

newborn hearing screening



Oklahoma Newborn Hearing Screening Program

Home Visitation Conference October 15, 2013

Debbie Earley, Au.D., CCC-A
Follow-up/Audiology Coordinator

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Meet our Team

- **Patricia Burk, M.S., CCC-A, Cert AVT LSLS**
– Program Coordinator
- **Deborah Earley, Au.D., CCC-A**
– Follow-up/Audiology Coordinator
- **Nazim Abdul Rahim, M.B.A.**
– Quality Assurance/ Data Coordinator
- **Linda Muse, B.S.**
– Administrative Assistant



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“It takes a whole village to raise a child”
~ African Proverb



Early Hearing Detection and Intervention (EHDI)-It has to be a team effort!!!

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Objectives

- Gain understanding of childhood hearing loss and treatment options
- Understand where you as a home visitor fits into the journey
- Hands-on
- Gain knowledge of audiology resources available for follow up

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Why do we do what we do?



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Universal Newborn Hearing Screening

- The earlier the better!
- It’s about communication!
- It’s all about the brain!!
- Hearing is a First Order Event!



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Brain Development-The ear is the conveyor belt to the brain!!



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“Critical Windows”-It is a developmental emergency!

- “Critical windows” of development
 - Language: Birth – 2 years
 - Auditory Skill Development: Birth – 3 ½
- Yoshinaga-Itano: Intervention before 6 months of age results in normal cognitive and linguistic development.
- After 6 months of age, scores are significantly lower.

Source: (Yoshinaga-Itano C, Sedy AL, Coulter DK, Mehl AL. Language of early- and later-identified children with hearing loss, *Pediatrics*, 1998; 102:1161-1171.)

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1 Million Words A Month!! So every minute counts!!!!

Average number of words heard by a child in the first four years of life:

	<u>Daily</u>	<u>4-years</u>
Professional family	2100	45 million
Working-class family	1200	26 million
Welfare family	600	13 million

Meaningful Differences in the Everyday Experience of Young American Children (Hart & Risley, 1999)

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Statistics of Hearing Loss

- National Institute on Deafness and Other Communication Disorders estimates **28 million** people in the United States have some degree of hearing loss
- One of the most frequently Occurring Birth Defect
 - 1/300 births will be diagnosed with some degree of hearing loss
 - Approx. 165-200 babies annually in Oklahoma
- In the United States, approximately **12,000** babies a year are born with hearing loss
 - 33 babies a day
- Additional **4,000-6,000** children (birth-3 years) who passed NBHS will acquire late onset hearing loss.

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FACT:

92% of children with permanent hearing loss are born to two hearing parents.
(Mitchell & Karchmer, 2004)



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History And Laws

- 1982: Law Risk Registry
- 1983: Implementation
- 1997: Funding Physiologic Screening
- **2000: Law Physiologic + Risk Registry**
- 2002: Hearing Screening **ALL*** OK hospitals!

*birth census of 15 or more
**Source: OSDH, 2006

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State of Oklahoma Newborn Infant Hearing Screening Act

§ 63-1-543-545

Effective:
November 1, 2000

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Audiology 101



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“Red Flags” for Hearing Loss



- Speech-language delay
- Significant history of middle ear infections
- Poor school performance
- Inattentiveness
- Diagnosis of Learning Disability or other disorder such as, autism or PDD
- Behavior Issues, aggression, frustration

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Hearing Risk Factors

- Infant had serum bilirubin level ≥ 15 mg/dL.
- Infant is suspected of having a congenital infection (neonatal herpes, cmv, rubella, syphilis, toxoplasmosis).
- Infant has craniofacial anomalies (such as pinna/ear canal abnormality, cleft lip/palate, hydrocephalus).

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Hearing Risk Factors

- Blood Relatives of the infant have a permanent hearing loss that began at birth or in early childhood.
- Infant was placed in a Level II or III nursery for more than 24 hours.
- Infant had exchange transfusion.

