

HEARING HEALTH INFORMATION FOR WYOMING MEDICAL PROFESSIONALS

From Screening to Diagnosis: For Infants, Toddlers, and Preschoolers

The Wyoming Early Hearing Detection and Intervention (EHDI) Program has compiled the following information related to the needs of children with hearing loss. Hearing plays a vital role in a child's development. Children learn speech and language from listening to people around them. If a hearing loss exists, a child is not able to receive optimal benefit from spoken language, and as a result, delays in speech and language may occur. It is important that even the slightest hearing loss be identified and managed. Hearing loss in infants and children needs to be addressed with timely and appropriate audiological, medical, and developmental/ educational intervention.

Joint Committee on Infant Hearing "1-3-6 EHDI Plan"

1 - Hearing screenings, and when necessary a rescreening, for all newborns should be completed by **1 month** of age.

3 - A diagnostic hearing evaluation by an audiologist specializing in pediatrics should be completed by **3 months** of age if the newborn did not pass the newborn hearing screening.

6 - Early Intervention (EI) must be initiated by **6 months** of age if a newborn is diagnosed with a hearing loss. The child should be referred to EI as soon as possible after diagnosis of the hearing loss.

Medical Home Instruction Checklist

- ✓ At 1st Well-Baby Visit – Review hearing screening results on hospital discharge summary.
- ✓ If Newborn Hearing Screening results indicate a referred or missed/incomplete screen, the baby should return to the birthing hospital within two weeks for a rescreen.
- ✓ If the baby has failed two newborn hearing screenings he/she should be referred for a hearing evaluation including a diagnostic Auditory Brainstem Response (ABR) evaluation by an audiologist specializing in pediatrics.

Late Onset Hearing Loss (LOHL) and Progressive Hearing Loss

LOHL is when a child develops a hearing loss sometime after birth but before entering kindergarten. The child may pass his/her hearing screening at birth, and then develop hearing loss later in life.

- Between the newborn period and school age, the incidence of hearing loss in children triples.
- Children who develop late onset hearing loss often fall into a grey area, as parents and health care providers fail to recognize that the child has a hearing loss. The intricate link between speech and hearing is a fundamental cornerstone of a child's academic and social success. Ruling out hearing loss as soon as possible is necessary for continued development.
- The most common risk factors for LOHL or a progressive loss include: CMV, Meningitis, Syndromes, head trauma, recurrent Otitis Media with effusion and family history of hearing loss.

Infants with Hearing Loss

When infants with hearing loss receive timely and appropriate diagnostic and early intervention services, they are more likely to have positive speech, language, and listening outcomes.

3 – "E"s

Early Identification: Identification of a hearing loss at the earliest possible age.

Early Amplification: If elected by the family, fitting the child with hearing aids and consistent use of hearing aids for access to sound.

Early Intervention: Participation in an appropriate early intervention program leads to better outcomes for children and families.

Amplification

Cochlear Implants

- Cochlear Implants are devices that are implanted surgically, consisting of external and internal components. An eligible child can be implanted at 12 months of age (after a 6-month hearing aid trial).
- Approximately 3-4 weeks after surgery the Cochlear Implant device is activated.
- Sounds are gradually programmed (mapped) into the device allowing the child access to sound and speech.

Hearing Aids

- Hearing aids provide amplification of speech and sound.
- Children can be fit with hearing aids as early as 1-month of age.
- The results of an age appropriate pediatric diagnostic hearing evaluation are used to determine the hearing aid programming.
- Children may progress to be a candidate for a cochlear implant (depending on the type, degree and progressive nature of their hearing loss).

Early Intervention

"Research compared children with hearing loss who receive early intervention and amplification before 6 months of age versus after 6 months of age. By the time they enter first grade, children identified earlier are 1-2 years ahead of their later-identified peers in language, cognitive, and social skills." Source: Yoshinaga-Itano, C., Sedey, A., Apuzzo, M., Carey, A., Day, D., & Coulter, D. (July 1996).

Middle Ear Health

A conductive hearing loss can result from the presence of middle ear fluid. Until the fluid is cleared, hearing levels may fluctuate and create a risk for listening and learning. A conductive loss can also impact a child's language and behavior. From birth to three years old hearing health problems are especially significant because they may delay language and speech development.

It is extremely important that the middle ear health of children with pressure equalization tubes, hearing aids, and cochlear implants be monitored on a regular basis.

Screening & Evaluating Hearing in Wyoming Infants Toddlers, and Preschoolers

Hospital Newborn Hearing Screening

It is strongly recommended that all babies have a Newborn Hearing Screening prior to being discharged from the hospital birth stay. In Wyoming, newborn hearing screening is supported via legislation. Hearing screenings are completed unless parents object or waive the screening.

