



Diagnostic Audiology for Infants 0-6 months

Idaho Sound Beginnings, Idaho's Early Hearing Detection and Intervention (EHDI) Program, recommends a comprehensive audiologic evaluation of all infants referred by the newborn hearing screening program by 3 months of age¹. This protocol is based on guidelines set forth by the Joint Committee on Infant Hearing (JCIH) 2007 statement and was developed by Idaho Sound Beginnings, in conjunction with the National Center for Hearing Assessment and Management (NCHAM).

Comprehensive evaluations should be completed by audiologists experienced in pediatric hearing assessment. The initial test battery to confirm hearing loss *must* include physiologic measures and, when developmentally appropriate, behavioral methods.

Confirmation of an infant's hearing status requires:

- A battery of audiologic test procedures to:
 - ◆ assess the integrity of the auditory system in each ear;
 - ◆ obtain an estimation of hearing sensitivity across the speech frequency range;
 - ◆ determine the type of hearing loss;
 - ◆ establish a baseline for further monitoring;
 - ◆ provide information needed to initiate amplification device fitting.

A comprehensive assessment must be completed on both ears, even if only one ear 'failed' the hospital screening.

Evaluation: Birth to 6 months of age

- Child and family history, including newborn screening results and the presence of any risk indicators.
- Otoscopy
- A frequency-specific threshold assessment of the auditory brainstem response (ABR) using air-conducted tone bursts.
 - Obtain at least 1 (one) low frequency & 1 (one) high frequency response.
- Click-Evoked ABR using both condensation and rarefaction single-polarity stimulus, to evaluate neural integrity. Obtain threshold to the click stimulus.*
 - Obtain bone conduction thresholds when indicated.*
- Distortion product and/or Transient evoked otoacoustic emissions (OAE).
- Tympanometry using a 1000Hz probe tone
- Clinical observation of infant's auditory behavior and check of auditory milestones as a cross-check, in conjunction with electrophysiologic measures.

** Refer to: ISB Best Practices Protocol, "Guidelines to ABR Parameters for Infants"*

For Audiologic Mentoring, Training or Support, contact:

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Audiology Assessment for Risk Factor Follow-up

“The timing and number of hearing re-evaluations for children with risk factors should be **customized and individualized depending on the relative likelihood of a subsequent delayed-onset hearing loss.**”
(JCIH 2007 Position Statement)

Early and more frequent assessment may be indicated for children with: cytomegalovirus (CMV) infection, **syndromes** associated with progressive hearing loss, **neurodegenerative** disorders, trauma, culture-positive **postnatal infections** in association with sensorineural hearing loss; for children who have received **ECMO** or **chemotherapy**; and when there is a **caregiver concern** or a **family history** of hearing loss (JCIH 2008 clarification)

Recommended *Minimum* Standards:

Behavioral testing at 6/9 months of age**

All testing should be ear-specific

Tests included in this evaluation are:

- Family/child history
- Otoscopy
- Visual Reinforcement Audiometry for each ear:
 - Minimal Response levels for air conduction: 500, 2000 and 4000 Hz
 - Bone conduction as needed to rule out conductive pathology
 - Speech Awareness Thresholds (SAT)
- Otoacoustic Emissions, DPOAE and/or TEOAE
- Immittance battery:
 - 226 Hz and/or 1,000 HZ probe tone, as appropriate.
 - Acoustic Reflexes, as appropriate.
- ABR testing is indicated, if hearing loss is diagnosed, or if responses to behavioral audiometry are not reliable.

Based on: American Speech-Language-Hearing Association. (2004). *Guidelines for the Audiologic Assessment of Children from Birth to 5 Years of Age*. [Guideline]. www.asha.org/policy

The recommendation for the initial risk factor evaluation to be done at **9 months of age is based on the following factors:

- The ease of testing using Visual Reinforcement Audiometry for the child and family. and
- The ability to gather the greatest amount of information quickly with minimal repeat visits, balanced with...
- The ability to identify and address hearing losses and caregiver concerns early enough during the critical “language learning period” to maximize communication skills and minimize speech and language delays.

Risk Indicators Associated with Permanent Congenital, Delayed-onset, or Progressive Hearing Loss in Childhood

1. **Caregiver concerns** regarding hearing, speech, language or developmental delay
2. **Family history** of permanent childhood hearing loss.
3. Neonatal intensive care of more than 5 days or any of the following regardless of length of stay: **ECMO**, assisted ventilation, exposure to ototoxic medications (gentamycin/tobramycin) or loop diuretics (furosemide/Lasix) and hyperbilirubinemia requiring exchange transfusion.
4. In utero infections: **CMV**, herpes, rubella, syphilis, and toxoplasmosis.
5. Craniofacial anomalies, including those that involve the pinna, ear canal, ear tags, ear pits, and temporal bone anomalies.
6. Physical finding, such as a white forelock, that are associated with a syndrome known to include a sensorineural or permanent conductive hearing loss.
7. **Syndromes associated with hearing loss** or progressive or late onset hearing loss such as neurofibromatosis, osteopetrosis and Usher syndrome; other frequently identified syndromes including Waardenburg, Alport, Pendred, and Jervell and Lange-Nielson.
8. **Neurodegenerative disorders**, such as Hunter syndrome, or sensory motor neuropathies, such as Friedreich ataxia and Charcot-Marie-Tooth syndrome.
9. **Culture-positive postnatal infections associated with sensorineural hearing loss**, including confirmed bacterial and viral (especially herpes viruses and varicella) meningitis.
10. Head trauma, especially basal skull/temporal bone fractures that requires hospitalization.
11. **Chemotherapy**

Risk factors **bolded** are considered to have a greater concern for delayed onset hearing loss and monitoring of those children should be **more frequent** than once following the neonatal period.

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Principles and Guidelines for Early Hearing Detection and Intervention Programs:
Appendix 2. Joint Committee on Infant Hearing
2007 Position Statement (www.icih.org)