inner ear to the brain stem, the loss is referred to as a sensorineural impairment. In other words, sound is conducted properly to the fluid of the inner ear, but it cannot be analyzed or perceived normally. This loss can be discovered at any age. This type of hearing loss may be a sign of a serious illness and should not be neglected. Hearing aids are usually helpful with this type of hearing loss. Medication and/or surgery are usually effective treatment options for sensorineural hearing impairment. High frequency sounds tend to be more affected, although some congenital losses affect all tones equally. Cochlear implants have been helpful for some individuals, especially if implanted early in childhood.

Causes of Sensorineural Hearing Impairment:

- Damage during fetal development or at birth;
- Familial-hereditary factors;
- Infections;
- Certain medications;
- Certain diseases;
- Prolonged exposure to excessive noise;
- Head injuries; and
- Aging.



- 3) **Mixed Hearing Impairment**-In some instances, an individual may exhibit symptoms of both conductive and sensorineural hearing loss. For example, a child with a congenital sensorineural hearing loss may also have some degree of conductive hearing loss due to otitis media. A patient with a mixed impairment shows some loss by bone conduction, but a greater loss by air conduction.

- 4) **Unilateral Hearing Impairment**-An individual may have normal hearing in one ear and a hearing loss in the other ear that could impact learning. These children may benefit from hearing aids or a sound field system.

Educational Implications

There are many factors that affect the speech/language abilities and academic success of each child. Some children have severe loss, very intelligible speech and make good grades. Other children with very mild loss and little family support exhibit considerable academic failure. Labels such as mild, moderate, severe, or profound, based on the pure tone thresholds, do not predict handicap or academic success. The possibility of hearing loss, however mild, needs to be evaluated to assure attention to a learning barrier. Being able to hear all sounds is important when learning to read. Any loss, no matter how mild, needs to be evaluated in order to assure attention to any barrier of learning.

Federal programs exist in all states to assist families and children with early-identified hearing concerns. In Missouri, the First Steps program is designed for children, birth to age 3, who have delayed development or diagnosed conditions that are associated with developmental disabilities. Deafness and hearing impairments are one of the eligibility criteria that qualify young children to receive free services through this program.



Appendix B

Assessment Schedule

Hearing screening begins at birth and continues throughout life. The majority of states (including Missouri) currently conduct newborn hearing screenings. The following schedule lists the methods of screening appropriate for individuals at different ages. As the age of the person being screened changes, so should the screening protocol. Specific program guidelines may differ from the following recommendations:

Age	Appropriate Screening
At Birth	High Risk Register Criteria Observational Screening (Startle Response) Parental screening Questions A-C Otoacoustic Emissions Screening Auditory Brainstem Response
Birth to 6 Months	High Risk Register Criteria Observational Screening (Startle Response) Parental Screening Questions A-C Otoacoustic Emissions Screening Auditory Brainstem Response
7-12 Months	High Risk Register Criteria + Supplemental Questions Parental Screening Questions A-C Observational Screening Tympanometry Otoacoustic Emissions Screening
13-18 Months	High Risk Register Criteria + Supplemental Questions Parental screening Questions A-E Observational Screening Tympanometry Otoacoustic Emissions Screening
19-24 Months	High Risk Register Criteria + Supplemental Questions Parental Screening Questions A, F and G Observational Screening Tympanometry Otoacoustic Emissions Screening
25-36 Months	High Risk Register Criteria + Supplemental Questions Parental Screening Questions A, F and G Otoacoustic Emissions Screening Pure Tone audiometric Screening Conditioned Play Audiometry Tympanometry
3-6 Years	High Risk Register Criteria + Supplemental Questions Pure Tone Audiometric screening Conditioned Play Audiometry Tympanometry
6 Years and Older	Health History Pure tone audiometric screening Tympanometry



Appendix C

History Related to Hearing

A variety of conditions may put a child “at risk” for developing hearing problems after birth. Some children with significant hearing loss are identified after 1 year of age when behaviors may indicate inability to hear. Children with a health history that includes the following conditions should be observed for the development of a hearing loss.