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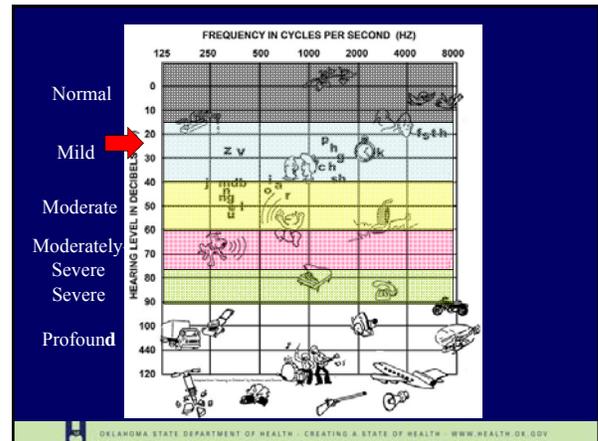
Hearing Risk Factors (JCIH)

- Caregiver concern
- Physical findings such as a white forelock, associated with syndromes
- Syndromes associated with hearing loss, Usher, neurofibromatosis, Waardenburg, Alport, Pendred etc.
- Neurodegenerative disorders like Friedreich ataxia, Hunter syndrome
- Postnatal infections such as meningitis
- Chemotherapy

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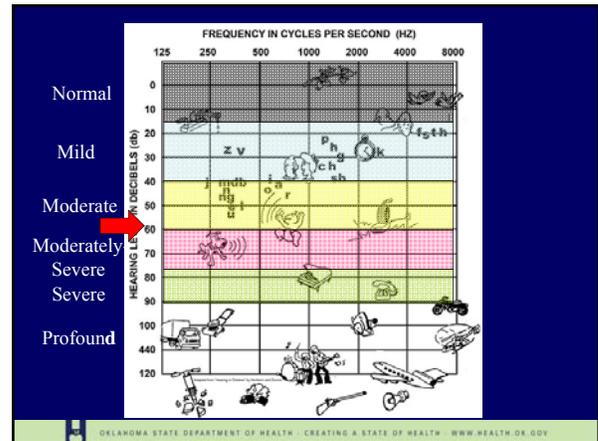
Degrees of Hearing Loss

- **Mild**
 - Still a hearing loss
 - May miss up to 40% of the speech signal in noise
 - Children may be accused of “not paying attention”
 - 37% of children with mild loss may fail at least one grade



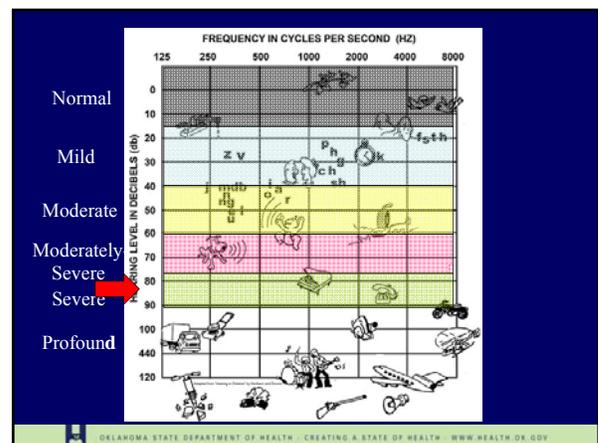
Degrees of Hearing Loss

- **Moderate**
 - Often delayed in academics
 - Speech-language delays without early intervention
 - Reading comprehension can be poor
 - Difficulty with group discussion
 - Written language can suffer