- The hearing screening, in all 21 Wyoming birthing hospitals, is completed using an Automated Auditory Brainstem Response (AABR). The AABR screening works by recording brain activity in response to sounds. The AABR is part of the EEG.
- The AABR equipment sends a series of clicking sounds through headphones. Three electrodes are placed on the newborn's head and the leads are connected to the computer equipment. If the newborn's auditory response matches the algorithm in the computer the newborn passes the screening. If the auditory response does not match the algorithm the newborn fails the hearing screening.

Child Development Center Hearing Screening

In the first few years of life, hearing is a critical part of a child's social, speech, language, and cognitive development. Even a mild or temporary hearing loss may affect a child's ability to speak and understand language.

Hearing Screenings can be performed at the local Child Development Centers. The screenings consist of the following:

- Using an otoscope for a cursory visualization of the ear canal and eardrum.
- Immittance screening which reflects the function of the middle ear system.
- Screening hearing using either Otoacoustic Emissions (OAE) or Puretones. An OAE is an objective, reliable screening of cochlear function. If a response is present, the outer hair cells of the cochlea are functioning normally, suggesting normal peripheral hearing. A Puretone screening involves having the child respond to tones at 20dBHL at 1000, 2000 and 4000Hz.

Pediatric Hearing Evaluations

If an infant/child fails two hearing screenings he/she will be referred for a hearing evaluation. The evaluation should be completed by a pediatric audiologist who is equipped to complete a hearing evaluation for babies and young children that meets the standards outlined by the Joint Committee on Infant Hearing (www.jcih.org). The components of the hearing evaluation include:

- **Diagnostic Auditory Brainstem Response (ABR)** - At least one ABR test is recommended as part of a complete audiologic diagnostic evaluation for children younger than 3 years for confirmation of permanent hearing loss. An ABR is an electrophysiological measurement that allows the audiologist to obtain information about the condition of the inner ear and/or auditory nerve. This is a non-invasive, painless test administered while the child is in natural sleep. Some clinical/hospital settings will offer sedation. Electrodes are placed behind the child's earlobes and forehead. A sound comprised of various tones is delivered to the child's ear through the use of an insert ear phone. The child's brainstem response is measured. It is a critical procedure in the initial test battery because it is an accurate and reliable predictor of hearing loss in infants who are too young to respond to behavioral testing. The ABR measurement provides information on the degree, type, and configuration of a hearing loss and allows the audiologist to fit an infant with a hearing aid when needed.
- **Otoacoustic Emissions (OAE)** - A cochlea that is functioning normally produces low-intensity, measurable sounds called OAEs. OAEs are absent when an infant/child has a sensorineural hearing loss of 30dBHL or greater. It is important to note that middle ear fluid or negative middle ear pressure associated with otitis media can interfere with OAE measurement. The middle ear must be clear for OAE equipment to accurately assess cochlear functioning. During testing, a probe containing a sound generator, filter, and recording microphone is sealed into the ear canal. The speaker delivers the stimulus while the microphone samples the emission following stimulus presentation. The emission is recorded and displayed in graphical representation.
- **Behavioral Testing** - When a child is old enough to demonstrate a behavioral response to sound, the audiologist will test the child in a sound booth. His/her response to sound at different frequencies and decibels will be recorded. This test is useful to determine precise thresholds at specific frequencies for each ear.
 - For infants 6 – 36 months of age, visual reinforcement audiometry (VRA) is recommended in addition to the tests described above. In VRA assessment, the infant/child is seated on a caregiver's lap in a sound treated booth. The child is conditioned to turn toward a toy (one that lights up and/or moves) when he/she hears a sound at low, mid, and high frequencies. When this testing is used, a complete audiogram can be obtained.
 - After 3 years of age, a toddler may be trained for conditioned play audiometry (CPA). In this assessment, the audiologist teaches the child to drop a ball in a bucket (or engage in some other enjoyable activity) when he/she hears a tone. CPA usually results in a complete individual ear audiogram by both air and bone conduction.

Although universal newborn hearing screening is designed to identify infants who have congenital hearing loss, it is important to acknowledge that some infants may have a hearing loss that is not detected at birth and become more severe over time (progressive loss). Other children experience a permanent hearing loss at some point after birth (late-onset or delayed-onset loss). If a child has unilateral, mild, or chronic conductive hearing loss or is "at risk" for progressive or delayed-onset hearing loss, audiologic monitoring is recommended.

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