1) High Risk Register (for early childhood screening)

Some babies may be identified at birth as being “at risk” for hearing impairments. The following is a list of criteria to indicate infants who might be considered at risk:

- a) Family history of any blood relative with childhood hearing impairment;
- b) Rubella or other nonbacterial transplacental infection (e.g., cytomegalovirus infection, herpes infection, syphilis);
- c) Defects of the ear, nose, or throat. Malformed, low-set or absent pinnae, cleft lip or palate (including sub mucous cleft), any residual abnormality of the otorhinolaryngeal system;
- d) Birthweight less than 1500 grams;
- e) Bilirubin level greater than 15 mg/100 ml serum or exchange transfusions;
- f) Significant asphyxia associated with acidosis, as determined by attending physician, and proven meningitis;
- g) Low Apgar Scores (zero to three at five minutes, zero to six at ten minutes);
- h) Respiratory distress;
- i) Physical features associated with syndromes that include progressive hearing loss; and
- j) NICU stay greater than five days.

If one or more of the criterion are present, refer the infant to the appropriate health care professional.

2) Supplemental Questions

- a) Did the child receive a Newborn Hearing Screening?
- b) Does the child presently have a continuous or recurrent ear infection?
- c) Has the child suffered from any of the following: meningitis, encephalitis, cerebral palsy, mumps, head injury, chemotherapy, or birth defects?
- d) Was the child in an intensive care nursery after birth?



3) Parental Screening Questions

- a) Have you had any worry about your child's hearing?
- b) When he is sleeping in a quiet room, does he move and begin to wake up when there is a loud noise?
- c) Does he turn his head directly toward an interesting sound or when his name is called?
- d) Is he beginning to repeat some of the sounds that you make?
- e) By 15 months, can he use three or four words correctly, other than "mama and dada?"
- f) Can he identify familiar pictures when you name them?
- g) Does he name things when he wants them, like candy or juice?





Appendix D

Observational Screening for Hearing Problems

Techniques for screening are indicated below and are intended for use in a well-baby clinic, physician's office, parent's home, or for children who can't be conditioned to an audiometer. The screener should be trained to do the observational screening, and have the appropriate materials.

- Select a quiet room for screening with little distraction from the outside.
- Have several noisemakers available—squeeze toys, bells, rattles, etc. Select these carefully to provide a variety of pitch and intensity levels.
- Seat the mother on a chair with the child on her lap. A colorful toy should be available as a distraction, but it should not be too attractive or it will engage the entire attention of the child.
- The screener kneels at a 45-degree angle to the side of the child, with the distracting toy in one hand and the noisemaker well hidden in the other. When the toy held in front of him engages the baby's attention, the screener makes a sound with the noisemaker in the hand, held close to the floor, out of the peripheral vision of the child. If an orientation response is seen after one or two presentations of the sound, the screener moves to the other side. The screener will learn by experience that for the 0 to 4 month age level, the noisemaker must be presented loudly; by 6 to 9 months, it can be presented more softly; and by 10 to 12 months, it should be made as soft as possible.

The expected response is some sort of head turn toward the sound. An exact description of the head turn and accompanying eye movement should be noted. A normal-hearing child's orientation to sound will progress as follows:

- Newborn-arousal from sleep, or eye widening, eye blinking;
- 3 to 4 months-rudimentary head turn, a wobble of the head even slightly toward the sound;
- 4 to 7 months-localization to side only;
- 7 to 9 months-localization to side and indirectly below;
- 9 to 13 months-localized to side and below;
- 13 to 16 months-localized directly to all signals to side, below, and above; and
- 21 to 24 months-locates directly to a sound at any angle.



Interpretation of Observational Screening

When there appears to be no response, the screener should repeat the use of a particular stimulus at his discretion until the observer is satisfied that the failure to respond is genuine. Two repetitions should be adequate to establish this fact.

