Pediatric Hearing Detection and Testing
Learning Objectives

Participants will:

• Understand the importance of early identification
• Be familiar with the 1/3/6 model of early hearing detection
• Be familiar with Joint Committee on Infant Hearing guidelines
• Be comfortable knowing when to refer to an audiologist (for infants, toddlers, and school-aged children)
• Know types of testing available for infants and children including limitations of various methods of testing
• Be comfortable with various habilitation/rehabilitation options for infants and children (including hearing aids, bone conduction devices, cochlear implants, and remote microphone systems)
EHDI
Early Hearing Detection and Intervention

Anne Banger, Follow-up Coordinator
Maine Newborn Hearing Program
The Importance of Early Identification of Hearing Loss

- Hearing loss occurs more frequently than any other birth disorder
- Undetected hearing loss can have serious, negative consequences
- There are significant benefits associated with early identification of hearing loss
MNHP Program Goals

• Hearing screen by 1 month
• Audiology evaluation by 3 months
• Early intervention by 6 months
• Identification of infants at risk for hearing loss
• Medical home for all with hearing loss
• Tracking and surveillance system
Hearing screen by 1 month

Auditory Brainstem Response Audiometry (ABR)

Results
• PASS
• REFER
• PASS with Risk Factors
Audiology evaluation by 3 months

• Full diagnostic evaluation is scheduled at a Category A Audiology Facility
• Testing does not hurt
• The baby will be sleeping
• Results may take several appointments
Identification of infants at risk for hearing loss

- PASS with risk factors
- Late onset and progressive hearing loss
Early intervention by 6 months
All infants with hearing loss need the support of their primary care provider to ensure follow-up related to hearing loss needs.
Help parents understand:

• Hearing screening and evaluation process
• What PASS-REFER means
• RISK factors, if present
• Follow-up process
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Maine Newborn Hearing Program

NCHAM – National Center for Hearing Assessment and Management
http://www.infanthearing.org

The NCHAM eBook – A Resource Guide for Early Hearing Detection & Intervention (EHDI)
http://www.infanthearing.org/ehdi-ebook/

Interactive Web Based Newborn Hearing Screening Training Curriculum
http://www.infanthearing.org/nhstc/index.html
Questions?

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Evaluation and treatment of pediatric hearing disorders

Nicole Duncan, Au.D., CCC-A, PASC
Scope of Audiologist

• Professionals engaged in autonomous practice to promote healthy hearing, communication competency, and quality of life for persons of all ages through the prevention, identification, assessment, and rehabilitation of hearing, auditory function, balance, and other related systems.

• Professional responsible for the identification of impairments and dysfunction of the auditory, balance, and other related systems

• (re)habilitation services includes not only the selecting, fitting, and dispensing of hearing aids and other hearing assistive devices, but also the assessment and follow-up services for persons with cochlear implants.

• Functional diagnosis of vestibular disorders and management of balance rehabilitation

Basics of Audiometry
Who to refer?

- Infant who has not passed a newborn hearing screening
- Infant with risk factors
  - Level 1A: family history, in-utero infections, postnatal infections, craniofacial anomalies, birth asphyxia, mechanical ventilation, hyperbilirubinemia with transfusion, ECMO, chemotherapy
  - Level 1B: syndromes associated with progressive hearing loss like neurofibromatosis, Usher, Waardenburg, Alport, etc, neurodegenerative disorders, head trauma, birth weight below 1500 g, respiratory distress
  - Level 2: ototoxic medications, low birth weight of 1500-2500 g, prematurity (<37 weeks), NICU more than 5 days, hyperbilirubinemia without transfusion
- Toddlers with speech concerns or other developmental delays
- Those with difficulty understanding in background noise
- Anyone who reports tinnitus
- Anyone who reports a sudden decrease in hearing
Pediatric hearing loss statistics