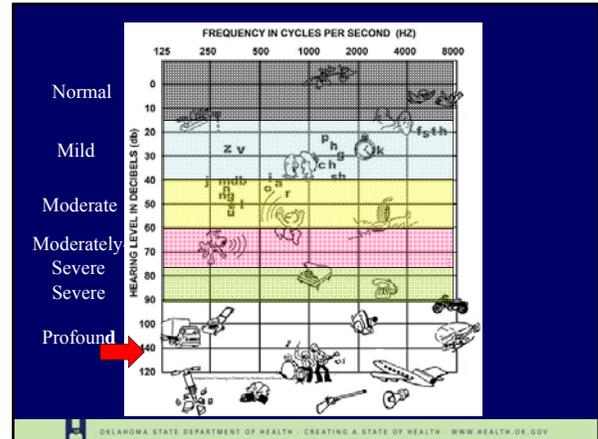
Degrees of Hearing Loss

- **Severe**
 - Can detect speech sounds when aided optimally
 - May have severe delays in speech and language without early intervention
 - Reading comprehension and written language can be poor
 - Difficulty with group discussion

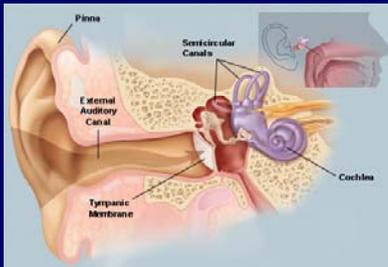


Degrees of Hearing Loss

- **Profound**
 - Severe delays in speech and language without early intervention
 - Reading comprehension and written language can be poor
 - Difficulty with group discussion



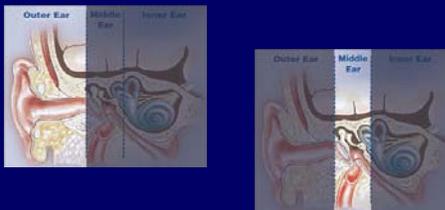
Anatomy of the Ear



Types of Hearing Loss

- **Conductive**
 - The inner ear has normal function, but the interference with the transmission of sound happens from the ear canal to the inner ear.
 - Common causes are fluid in the middle ear, hole in eardrum, foreign body, earwax, infection in ear canal (swimmer's ear), benign tumor, absence or malformation of the outer ear, ear canal, or middle ear

Anatomy of the Ear



Types of Hearing Loss

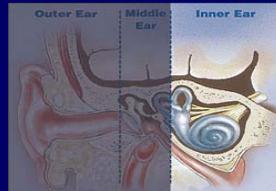
- **Sensorineural:**
 - The inner ear has sustained damage within the cochlea and/or the auditory nerve
 - Speech recognition may be decreased ("I hear but I don't understand")
 - Many causes

Types of Hearing Loss

- **Auditory Neuropathy Spectrum Disorder:**
 - Neural/brainstem dysfunction
 - Hearing thresholds may range from normal sensitivity to profound loss; however, speech understanding is worse than expected by the audiogram results
 - Many different causes: prematurity, hyperbilirubinemia, hypoxia, metabolic disorders, genetic
 - Typically other co-morbid disabilities

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Anatomy of the Ear



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Types of Hearing Loss

- **Mixed:**
 - Conductive and sensorineural hearing loss occur together
 - Common causes can be middle ear infection on top of an existing sensorineural hearing loss

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Anatomy of the Ear



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Beginning of the Journey” How do we get to the final destination?



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National 1-3-6 Goals

- **1 Month**
 - Initial Hospital Screen
- **3 Months**
 - Diagnosis of Hearing Loss
- **6 Months**
 - Early Intervention

Source: (Center for Disease Control and Prevention)



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“The 1”

Types of Physiologic Screening in Oklahoma

- **Auditory Brainstem Response (ABR)**
 - Test used to measure responses in the brain waves to auditory stimulus
 - **Otoacoustic Emissions (OAE)**
 - Test used to measure the response of the sensory cells in the cochlea to sound source presented
- Note: Child can be screened within hours of birth.**

Responsibility–Initial Screen

- Oklahoma Birthing Hospitals
310: 540-1-3 Guidelines (a) All newborns in Oklahoma will have a Hearing Screening Procedure completed unless the parent of guardian refuses because of religious or personal objections.