It must be kept in mind that the failure of the child to locate the sound does not always indicate that the child did not hear it. The simple fact that the child may not be interested in that particular sound can account for the lack of response. For this reason, more than one stimulus in a particular pitch range should be available for use at the discretion of the screener. In addition, it is important to conduct the screening when the infant or child is otherwise alert and calm.

Referral Criteria for Observational Screening

In making the observations previously described, a hearing loss should be suspected if the child does not respond appropriately on either side, or if he orients to the wrong side. The child who deviates markedly in these behaviors should be referred for further testing.

Tympanometry, or pneumatic otoscopy, and rescreening of failures may significantly reduce false positives and over-referrals. An infant who fails these additional tests should be referred to an appropriate health care professional.



Appendix E

Screening Students for Dual Sensory Loss

Students who are born deaf, or have a profound hearing loss should be screened for the possibility of the genetic disorder, Usher syndrome. This condition is of very low incidence (three to six percent of the deaf population have Usher's) but the condition, if present, will progress to total blindness. The individual develops retinitis pigmentosa (RP), usually in adolescence. It is important to identify these students as early as possible in order to prepare them for the future. Deaf students may function well using sign language or lip reading, but when they lose their vision, they must develop other means of communication. Students identified with Usher syndrome are often referred to special centers where they learn communication skills and mobility before they become totally blind.

If there are students in the population who are congenitally or profoundly deaf, it is helpful to complete the Usher Syndrome Screening Checklist. This checklist can rule out more than 99 percent of the students who might need further screening. The Vision Screening Guidelines contain the checklist and directions to test for balance (vestibular dysfunction), dark adaptation, and loss of peripheral vision that occurs with RP.

There are three types of Usher syndrome:

- 1) Type I congenitally deaf (up to 90 percent of Usher syndrome)
 - Impaired balance
 - Retinitis Pigmentosa
- 2) Type II moderate to severe hearing loss (up to 10 percent of Usher syndrome)
 - Normal balance
 - Retinitis Pigmentosa
- 3) Type III progressive hearing loss, normal at birth
 - Fifty percent have balance problems
 - Retinitis Pigmentosa
 - Possible mental retardation

Not all students with a hearing loss and RP have Usher syndrome. Type II and III will be mainstreamed in schools, so it is important to remember this possibility when reviewing your hearing screening results.

There is no cure for Usher syndrome and no way to prevent it, but you can screen high-risk students. If you find there is reason for concern after doing the additional screening by history and expanded vision and balance testing, the family should be contacted and a referral made for diagnostic testing.



Appendix F

Missouri History Related to Hearing Screening

Each year, nearly 80,000 newborns are added to Missouri's population. Children born in Missouri receive a Newborn Hearing Screening, as required by law (effective January 1, 2002), to detect hearing loss present at birth. All hospitals delivering babies must now assure a screening is performed prior to discharge. Parents who object to the screening based on religious reasons must document their refusal in writing. Informational materials must be provided to the parents prior to the screening describing the procedures and following the screening for those infants who fail. The Department of Health and Senior Services (DHSS) shall establish standards for screening, records maintenance and the development of follow-up procedures for newborns with reported hearing loss. Information maintained in this system shall be kept confidential. A newborn hearing screening advisory committee assists DHSS in developing rules, reporting forms and procedures, educational materials, and program evaluation forms. For a variety of reasons, e.g., equipment failure, home births, etc., newborn screenings may not occur; however, the vast majority (greater than 90 percent) will have been screened.

The purpose of the Missouri Newborn Hearing Screening Program (MNHSP) is to assure all babies born in Missouri receive a hearing screen and appropriate follow-up, including audiologic evaluation, enrollment into early intervention, and medical intervention, when indicated. Statistics show that three newborns per 1,000 have some degree of permanent hearing loss. Congenital hearing loss is more common than cleft lip or Down syndrome. Early identification of hearing loss and enrollment in appropriate intervention services during the first 6 months of life allows children who are deaf or hard of hearing to take advantage of the critical first few years of life, when language (spoken or signed), is acquired and allows children to develop language at a level equal to that of their hearing peers.

