Update on Newborn Hearing Screening

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Financial Disclosure Information

- I have no relevant financial relationship with the manufacturers of any commercial products and/or provider of commercial services discussed in this CME activity.

- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
Learning Objectives

- Discuss the importance / impact of early identification of hearing loss
- Describe the status of newborn hearing screening in states and nationally
- Review universal newborn hearing screening (UNHS) techniques
- State the Primary Care Physician’s role in Early Hearing Detection and Intervention (EHDI)
- Describe resources to support patient management and follow up
National Goals for Hearing Screening (1-3-6)\textsuperscript{1, 2}

- All infants will access hearing screening using a physiologic measure
  - no later than 1 month of age
- All infants not passing initial screening and subsequent rescreening should have confirmatory audiological and medical evaluations
  - no later than 3 months of age
- All infants with confirmed permanent hearing loss should receive early intervention as soon as possible
  - no later than 6 months of age
<table>
<thead>
<tr>
<th>Prerequisites for a Population Screening Program</th>
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<tbody>
<tr>
<td><strong>YES</strong></td>
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Why is early identification of hearing loss important?

- Hearing loss is the most common birth condition.
Incidence of Congenital Conditions
(Per 10,000)

<table>
<thead>
<tr>
<th>Congenital Condition Type</th>
<th>Number per 10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing loss</td>
<td>30</td>
</tr>
<tr>
<td>Cleft lip or palate</td>
<td>10</td>
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<tr>
<td>Down syndrome</td>
<td>10</td>
</tr>
<tr>
<td>Limb defects</td>
<td>5</td>
</tr>
<tr>
<td>Spina bifida</td>
<td>5</td>
</tr>
<tr>
<td>Sickle cell anemia</td>
<td>1</td>
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<tr>
<td>PKU</td>
<td>1</td>
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</tbody>
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Prevalence of Hearing Loss

- Prevalence estimates vary across studies
- Estimated that 1 to 3 per 1000 infants will have permanent sensorineural hearing loss\(^3, 4\)
  - 1/1000 from the well baby nursery
  - 10/1000 from the NICU
- Rate increases to 6/1000 by school age\(^4\)
  - Need for surveillance
Why is early identification of hearing loss important?

- Previous methods for detecting hearing loss have been ineffective
  - High risk screening failed to identify ~50% of the infants with hearing loss
  - Large retrospective cohort study\textsuperscript{5, 6}: mean age of diagnosis 21.6 months
  - Similar findings reported in US\textsuperscript{7, 8, 9}
Vocabulary Development in Infants\textsuperscript{12, 13}

Delays in babble also observed \textsuperscript{14, 15}
Reading Comprehension in Children with Mild-Mod Loss

Why is early identification of hearing loss important?

- Early identification and intervention can make a difference.
Effects of Age of Identification on Language Development

- Prospective, longitudinal study of early-identified infants
- 30 children with mild-profound hearing loss (HL) compared to 96 normal hearing (NH) controls
- Children identified ≤ 3 months had stronger language development at 12-16 months than those identified > 3 months
- Children with HL were delayed compared to NH infants
Vocabulary at Age Five by Age of Intervention

**Significant Predictors:**

- **Id Age:** 8%
- **Family Involvement:** 37%

![Graph showing vocabulary scores by age of enrollment in services.](image-url)
American Academy of Pediatrics (AAP)

- Endorsed implementation of universal newborn hearing screening in 1999
- Defined standards for:
  - Screening
  - Tracking & Follow-up
  - Identification & Intervention
  - Program Evaluation
- Encouraged AAP chapters to provide leadership in physician education and newborn screening in their states
Early Hearing Detection and Intervention (EHDI)

- Endorsed by:
  - AAP, National Institutes of Health, Maternal and Child Health, Centers for Disease Control, Joint Committee on Infant Hearing & in 2008, the USPSTF

- As of 2005, all 50 states implemented statewide EHDI programs

- As of 2006, an average of 95.7% of newborns were screened nationally
Status of Hearing Screening in Missouri
Hearing Screening Techniques

- Otoacoustic emissions (OAE)
- Auditory brainstem response (ABR)
- Two stage screening (OAE + ABR)
Otoacoustic Emissions

- Sounds are presented to the ear canal and a small microphone measures the response in the ear canal.
- Average test time is 5-15 minutes/baby.
Auditory Brainstem Response

- Sounds are presented and surface electrodes measure brainstem activity
- Average test time 20 min/baby
All babies are screened using OAEs