Oklahoma (Physiologic Screening)

- **99.1% screened in Oklahoma***

*Source: OSDH, 2010

Hospitals



- Responsible for hearing screening prior to discharge
- Educating parents of importance of early identification
- Discussing importance of follow-up
- Providing resources for follow-up



Collaboration With Birthing Hospitals

- Provide hospitals screening equipment (AABR)
- In-services provided for hospital staff
- State law requiring screening and reporting
- List of babies sent to double check if no results were sent or confusing
- Free brochures in Spanish and English
- Hearing Results linked w/ Metabolic Bloodspot

The Filter Form

Mobile Screening Packet - 05/08

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Responsibility – Follow-up Screen

- Providers completing follow-up screens 310: 540-1-3 Guidelines (i) “Audiologists or physicians involved in completing follow-up evaluations will forward test results and recommendations to the Oklahoma State Health Department in a manner and time frame deemed appropriate by the Oklahoma State Department of Health”

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NHSP Follow-up

- Send follow-up letters to Parents and Primary Care Physicians at 7 days
- Provide Spanish translation
- Make phone calls to Parents at 45 days
- Reminder letters at 5 months for babies who passed but are at risk
- Give providers Initial/Follow-up Results
- Help families follow-up with providers
- Seek results for Follow-up Screenings
- Accumulate State Statistics

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This is where you fit in!

- Check Newborn Hearing Screening Results
- Understand Risk Factors for Late-onset hearing loss
- Know “red flags” for possible hearing loss
- Have knowledge of community audiology resources
- Have appropriate training/equipment for hearing screening if program is performing the hearing screenings

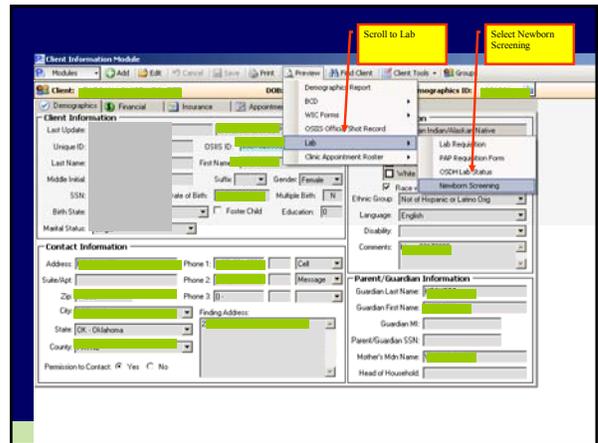
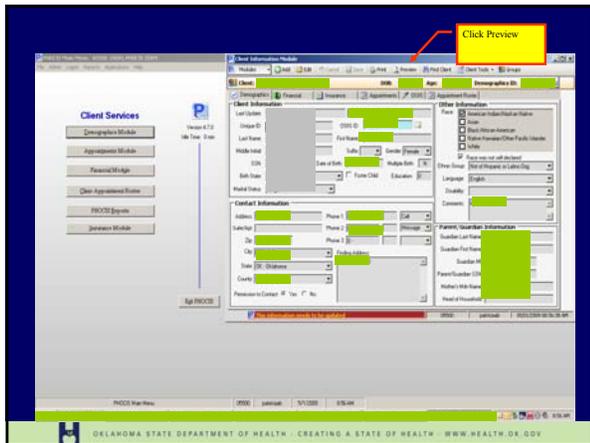
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PHOCIS – Finding Results

- Find Child in PHOCIS
- Link to Mother
- Click PREVIEW on top bar
- Scroll to LAB – Select ‘Newborn Screening’
- Find NBS (Newborn Screening) and Hearing Results for child

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Verify identity and screening results by calling the VRS at 1-877-542-9111 or 405-271-4774 and request a fax copy. For out-of range or Followup Required, refer to faxed copy for instructions.