Currently, the MNHSP employs two regional representatives (RRs) who follow-up each newborn who missed or failed the hearing screen. The RRs contact the parents of newborns who need to return for an initial screen, a rescreen, or obtain an audio logic evaluation. Additionally, they contact birth hospitals and primary care physicians to obtain screening results that were not submitted to DHSS. Their goal is to ensure infants are screened no later than one month after birth, diagnosed by 3 months of age, and enrolled into early intervention no later than 6 months of age.

The MNHSP successfully collaborates with numerous entities. The MNHSP works with the Department of Elementary and Secondary Education in order to acquire data about the intervention services children with hearing loss receive through First Steps, Missouri's Part C program. Additionally, Missouri State University provides a contract audiologist consultant who advises the MNHSP in audiological matters and who is available to provide assistance to newborn hearing screening programs throughout the state. All Missouri birth facilities and audiologists report hearing screening and evaluation results to MNHSP, as required by state statute.



APPENDIX G

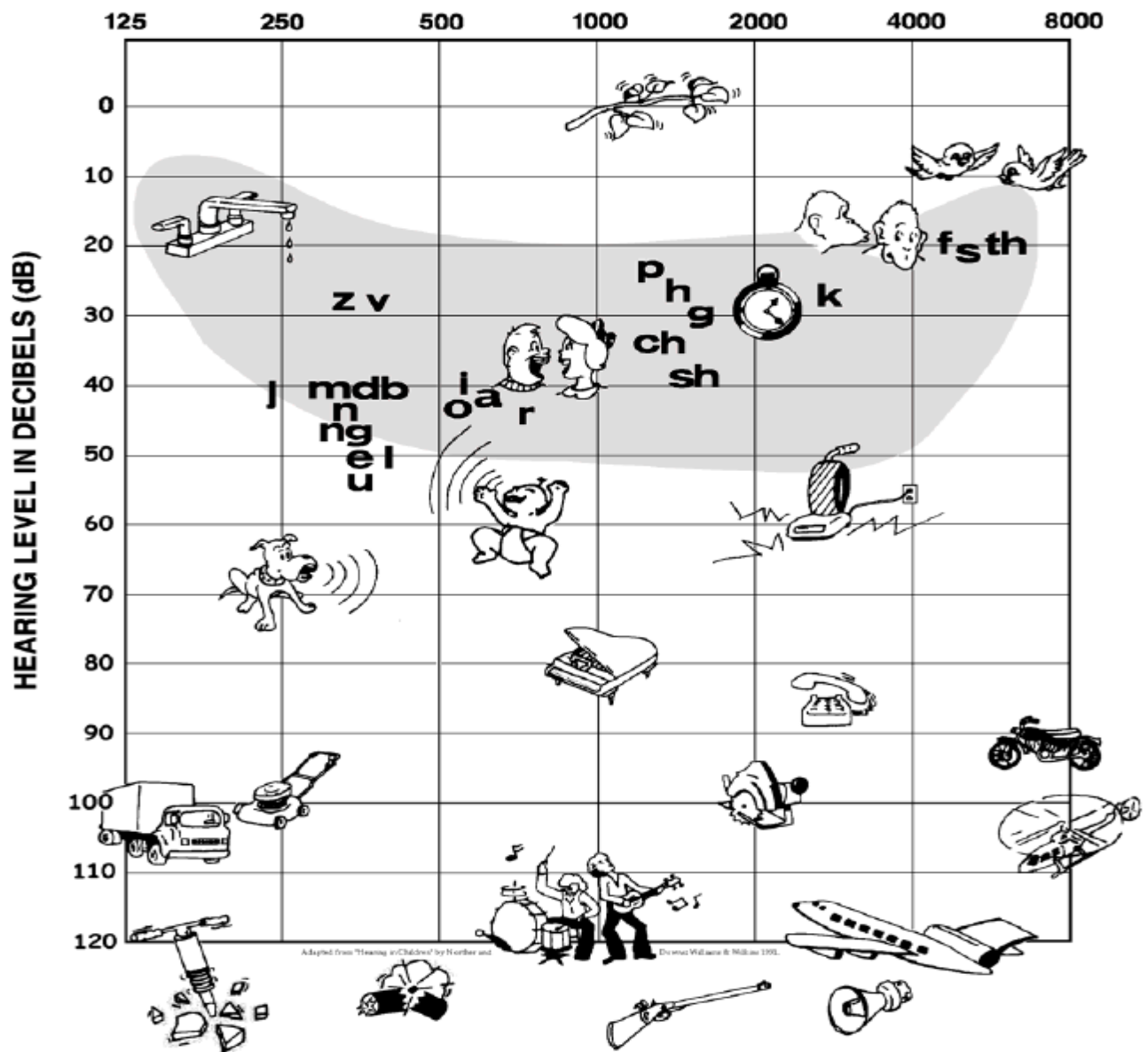
Diagrams and Forms:

