

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 consult. 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 hearing losses (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 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 12 hours old, recently fed, and sleeping or quiet with very little muscle movement
- Room is quiet, with no electrical interference (for AABR screening)

FACTORS AFFECTING SCREENING RESULT

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| <ul style="list-style-type: none">• Screener skill and experience• Equipment type and functionality• Room noise (acoustic and/or electrical) | <ul style="list-style-type: none">• State of the baby• Health of the baby• Age of the baby• Hearing sensitivity of the baby |
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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 as close to discharge as possible, 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 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.

OAE screening in the well-baby nursery

- Initial Screening with OAE **at least 12 hours after birth:**
 - Pass: Testing is complete
 - Refer: Repeat screening of each ear **as close to discharge as possible**
- Inpatient Rescreening of both ears with OAE:
 - Pass: Testing is complete
 - Refer: Schedule outpatient rescreening **within one month**
- Outpatient Rescreening of both ears with OAE (and AABR, if possible):
 - Pass: Testing is complete
 - Refer: Schedule comprehensive audiologic evaluation **as soon as possible, within three months**

AABR screening in the well-baby nursery

- Initial Screening with AABR **at least 12 hours after birth:**
 - Pass: Testing is complete
 - Refer: Repeat screening of each ear **as close to discharge as possible**
- Inpatient Rescreening of both ears with AABR:
 - Pass: Testing is complete
 - Refer: Schedule outpatient rescreening **within one month**
- Outpatient Rescreening of both ears with AABR:
 - Pass: Testing is complete
 - Refer: Schedule comprehensive audiologic evaluation **as soon as possible, within three months**

NOTE: AABR initial screen resulting in a “refer” should NOT be followed by an OAE screen.

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

- Initial Screening with OAE **at least 12 hours after birth:**
 - Pass: Testing is complete
 - Refer: Repeat screening with AABR at each ear
- Inpatient Rescreening of both ears with AABR:
 - Pass: Testing is complete
 - Refer: Schedule outpatient rescreening **within one month**
- Outpatient Rescreening of both ears with AABR:
 - Pass: Testing is complete
 - Refer: Schedule comprehensive audiologic evaluation **as soon as possible, within three months**

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/Auditory Dys-synchrony; 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

- Initial Screening with AABR:
 - Pass: Testing is complete
 - Refer: Repeat screening of each ear **as close to discharge as possible**
- Inpatient Rescreening of both ears with AABR:
 - Pass: Testing is complete
 - Refer: Schedule comprehensive audiologic evaluation **as soon as possible, within three months**

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

EXPLANATION OF RESULTS TO PARENTS

Screening results should be communicated to the families immediately by the hearing screener. Screeners should be careful not to downplay the results of the testing, nor cause undue anxiety for the family. A written results report shall also be given to the families. Screening should not be completed so close to discharge that a second screen is not possible or discussion of results is rushed or without time to answer parent questions. 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.

In NICU only: if the family is not present at time of hearing screening, the nurse in charge of the baby may explain hearing screening results as soon as possible. A written results report signed by the hearing screener shall also be given to the family.

WHAT HAPPENS WHEN...

Baby Passes: The baby's family is given the appropriate paperwork indicating the infant has passed their newborn hearing screen, with a list of developmental milestones related to hearing.

Baby Refers: The appropriate follow-up forms shall be completed and signed by the family. The baby shall be referred either for an outpatient hearing screen appointment using the appropriate technology or to a diagnostic facility that is on the Oregon EHDH handout.

Baby is Missed: The baby's family should be contacted to make an appointment for the hearing screen before 30 days of age, and preferably within two weeks of discharge.

Baby's Screening is Incomplete (2nd screen 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.

HEARING SCREEN WAIVER

If a parent refuses the newborn hearing screen, the parent must sign a waiver form indicating understanding of the risks of declining the screening. Maintain the original copy in the infant's medical record. Documentation of the waiver must be made in all hospital documentation processes, in the infant's Oregon Vital Events Registration System (OVERS) record as a 'Refusal' as instructed by the EHDI Program.

REQUIRED REPORTING OF THE HEARING SCREENING RESULTS

The following information shall be reported to the Oregon EHDI Program **within 10 days** of the birth of the newborn, utilizing the department's designated reporting system:

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

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.

Personnel of the Oregon EHDI Program 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:** <http://www.oregon.gov/DHS/ph/ch/hearing/index.shtml>
- **Joint Committee on Infant Hearing (JCIH) 2007:**
<http://pediatrics.aappublications.org/content/120/4/898.full?ijkey=oj9BAIeq21OIA&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/>

Further questions: Contact the EHDI program at **1-888-917-HEAR (4327)** or **oregon.EHDI@state.or.us**