

OREGON EARLY HEARING DETECTION and INTERVENTION (EHDI) NEWBORN HEARING SCREENING PROTOCOL

National recommendations indicate that each infant is to be screened before ONE month of age; hearing loss identified by THREE months of age and enrolled in early intervention services by SIX months of age.

POLICY

Oregon Revised Statute 433.321 Hearing screening tests for newborns:

(1) In all Oregon hospitals and birthing centers with more than 200 live births per year, each newborn child shall receive a newborn hearing screening test within one month of the date of birth. A hospital or birthing center shall attempt to conduct the test required under this subsection prior to the discharge of the child from the facility.

(2) All Oregon hospitals and birthing centers with fewer than 200 live births per year shall provide the parent or guardian of a newborn child with the appropriate information furnished by the Oregon Health Authority concerning the importance of newborn hearing screening tests.

PERSONNEL

Newborn Hearing Screening Program Coordinator: Every birth hospital or birth center shall designate an employee to be their Newborn Hearing Screening Program Coordinator. It is recommended that this employee be an audiologist. If the coordinator is not an audiologist, then each birth hospital or birth center should have access to an audiologist for consultation. Each coordinator shall act as liaison between their facility and the Oregon State EHDI Program.

Newborn Hearing Screeners: Only those individuals who undergo comprehensive newborn hearing screening training on protocol, equipment and communication of results shall perform hearing screens. These individuals include but are not limited to audiologists, audiology assistants, nurses, midwives, entry-level employees or volunteers.

EQUIPMENT

All newborns shall receive a hearing screen using at least one of the following:

- Automated auditory brainstem response (AABR)
- Otoacoustic emissions (OAE)

Neither method is perfect; each will miss some forms of hearing loss (i.e. mild hearing loss, neural hearing loss, or a specific frequency region loss). Both tests should be performed while the baby is asleep or quiet and does not require the infant's participation. Both tests are quick, painless, and non-invasive. Equipment shall be calibrated in accordance with manufacturer's recommendation. Disposable components of equipment shall not be re-used.

Otoacoustic Emissions (OAE): A soft tip containing a miniature earphone and microphone is placed into the baby's ear. Sounds (tones or clicks) are presented through the tip, and, in most normal-hearing ears, the cochlea generates a response to the sounds that are recorded by the microphone automatically. OAE technology reflects the status of the peripheral auditory system extending to the outer hair cells in the cochlea.

Automated Auditory Brainstem Response (AABR): A few electrodes will be placed on the baby's head to measure the brainstem's response to soft clicking or chirping sounds presented through earphones. The electrodes record neural activity generated in the cochlea, auditory nerve and brainstem in response to the sounds. AABR technology reflects the status of the peripheral auditory system, the eighth nerve, and the brainstem auditory pathway.

SCREENING PARAMETERS AND PASS CRITERIA

Screening parameters and pass criteria should be pre-set into the hearing screening equipment by the manufacturer or an audiologist. When the hearing screens are administered, a “pass” or “refer” result should automatically appear. There should be no interpretation of results by the hearing screener at time of screen.

Transient Evoked Otoacoustic Emissions (TEOAE)

- **Parameters:**
 - Stimulus type: click
 - Click rate: 50-80 per second
 - Stimulus intensity: 78-82 dB SPL
 - Frequency Region: 1500-5000 Hz

- **Pass Criteria:**
 - 70% reproducibility
 - At least 3 to 6 dB SNR (signal-to-noise ratio) for the majority of responses
 - Emission amplitudes within the normal range for a given age (Prieve, 1997)

Distortion Product Otoacoustic Emissions (DPOAE)

- **Parameters:**
 - Stimulus type: two primary pure tones, response measured at $2f_1-f_2$ for each tone pair
 - Frequency ratio (f_2/f_1): 1.22
 - Stimulus intensity: L1 65 dB SPL, L2 55 dB SPL
 - F2 Frequency region: 2000-5000 Hz

- **Pass Criteria:**
 - At least 3 to 6 dB between the noise floor and distortion product (DP-NF)
 - Emission amplitudes within the normal range for a given age (Gorga et al, 2000)
 - The majority of emissions within the 1500-8000 Hz region must meet the criteria above

Automated Auditory Brainstem Response (AABR)

- **Parameters:**
 - Stimulus type: 0.1 msec click
 - Intensity: 35 dB nHL

- **Pass Criteria:**
 - Baby’s response matched to template to determine “pass” or “refer” status.