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Statistical Report	43



AUDIOGRAM OF FAMILIAR SOUNDS

FREQUENCY IN CYCLES PER SECOND (Hz)



AMERICAN
ACADEMY OF
AUDIOLOGY

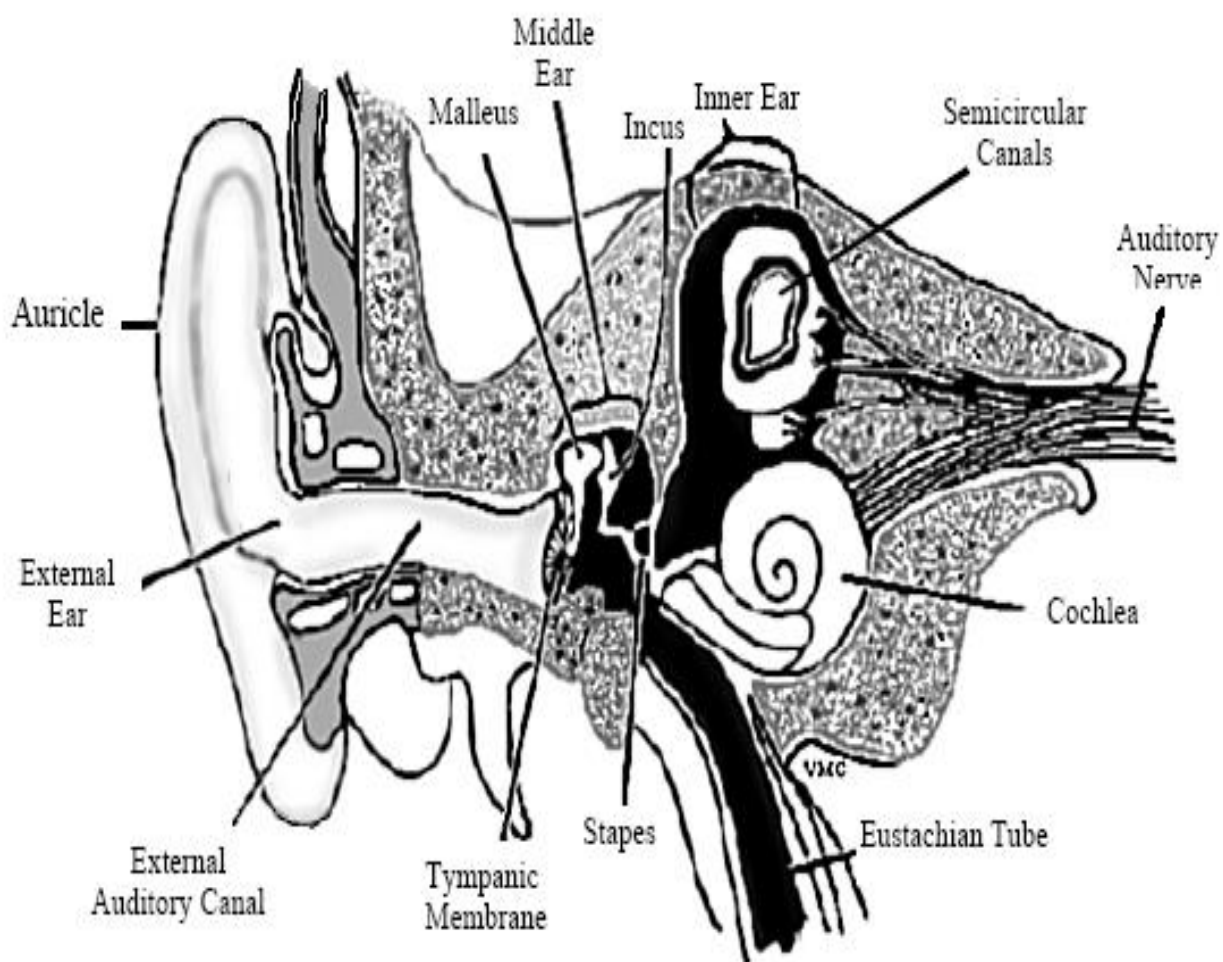


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Diagram of the Ear





Individual Screening Form

Name		Grade	
Date		Decibels	
Frequency	Right	Left	
1,000			
2,000			
4,000			

Individual Screening Form

Name		Grade	
Date		Decibels	
Frequency	Right	Left	
1,000			
2,000			
4,000			

Individual Screening Form

Name		Grade	
Date		Decibels	
Frequency	Right	Left	
1,000			
2,000			
4,000			

Individual Screening Form

Name		Grade	
Date		Decibels	
Frequency	Right	Left	
1,000			
2,000			
4,000			



HEARING SCREENING PROGRAM Re-screening Worksheet

Name _____ Age _____ Grade _____ Teacher _____

Parents _____ Address _____

Phone _____ Health Care Provider _____

Conditions Indicative of Possible Hearing Loss: (teacher observations and health history)

- _____ Repeated colds
- _____ Cold today
- _____ Sore throat today
- _____ Discharge from ear more than once
- _____ Discharge from ear today

Frequent earaches:
R _____ L _____ Both _____

Date of Re-screen _____ decibels		
Frequencies	R	L
1,000		
2,000		
4,000		

- _____ Complains of loud, constant ringing in the ears
- _____ Hearing problems or deafness in family
- _____ Inattentive
- _____ Slow responding
- _____ Repeating grade
- _____ Says “huh?” or “what” often
- _____ Speech defect “baby talk”
- _____ Omits letters
- _____ Substitutes letters
- _____ Garbled speech
- _____ Distorted speech
- _____ Too soft
- _____ Too loud
- _____ Too high pitched
- _____ Too low pitched

Tympanometry			
	P	F	Type Curve
R Ear			_____
L Ear			_____

Referred by nurse to:

- _____ Family
- _____ Primary Care Provider
- _____ ENT Specialist
- _____ Speech/Language Pathologist
- _____ Audiologist
- _____ Other

Parent/Guardian Notification of Screening Completion

Your child, _____, has participated in the
Hearing Screening Program in our school on _____, of this year.

At this time, he/she has no apparent hearing problems.

Please contact us if you have questions about your child's hearing.

School Administrator/Nurse

Your child, _____, has participated in the
Hearing Screening Program in our school on _____, of this year.

At this time, he/she has no apparent hearing problems. Children may have temporary difficulty
hearing due to colds, allergies, or prolonged exposure to loud noise.

Please contact us if you have questions about your child's hearing.