To contact the follow-up program call 1-800-766-2223 or 405-271-6617.

Newborn Metabolic Disorder Screening Results

AVAILABLE 24 HOURS A DAY, 7 DAYS A WEEK

To assist health care providers in ensuring every newborn is adequately screened, the Newborn Metabolic Disorders Screening Program of the Oklahoma State Department of Health has established an automated Voice Response System.

- 1 Call 271-4774 (Oklahoma City local) or 1-877-542-9111 (Toll-Free)
- 2 Provide your pre-assigned Submitter ID number and PIN.
- 3 Provide Mother's Social Security number and the infant's filter paper serial number.

A result or status of screening will be provided at the time of the call and if desired, faxed to your office.

- To verify your PIN and Submitter ID number, or to update your fax number, call the Public Health Laboratory at (405) 271-5070.
- Questions or comments call the Public Health Laboratory at (405) 271-5070.
- To contact the follow-up program, (405) 271-4662 or 1-800-766-2223 (Toll-Free).

Remember: To prevent neonatal and mortality, all Oklahoma newborns are required to have a blood test that screens for congenital hypothyroidism, galactosemia, phenylketonuria (PKU), and sickle cell disease.

NEWBORN SCREENING
Oklahoma State Department of Health

It is all about Communication!

- Contact our office for initial results
- 1-800-766-2223

Let's get started

Figure 1: Distortion Product Otoacoustic Emissions screener (all ages)

Figure 2: Evoked Potential Assessment-Auditory Brainstem Response Screening (up to 6 months) Diagnostic - all ages

Figure 3: Portable Audiometer (est. ages 2 1/2+)

Probe Tips for OAE

OAE screening vs ABR screening

- JCIH recommends ABR as initial screening due to assessment of complete auditory pathway
- If baby refers in hospital, recommended to be followed up with ABR if at all possible
- OAE is good tool to complement ABR or as a follow up screening on a baby that has passed ABR initially (babies with risk factors)

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Why is OAE a good follow-up screening tool????

- OAE does not require behavioral responses
- Can help identify a wide range of hearing health concerns
- Is quick and painless
- Is often a reimbursable procedure
- Can be conducted by anyone who is trained to use the equipment and is skilled in working with children

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Familiarize with Equipment

- Screening Unit
- Power Supply
- Probe Assembly
- Probe tips or covers

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Preparing to Screen

- Conduct screening in quiet setting
- Maximize cooperation of child if not sleeping
- The OAE cannot be accomplished if a child is crying or is physically resistant
- Brief case history and explain to parent the test
- Check probe for blockage (cleaning)

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OAE Procedure

- Visual Inspection should take place first
- Take a thorough look at the outer ear for malformations, blockages etc
- If drainage, do not screen and refer to PCP
- If blockage, do not screen and refer to PCP
- Note ear pits, holes, skin tags

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OAE Procedure

- Select probe tip and place it on the probe
- Select a probe tip slightly larger than the ear canal opening
- Place tip over the probe, push it all the way down
- Turn on the equipment
- Clip probe to the child's clothing (behind)

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OAE Procedure

- Prepare the child – make sure child is comfortable
- Instructions to parent prior to appointment
- Insert probe-Discuss
- Never be tempted to hold the probe in the ear during screening
- Start Test – then prepare to screen other ear

Helpful Hints

- Ensure a good probe fit
- Minimize external noise in the environment
- Minimize internal noise caused by child's movement

Your role as a screener

- Educating parents
 - Obtaining consent
 - Informing parents of results - Scripts
 - Documenting and reporting screening outcomes
 - Discussion follow-up/resources
- *** Remember a screening does not diagnose

Updated Reporting Form

The image shows two pages of a reporting form. The left page is titled 'HEARING SCREENING REPORTING FORM' and contains sections for 'PATIENT INFORMATION', 'SCREENING INFORMATION', and 'SCREENING RESULTS'. The right page is titled 'HEARING SCREENING REPORTING FORM - RESULTS' and contains sections for 'PATIENT INFORMATION', 'SCREENING INFORMATION', and 'SCREENING RESULTS'. Both forms have various fields for text entry and checkboxes.