IDEAL SCREENING CONDITIONS

- Baby is at least 8 hours old, recently fed, and sleeping or quiet with very little muscle movement
- Baby has been cleaned/washed
- Room is quiet, with no electrical interference (for AABR screening)

FACTORS AFFECTING SCREENING RESULT

- Hearing sensitivity of the baby
- Screener skill and experience
- Equipment type and functionality
- Room noise (acoustic and/or electrical)
- State of the baby
- Health of the baby
- Age of the baby

A refer may occur for **one or more** of the above reasons. Without ideal screening conditions, accurate results cannot be obtained, and require additional testing.

RECOMMENDED PROTOCOL for the WELL-BABY NURSERY

Both OAE and AABR technology are sufficient technologies for testing peripheral hearing loss of 40 dB or greater in the well-baby nursery.

The initial screening should be performed at least 12 hours after birth. This allows the infant's ears to clear of any fluid or birthing debris. If a second screen is required, an ear canal massage between screens is recommended.

Not all babies pass, so make only two valid attempts. Excessive re-screening can increase the false negative rate (passing babies with hearing loss). Even if only one ear refers, rescreen both ears. A true pass is indicated only when both ears pass during the same screening session. Wait at least 4 hours between initial screening and rescreening unless baby will be discharged before the 4 hours between screenings can elapse. Initial screening should not be completed so close to discharge that a second screening is not possible.

OAE screening in the well-baby nursery

1. Initial Screening **at least 8 hours after birth:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Repeat screening of both ears **as close to discharge as possible**
2. Inpatient Rescreening of both ears **as close to discharge as possible:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Schedule outpatient rescreening of both ears **within one month**
3. Outpatient Rescreening of both ears **within one month:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Schedule comprehensive audiologic evaluation of both ears **as soon as possible**

AABR screening in the well-baby nursery

1. Initial Screening with AABR **at least 8 hours after birth:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Repeat screening of both ears **as close to discharge as possible**
2. Inpatient Rescreening of both ears:
 - **Pass** both ears: Testing is complete
 - **Refer** either ear: Schedule outpatient rescreening of both ears **within one month**
3. Outpatient Rescreening of both ears:
 - **Pass** both ears: Testing is complete
 - **Refer** either ear: Schedule comprehensive audiologic evaluation of both ears **as soon as possible**

NOTE: AABR screening resulting in a "refer" should NOT be followed by an OAE screen.

OAE/AABR two-step screening in well-baby nursery

1. Initial Screening with **OAE at least 8 hours after birth:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Repeat screening with AABR at each ear before discharge
2. Inpatient Rescreening of both ears with **AABR:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Schedule outpatient rescreening **within one month**
3. Outpatient Rescreening of both ears with **AABR:**
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Schedule comprehensive audiologic evaluation **as soon as possible**

RECOMMENDED PROTOCOL for the NEONATAL INTENSIVE CARE UNIT (NICU)

A NICU is defined as a facility in which a Neonatologist provides primary care for the infant. Infants cared for in the NICU are at higher risk of having neural hearing loss (Auditory Neuropathy Spectrum Disorder). Therefore, the AABR is the only appropriate screening technology to use in the NICU, as the OAE does not evaluate the status of the auditory nerve or brainstem.

In the NICU, the preferred age at screening is at least 34 weeks gestational age AND at least five days of age in the NICU (if length of stay permits).

AABR screening in the NICU

1. Initial Screening with AABR:
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Repeat screening of both ears **as close to discharge as possible**
2. Inpatient Rescreening of both ears with AABR:
 - **Pass** both ears: Testing complete
 - **Refer** either ear: Schedule comprehensive audiologic evaluation **as soon as possible**

NOTE: OAE is NOT permitted for use in the NICU; the only screening method allowed is the AABR.

EXPLANATION OF RESULTS TO PARENTS

Screening results should be communicated to the families immediately by the hearing screener, or by the charge nurse or newborn hearing screening coordinator, according to hospital protocol.

