HEARING SCREENING GUIDELINES

The purpose of this document is to provide standard procedures for hearing screening for use by ACSLPA registered members and support personnel. ACSLPA’s Professional Practice-Audiology Committee reviewed the Identification Audiometry (Screening) SHAA 2001 document in light of existing research in 2006/2007 and obtained member input in 2007. ACSLPA Council approved these procedures in January 2008. The procedures are subject to periodic review and revisions.

This information represents the consensus professional opinion on the appropriate conduct of hearing screening at the time the document was produced (November 2007). A companion document has been attached to assist with the identification of risk factors for hearing loss (JCIH Risk Indicators).

PERSONNEL

By definition of a screening program, professionals performing the measurements of hearing screening need not be clinical audiologists, but rather, may be speech-language pathologists, speech-language pathologist assistants, audiology assistants, public health aides, etc. However, screening programs and personnel involved should be trained by and in contact with (as per ASHA, 1985) a clinical audiologist who has training and experience related to the test procedures that may affect the desired outcome results.

WHO SHOULD BE SCREENED/WHO IS EXCLUDED?

Any child, preschool (three years old) and older may be screened. Any person difficult to test (or if the tester is unable to perform conditioned play audiometry) or who demonstrates conditions associated with hearing impairment (see below) shall automatically be referred to an audiologist for full audiological assessment. (See Flow Chart, attached).

I. CASE HISTORY AND VISUAL INSPECTION

Ideally, a thorough case history should be obtained prior to screening and must include a signed consent and completed questionnaire from the caregiver. When visual inspection of the individual is considered suspect (i.e. drainage, anatomical abnormalities), medical referral is warranted; therefore, hearing screening is not necessary. Referral for comprehensive audiological assessment may still be appropriate. Any child or person experiencing the following shall be excluded from screening and referred (see Flow Chart, attached):

- already under the care of an otolaryngologist/ENT specialist or audiologist
- chronic/recurrent ear infections
- otorrhea (drainage) and/or blood discharge from the ear canal

Procedure: Hearing Screening Guidelines (Jan 2008)
II. PREPARATION

The acoustic environment for hearing screening is very important. The room should be as quiet as possible. In determining whether or not a room is quiet enough for screening, close the door and listen for the following: hum from overhead lights, fan/heating/air conditioning noise, intrusion of street noise, etc. The examiner must perform a listening check of the instrument in order to determine if the room is quiet enough. A soundproof environment would be preferable to conduct hearing screenings, but may not be available.

A. Performing a Function/Listening Check of the Equipment *

The audiometer is an electronic instrument designed to measure the sensitivity of a person’s hearing. It is calibrated to produce pure tones at various frequencies (cycles per second, Hertz or Hz) in order to measure hearing loss in decibels (dB HL). The examiner should carry out the following procedure each time the audiometer is set up:

1. Plug in the audiometer.
2. Ensure that the headphone jacks are properly plugged into the right (red) and left (blue) sockets.
3. Turn the power switch on.
4. Listen to each headphone at the 20 dB intensity level, for each frequency – 1000, 2000, and 4000 Hz. The examiner should place the headphones on their head and sweep through the test frequencies. Assuming the hearing of the examiner is normal, if they can hear the tones at 20 dB at all frequencies, then the child being tested should also detect the tones at the appropriate level (20 dB HL).

* This procedure must be carried out each time the equipment is set up.

III. SCREENING PURE TONES

Protocol
(Adapted from the American Speech-Language Hearing Association (ASHA) Guidelines, 1997).

1. Children from age three years and older may be screened in this manner.
2. Test frequencies are 1000, 2000, and 4000 Hz.
3. Screening level is 20 dB HL (ensure ambient noise levels are sufficiently low to allow testing to be completed).

4. Any consistent type of response is acceptable (i.e. hand raising, verbal response, etc.). With younger children, a conditioned play audiometry technique may be used. Any two positive responses from three presentations shall be considered a “pass”.

5. Failure to respond to two or three tones, presented at any frequency, at the screening level in either ear constitutes a failure.

6. Referral of a child who fails the screening should be made to an audiologist at a health centre close to the family.

7. Appropriate calibration of equipment and monitoring of background noise levels is essential.

**Procedure**

**A. Detailed Screening Procedure**

This procedure should be followed by the examiner each time screening is attempted:

1. The audiometer should be plugged in or turned on and a listening check must be done before use. The red light marked “Power On” must come on (if available).

2. Check inside the audiometer to be sure that the red (right) plug and blue (left) plug are in the correct red and blue sockets and are fully inserted.

3. The screening is completed using three tones: 1000, 2000, and 4000 Hz at 20 dB. The intensity level can remain constant for the entire test.

4. It is very important to instruct the child carefully. Explain to the child that he/she must let the examiner know when a sound is heard. The child should raise his/her hand for as long as the sound is heard, and put it down when the sound disappears.

5. The instructions should emphasize the importance of responding right away even if the beep sounds far away. Ask the child to listen carefully. Play audiometry would be approached slightly differently (child who is not yet able to raise his/her hand when the beep is heard).