School Administrator/Nurse

(Suggested Content for Referral Letter to Parent)

(Date)

(Address)

(City, State, Zip)

Dear Parent:

The School Health Services program routinely screens students for possible hearing problems in order to identify any barrier to learning that might be corrected. Screening programs to find students with possible problems and to refer them to the appropriate health care provider are important for these reasons:

1. Temporary hearing loss causes students to miss crucial instructions in the classroom;
2. Parents may not be aware of a child's mild hearing loss in every day home situations;
3. Even mild losses may interfere with learning new vocabulary, which is critical for success in reading;
4. Hearing loss is invisible and the child may be blamed for "not paying attention;"
5. Hearing loss may be a sign of ear disease; and
6. Children with very mild losses or loss only in one ear may be experiencing school failure.

Your child failed our screening and rescreening for hearing problems. We feel it is important to your child's school success to have a professional evaluation for this. If a problem is found and corrected, it may help your student do better in his schoolwork. Enclosed is a referral form to take to your doctor if we suspect a medical problem, or an audiologist, if that is more appropriate.

It is important to us to know what is found on the professional examination, so we would appreciate your returning the form to us, with the results of the exam.

Sincerely,

School Nurse

(School or Health Services letterhead)

Screening Tracking Form

SCHOOL	BUILDING	ROOM NUMBER
--------	----------	-------------

STUDENT INFORMATION		
STUDENT NAME	AGE	GRADE
PARENT NAME	ADDRESS (INCLUDING CITY, STATE & ZIP)	

Your child has participated in the hearing screening program in our school this year, on _____.

_____ Findings indicate a possible problem.

_____ It is recommended that your child be evaluated by a physician for medical problems that may be interfering with the ability to hear.

_____ It is recommended that your child be evaluated by an audiologist or speech-language pathologist to determine the nature of the problem.

If you have questions, please contact _____ / _____
School Nurse Phone

OBSERVATIONS – Check all that apply.

BEHAVIOR		SYMPTOMS		SPEECH		HISTORY	
Often says “huh?” or “what”		Discharge from ears		Speaks too loud or too soft		Seasonal allergies	
Is slow in responding		Complains of earaches		Distorted speech		Frequent upper respiratory infections	
Inattentive		Complains of ringing in ears		Turns one ear to speaker		History of hearing loss in family	
						History of past concerns re: hearing	

RESULT OF SCREENING (Specify type of screening test)					
A. SCREENING	DATE		B. RESCREENING	DATE	
Results of hearing screening			Results of hearing rescreening		
FREQUENCY	RIGHT	LEFT	FREQUENCY	RIGHT	LEFT
1,000			1,000		
2,000			2,000		
4,000			4,000		
6,000 (optional)			6,000 (optional)		
			Tympanometry (See Attached graph)		

OBSERVATIONS	OBSERVATIONS
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(Continue on back)

This student was screened in the school setting using a pure tone audiometer/and or tympanometry (impedance unit). Screening was done at _____ decibels. The student failed the screening and rescreening process. In addition, any other concerns are noted above. It is important that your evaluation results be communicated to the school, as they are essential for our completion of follow-up. We will be happy to assure any recommendations are implemented, and give support to the family regarding this problem and any resulting treatment. You may send the report with the parent, or mail to this address:

SCHOOL NURSE: PLEASE COMPLETE THE FOLLOWING:

SCHOOL NURSE'S NAME	SCHOOL NAME
SCHOOL NURSE'S ADDRESS (INCLUDING CITY, STATE AND ZIP)	PHONE NUMBER (INCLUDE AREA CODE)

RELEASE OF INFORMATION FORM

To the physician:

Please provide the school nurse named above with the results of this evaluation so that the school may be informed and make any necessary adaptations and/or do monitoring of condition.

Signature of Parent/Guardian

Date



**MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES
DIVISION OF COMMUNITY AND PUBLIC HEALTH
Section for Community Health and Chronic Disease Prevention
Community Health & Wellness**

**PO Box 570
Jefferson City, MO 65102-0570
(573) 522-2822**

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TDD users can access the above phone number by calling 1-800-735-2966