Whoever communicates the results must not downplay the results of the testing, nor cause undue anxiety for the family. Screeners should be provided a script to ensure consistent information is being provided to each family, and should be coached on answering frequently asked questions, as well as who to refer the family to for more information.

A written results report shall also be given to the families and entered into the medical record. Screening should not be completed so close to discharge that discussion of results is rushed or without time to answer parent questions.

WHAT HAPPENS WHEN...

Both Ears Pass the Hearing Screening: Give the baby's family a form indicating the infant has passed their newborn hearing screen, with a list of developmental milestones related to hearing.

Either Ear Refers on the Hearing Screening: Review a form containing the screening results and next steps with the family. Have them sign the form and provide them with a copy. Alert the baby's primary care doctor of these results. The baby should be referred for follow-up testing: either an outpatient hearing screening or a comprehensive audiologic evaluation. If possible, the follow-up appointment should be scheduled prior to the baby discharging from the hospital.

Baby's Hearing Screening is Missed: Contact the family to make an appointment for the hearing screen before 30 days of age, and preferably within two weeks of discharge.

Baby's Hearing Screening is Incomplete (rescreening not performed before discharge): An appointment should be made at discharge for the baby to return to complete the hearing screen before 30 days of age, and preferably within two weeks of discharge.

Family Refuses the Hearing Screening: Have parent sign a waiver form indicating they understand the risks of declining the screening. Maintain the original copy in the infant's medical record.

REQUIRED REPORTING OF THE HEARING SCREENING RESULTS

The following information shall be reported to the Oregon EHDI Program **within 10 days** of the hearing screening, utilizing the designated reporting system (in most cases, OVERS):

1. Newborn's name, date of the birth, sex, and hospital medical identification number
2. Parent/Guardian's name, address, telephone number, and email (if available)
3. Birth facility
4. Name of the newborn's primary care provider (PCP)
5. Screening facility, test date, equipment type, results for each ear separately
6. Presence of any risk factors for hearing loss

If a hearing screening is not performed, a reason/status must be reported to the Oregon EHDI program within 10 days of the event or discharge, whichever is sooner. For example, if the family refuses the hearing screening, this information must be reported to the Oregon EHDI program within 10 days of the refusal.

If the baby is not accessible in OVERS, complete and fax the [Hearing Screening Report form](#).

CONFIDENTIALITY

Reports, records, and other information collected by or provided to the Oregon EHDI program relating to a child's newborn hearing screening and diagnostic audiologic assessment are confidential records.

Oregon EHDI Program personnel shall maintain the confidentiality of all the information and records used in its review.

No individual or organization providing information to the department in accordance with its rules shall be deemed to be or held liable for divulging confidential information.

LIABILITY

To avoid liability, each facility's equipment must be functional and calibrated. All screeners must be trained to perform the screen and counsel families appropriately. The screening equipment provides an objective result that screening staff will share with each family. No interpretation is required nor should any interpretation be provided, including suspected reason for non-pass result.

Passing the newborn hearing screening does not guarantee that a child will never have a hearing loss, nor does it guarantee that the child has normal hearing, as it is not a diagnostic test. The screening is intended to identify those infants most likely to have or be at risk for hearing loss that would contribute to developmental, educational, and/or social deficits, if not discovered and treated early in life.

RESOURCES

- **Oregon EHDI Program Website:** healthoregon.org/ehdi
- **Joint Committee on Infant Hearing (JCIH) 2007:**
<http://pediatrics.aappublications.org/content/120/4/898.full?ijkey=oj9BAleq21OIA&keytype=ref&siteid=aapjournals>
- **American Academy of Audiology (AAA) Pediatric Assessment Guidelines 2012:**
http://www.audiology.org/resources/documentlibrary/Documents/201208_AudGuideAssessHear_youth.pdf
- **American Academy of Audiology (AAA) Pediatric Amplification Guidelines 2013:**
<http://www.audiology.org/resources/documentlibrary/Documents/PediatricAmplificationGuidelines.pdf>
- **American Speech-Language Hearing Association (ASHA) Guidelines for Audiologic Assessment of Children 2004:** <http://www.asha.org/policy/GL2004-00002/>

QUESTIONS

Contact the EHDI program at **1-888-917-HEAR (4327)** or **Oregon.EHDI@state.or.us**