6. The audiometer should be positioned with the control panel facing the examiner. The child should be seated on a chair, facing away from the tester, in such a way that the child cannot see the tester’s hand while he/she is operating the audiometer.

7. Remove glasses if worn. Brush the hair behind the ears.

8. Place headphones over the child’s ears (red phone on right ear and blue phone on left ear) adjusting the headband so that the small round diaphragm in the middle of the headphone is directly opposite the ear canal.
B. Presentation of the Stimulus

Examiners should follow these presentation instructions each time screening is attempted. Children may require prior preparation for conditioned play audiometry.

1. Begin with the right ear.
2. Set the frequency dial to 1000 Hz and the intensity to 50 dB.
3. Press the button for the right ear and hold for three seconds, observing the response.
4. If the child responds, then reduce the intensity to 20 dB and present the tone again.
5. Pause between presentations for at least three seconds. The interval time between tones should be irregular (short and long) to avoid having the child anticipate a rhythm and guess when the tone should be heard.
6. Present each tone three times at the same intensity (20 dB). At least two positive responses out of three presentations constitutes a pass at that frequency. Remember that the child must pass each test frequency (1000, 2000, and 4000 Hz) in each ear in order to pass the overall screening.
7. Next, turn the frequency dial to 2000 Hz and follow the same procedure.
8. Turn the frequency dial to 4000 Hz and repeat the procedure.
9. Press the button for the left ear and repeat the procedure starting at step 6.
10. Repositioning the headphones and careful re-instruction may reduce the number of failures.

C. Preparing a Child for Conditioned Play Audiometry

Any number of tasks may be used in conditioned play audiometry (e.g. putting a block or small toy in a bucket or large container, placing a piece of puzzle in a puzzle board or placing pegs in a pegboard). The task must be appropriate to the child’s dexterity and age.

Place the headphones on the child and hand him/her a peg. Set the intensity level to 50dB and present the tone in the test ear, at 1000Hz for two to three seconds. The tester should demonstrate an appropriate response the first few times the tone is presented, to ensure the child understands the task. Once the child responds appropriately, reduce presentation level to 20dB and continue (see Presentation of the Stimulus, step 4).

If the tester is unable to perform conditioned play audiometry, the child shall automatically be referred to an audiologist for audiological assessment.
IV. RECORDING RESULTS (PASS / FAIL CRITERIA)

1. The results of the pure tone hearing screening are to be recorded on a Hearing Screening Form (Alberta health regions may provide such forms).

2. Place “P” for pass or “F” for fail under the appropriate box for each frequency for the right and left ear for pure tone testing. Remember that an individual must respond positively to at least two of the three 20 dB tones presented at each frequency to pass the screening for that ear. If the chart supplied below is used, the shaded areas represent positive responses for each frequency for each ear. Therefore, all shaded boxes must have a circle around the + sign for the child to pass the screening.

<table>
<thead>
<tr>
<th>Chart for Hearing Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 Hz</td>
</tr>
<tr>
<td>Right Ear</td>
</tr>
<tr>
<td>Left Ear</td>
</tr>
</tbody>
</table>

V. REFERRAL PROCESS (See Flow Chart, attached)

1. Any child who fails a hearing screening or is suspected of hearing loss is routinely referred, with the caregiver's permission, for further audiological assessment by an audiologist.

2. Inform the caregiver of the screening result. If a child has failed the screen or was uncooperative, indicate to the caregiver that with his/her permission you will make a referral to an audiology facility for follow-up. Let the caregiver know that he/she will be contacted by that facility to arrange an appointment at his/her convenience.

3. For children who have failed the screen, forward the results to the audiology facility to which the client is being referred. It is important to send the completed form as soon as possible so that follow-up can be arranged promptly. If unable to conduct the hearing screen, for whatever reason, please note that in the “comments” section of the form.

VI. AUDIOLOGY SERVICES

Audiology services for those who fail the hearing screening are available in most regional health authorities. Know your referral location for audiology services.

VII. CARE AND MAINTENANCE OF EQUIPMENT

An audiometer is a delicate electronic instrument and should be treated with care. The following suggestions are recommended to ensure consistent operation of the equipment:

1. Every audiometer should be calibrated according to the ANSI Standard at least once per year (last date of calibration will be indicated on a sticker on the unit).
2. A functional listening check should be performed each time the equipment is used in order to ensure that it is functioning properly. This takes only a few minutes and is worth the time that might otherwise be wasted if the equipment is not functioning optimally.

3. The headphones require special care, as they are delicate devices. Damage to headphones can be irreparable. NEVER substitute another set of headphones for the set that is regularly used with the audiometer. Every audiometer is calibrated for a specific set of headphones. A different set of headphones cannot be used unless the audiometer is re-calibrated.

Please be careful to avoid the following:
- Dropping the headphones
- Snapping the headphone cushions together
- Pressing the headphones down on a flat surface
- Poking sharp objects into the diaphragm of the headphone
- Water damage to the headphones

4. Damaged or cracked ear cushions need to be replaced to ensure optimum fit and environmental sound reduction. Headphones that have lost their “spring” or become difficult to resize need to be replaced.