- 1.4-4 per 1000 babies screened have permanent hearing loss
- 5 per 1000 age 3-5
- 14.7% of children ages 6-19
- 50-60% thought to be genetic
  - 30% of these thought to be syndromic

http://www.cdc.gov/ncbddd/hearingloss/data.html
http://www.betterhearing.org
Joint Committee on Infant Hearing

• 2000 Position Statement: All infants have access to newborn hearing screening using physiological measures
  – Screen by 1 month, diagnostic confirmation by 3 mo, services/intervention in place before 6 months

• 2007 Position Statement:
  – Screening in NICU or at risk populations – aABR
  – All rescreens - aABR (not OAE)
  – Rescreen if readmitted
    (sepsis/hyperbilirubinemia/ototoxic medications, etc)
  – At least one ABR is recommended as part of test battery for all children under 3 for confirmation of permanent hearing loss (in addition to behavioral testing)
Methods of Testing for Pediatrics

ABR (approximately 5 weeks to 5 months)
Methods of Testing for Pediatrics
Visual Reinforcement Audiometry – 6 months to 2.5 years
Methods of Testing for Pediatrics
Conditioned Play Audiometry – 2.5 years and older
Otoacoustic Emissions

Screenshots of Otoacoustic Emissions test results showing pass/fail criteria and data for both ears.
(Re)habilitation Options

Conventional hearing aids
(Re)habilitation Options
Bone anchored/ bone conduction devices
(Re)habilitation Options

Remote Microphone Systems

Cochlear Implants
Case 1: 3 month old male

- Referred on newborn hearing screening bilaterally x2
- Natural sleep ABR completed at outside center – results grossly within normal limits
- Parent uncomfortable with results and requested second opinion
Auditory Brainstem Response evaluation
Natural sleep / sleep deprived
Age: 3 months 5 days
• Fit with hearing aids at 5 months 2 weeks following ENT evaluation and medical clearance

• First behavioral evaluation in sound booth at 5 months 3 weeks
• Behavioral evaluations confirm the severity and configuration

• Referred to Children’s Hospital in Boston for cochlear implant evaluation

• Received first cochlear implant May 2013; second May 2018
Case 2: 1 year 8 mo old female

- Referred on newborn x2, follow up ABR not completed (missed due to snow storm, then not rescheduled)
- Presented to clinic at 20 months, a few single words, intermittent response to sound, parents note very smart, no developmental concerns
- Fit with hearing aids at 21 months, immediately accepted hearing aid use and showed significant improvement in sound awareness
- Hearing loss confirmed via ABR at 23 months
- Decline in hearing at 25 months, referred to BCH for cochlear implant evaluation
- Implanted at 29 months in one ear, currently scheduled to be implanted in the second ear later this summer
Case 3: 2.5 year old male

- Passed newborn hearing screening
- Mom concerned of speech delay
- Fit with binaural hearing aids at another clinic based on ABR thresholds
- Referred to our clinic for management
- Referred to our clinic for management
- Subsequent behavioral testing showed fluctuating sensorineural hearing loss
- Parents report he was eventually diagnosed with Lyme. Since treatment his hearing has remained within normal limits, but has some odd speech patterns that are thought to be related to central issues.
Case 4: progressive hearing loss

2003 - Newborn screen: refer right, pass left on OAEs

2004: Diagnostic ABR – normal sloping to mild/mod right ear, normal left

2004 – 2017: Many audiograms

2011: Right ear profound, left mild high freq – switched hearing aid to left

2012: drop in hearing

2016: several drops in hearing

2017: implanted bilaterally

2018 – entering high school and performing very well
Post test questions

1. According to JCIH: screening, evaluation, and intervention should be in place by:
   a) 1 month, 6 months, 12 months
   b) 1 month, 3 months, 6 months
   c) Once child is old enough to tell us

2. True or False: Permanent childhood hearing loss can occur even if the child passed the newborn hearing screening.

3. Which of the following are reasons to refer a toddler?
   a) family history of childhood hearing loss
   b) Speech delay
   c) Presence of ear pit/tag
   d) All of the above
Questions?