- Those babies who fail the OAE screening receive an ABR screening prior to leaving the hospital
- Average test time/baby (25-35 min)
- Reduces refer rate; useful when follow up is likely to be difficult or costly
- Initial cost of equipment is higher than OAE or ABR screening alone, but follow-up costs are less
2007 JCIH Position on Screening

- NICU
  - >5 days in NICU
  - ABR should be included to screen for neural loss
  - Rescreen BOTH ears, even if only one ear fails
  - Non pass – refer to Audiologist
  - Readmission – rescreen before discharge

- Well baby nursery
  - Screen with OAE or ABR
  - Repeat screen when necessary before discharge
  - When using 2 step protocol test order should be OAE then ABR
  - Rescreen BOTH ears, even if only one ear fails
Characteristics of a good screening program

- Refer rate of 1.5-5.0% in well baby nursery and slightly lower in the NICU (resulting from 2-stage screening in the hospital)
  - 5.0% = 400 babies per 8000 births
- Ongoing training and monitoring program for personnel
- Structured plan for follow up
- Ability to track program performance (important for quality assurance and for JCAHO requirements)
What if a baby fails UNHS?

- Failure rates range from 1.5-5.0% in good screening programs.

- Most babies who fail the initial screening will actually have normal hearing.
  - For 10 babies that refer, 1 is expected to have permanent hearing loss.
System challenges: Loss to Follow Up

- 8 New York hospitals,
  - 28% infants who did not pass in-hospital screening failed to return
  - Loss to follow up is as high as 50% in some states
- Return rates better for in-hospital fails than in-hospital misses
Medical Home: Strategies to Promote Follow Up

- At prenatal visit, encourage families to identify you as follow-up care location
- Inform hospital to facilitate communication of results
- Provide checkbox on newborn well child form/patient chart for hearing screening results & risk factors
- Set up tracking system for infants who do not pass hearing screening or for those infants with risk factors
Counseling Parents

- Effective communication of results to families has an influence on follow up behaviors.
- Balance between reassurance and importance of follow up testing.
- “Your child may or may not have a hearing loss…but let’s be sure about it. If further testing shows hearing loss, the earlier we get started helping the child, the better.”
Follow Up Testing

- Referral for follow-up testing
  - Repeat OAE and/or ABR screening
- If a hearing loss is still suspected...
  - Referral to a pediatric audiologist
    - Experienced in testing infants & children
    - Has appropriate equipment to test infants
  - Frequency specific ABR to estimate degree and configuration of hearing loss
    - Early testing can avoid need for sedation
Importance of Intervention in Outcomes

- Early Identification needs to be paired with early, appropriate and consistent interventions.
JCIH 2007 Follow Up Guidelines

- EHDI systems should be family-centered
- Families should have:
  - Access to information on all treatment options
  - Counseling regarding hearing loss
- Child and family should have:
  - Immediate access to hearing technologies
Amplification

- Hearing aids can be fitted as young as 1 month of age
Roles of the Medical Home

- Understand testing results at screening and diagnostic phases & implications for follow up
- Assure follow-up screening; refer for diagnostic and medical specialty evaluations (genetics, ophthalmology, etc.)
- Support family in understanding severity & type of hearing loss
- Refer to early intervention
- Offer partnership with parents to identify and develop a plan of health and habilitative care
Medical Workup

- Complete prenatal & perinatal history
- Family Hx of onset of HL < age 30
- Physical for stigmata, ear tabs, cleft palate, cardiac, skeletal, microcephaly
- Refer to ENT – consider CT of temporal bones
- Refer to Genetics and Ophthalmology
- Other: CMV, EKG, Developmental evaluation
Goals of Early Intervention

- Home based services
- Optimally, providers have experience & training with the population and work to:
  - Establish partnerships with families
  - Promote family competence & confidence in parenting child
  - Support family in providing a language-rich environment in everyday routines
  - Support family to become informed decision makers for the child
  - Conduct ongoing assessments of outcomes
    - Adjust interventions as necessary to optimize outcomes
  - Promote family access to formal and informal supports
  - Provide culturally competent services
Resources

- Early Intervention
  - Contact State EHDI Coordinator – see www.infanthearing.org
  - www.nectac.org

- Parent-to-Parent
  - www.handsandvoices.org
  - www.beginningssvsc.com
  - www.babyhearing.org

- Physician support
  - www.aap.org
  - www.medicalhomeinfo.org
Physician Resources

The National Center of Medical Home Initiatives for Children with Special Needs

http://www.medicalhomeinfo.org/screening/hearing.html

ALSO: hearing loss module on
http://www.pedialink.org

CDC Department of Health and Human Services
Centers for Disease Control and Prevention

http://www.cdc.gov/ncbddd/ehdi/
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Universal Newborn
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