A. Cleaning of the Audiometer

The headphones should be cleaned after each use by wiping the rubber ear cushions and the headband with an antiseptic towelette. DO NOT use an alcohol wipe as this will dry out the cushion and cause it to crack.

B. Effects of the Environment

Certain extreme environmental conditions may be detrimental to the performance of the equipment. Be sure to avoid the following:

1. **Extreme heat:** NEVER leave the equipment resting on a radiator or near any other sources of extreme heat. DO NOT leave the equipment inside the car where it would be exposed to direct sunlight in hot weather. Extreme heat can cause serious damage to electronic equipment.

2. **Extreme cold:** Resistance to electrical current flow decreases as temperature decreases. The acoustic output of the audiometer will be affected if it has been sitting in a cold car. Delicate crystals in the microprocessor-based equipment can be damaged if the equipment is used when it is extremely cold. Always allow time for the equipment to warm up to room temperature before turning on the audiometer.

3. **High humidity:** Do not expose the equipment to high moisture levels as this can damage the internal components.

Procedure: Hearing Screening Guidelines (Jan 2008)
C. Storage and Transportation

- Do not leave the equipment switched on with the cover in place as this may cause overheating and damage internal components.
- When transporting the equipment in a car, please ensure that it is protected from vibration. Avoid sudden stops, drops, jolts or bumps.
- Keep the headphones inside the audiometer when not in use.

REFERENCE

HEARING SCREENING PROCEDURE FLOWCHART

Audiometer Check
Can tester hear a 20dB tone at 1000, 2000 and 4000 Hz?

YES

Case History

• Followed by, or referred to, an ear, nose and throat (ENT) physician
• Followed by an audiologist

No contraindications for screening

Perform visual inspection of the ear

• Foreign body in the ear canal
• Outer ear and ear canal abnormalities
• Drainage and/or blood from the ear

Does the client respond consistently at 50 dB at 1000 Hz?

YES

Perform hearing screening

• Can hear 20 dB tones at 1000, 2000 and 4000 Hz in both ears

Pass hearing screening
• No further action

NO

NO CONCERNS

• Sudden hearing loss
• Outer ear and ear canal abnormalities

Do not screen
• Refer to an audiologist and a physician

CONCERNS

• Pain in the ear
• Chronic/recurrent ear infections

Do not screen
• Refer to an physician

Does the client respond consistently at 50 dB at 1000 Hz?

FAIL

Fail hearing screening
• Refer to an audiologist

Test responses are inconsistent or questionable

Pass hearing screening
• No further action

Misses one or more frequencies (<2/3) in either ear

Refer to an audiologist

January 2008
RISK INDICATORS FOR HEARING LOSS

This document serves as a companion to Hearing Screening Guidelines (ACSLPA, 2008). These risk indicators were specified in the Year 2007 position statement of the Joint Committee on Infant Hearing (JCIH). Presence of any of these indicators places an infant at risk for progressive or delayed-onset sensorineural hearing loss and/or conductive hearing loss.

The following risk indicators apply to neonates (birth through age 28 days):

- An illness or condition requiring admission of 48 hours or greater to a NICU
- Stigmata of other findings associated with a syndrome known to include a sensorineural and/or conductive hearing loss
- Family history of permanent childhood sensorineural hearing loss
- Craniofacial anomalies, including those with morphologic abnormalities of the pinna and ear canal, and preauricular tags or pits
- In-utero infection such as cytomegalovirus (CMV), syphilis, herpes, toxoplasmosis, or rubella

The following risk indicators apply to neonates or infants (29 days through two years):

- Parental or caregiver concern regarding hearing, speech, language, and/or developmental delay
- Family history of permanent childhood hearing loss
- Stigmata or other findings associated with a syndrome known to include a sensorineural or conductive hearing loss or Eustachian tube dysfunction
- Postnatal infections associated with sensorineural hearing loss including bacterial meningitis
- In-utero infections such as cytomegalovirus (CMV), herpes, rubella, syphilis, and toxoplasmosis
- Neonatal indicators – specifically hyperbilirubinemia at a serum level requiring exchange transfusion, persistent pulmonary hypertension of the newborn associated with mechanical ventilation, and conditions requiring the use of extracorporeal membrane oxygenation (ECMO)
- Syndromes associated with progressive hearing loss such as neurofibromatosis type II, osteopetrosis, and Usher’s syndrome
- Neurodegenerative disorders, such as Hunter syndrome, or sensory motor neuropathies, such as Friedreich’s ataxia and Charcot-Marie-Tooth syndrome
- Head trauma
- Recurrent or persistent OME for at least three months
- Chemotherapy (JCIH, 2007 pp. 921)

Important Note: The JCIH (2007) risk indicators were the most current and widely accepted at the time Hearing Screening Guidelines [ACSLPA, 2007] was published. Individuals conducting hearing screenings are encouraged to contact a clinical audiologist to ensure that these risk indicators remain current before utilizing them in a screening program.

REFERENCE


JCIH Risk Indicators (Nov 2007)