Why to Send

- Ensure that appropriate follow-up has occurred
- Help reduce confusion and stress for parents by eliminating second letter, calls, etc
- It's the law!

Whose Results to Send

- Any baby who did not pass birth screen
- Any baby who did not receive a birth screen
- Any child with a risk factor for hearing loss
- Any child diagnosed with hearing loss up to the age of 3 years (unilateral and bilateral)

When to Send

- When screened following hospital discharge
- When attempted screening or evaluation (continue until hearing status is determine)
- When referring to another audiological site for additional testing

What to Send

- Presence or absence of hearing loss
- Degree and Type of Loss & Date of Diagnosis
- Assistive Device (HA, CI, etc.) & Date
- Enrollment in Early Intervention
- Other referrals, genetics, ophthalmologist, etc
- Results Inconclusive? Tell us anyway!

Biggest Obstacles

- Minimal parental concern/misunderstanding information
- Hospital staff indicate follow-up is not important
- Physicians/providers tell parents to wait on follow-up- Why?
- Limited pediatric audiologists
- Lost to documentation
- Lack of screenings in rural areas



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“The 3”

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A Professional’s Guide to Pediatric Audiologists in Oklahoma



Developed by:
Oklahoma State Department of Health
Newborn Hearing Screening Program
&
The Oklahoma Audiology Taskforce

Phone: 405-271-6617
Toll Free: 1-800-766-2223
NewbornScreen@health.ok.gov

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Journey through Audiology



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Who Is An Audiologist?

- Audiologists currently hold a master’s or doctoral degree in audiology
- Audiologists are 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 (American Academy of Audiology)

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2007 JCIH Position Statement Diagnostic Audiology Evaluation

- Audiologists with skills and expertise
- At least 1 ABR test is recommended as part of a complete evaluation for children younger than 3 years for confirmation of hearing loss
- Timing and number of re-evaluations for children with risk factors - individualized
- (ECMO, CMV)

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2007 JCIH Position Statement Diagnostic Audiology Evaluation

- Infants who pass NBHS with risk factor have at least one diagnostic audiology assessment by 24-30 months
- Early and more frequent evaluations
 - CMV, syndromes, ECMO, Chemotherapy etc
 - Infants diagnosed with hearing loss-fit within one month

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2007 JCIH Position Statement Diagnostic Audiology Evaluation

- Initial audiological test battery to confirm hearing status, must include physiologic measures and when developmentally appropriate, behavioral measures
- Test battery
- Each ear
- Comprehensive assessment performed on both ears even if only one referred

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So, how do we get to a diagnosis quickly?

- Use of any test alone is discouraged
- Put the puzzle together
- Not always easy
- We use **all tools** available



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Objectives of Audiologic Assessment (ASHA Practice Policy)

- To determine the status of the auditory mechanism
- To identify the type, degree, and configuration of hearing loss for **each ear**
- To characterize associated disability and potentially handicapping conditions
- To assess the ability to use auditory information in a meaningful way (functional hearing)

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Objectives of Audiologic Assessment (ASHA Practice Policy)

- To identify individual risk factors and the need for surveillance of late-onset or progressive hearing loss
- To assess candidacy for sensory devices
- To refer for additional evaluation and intervention services when indicated

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Objectives of Audiologic Assessment (ASHA Practice Policy)

- To provide culturally and linguistically sensitive counseling for families/caregivers regarding audiologic assessment findings and recommendations
- To communicate findings and recommendations with parental consent to other professionals
- To consider the need for additional assessments and/or screenings (i.e. speech)

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Audiologist's Bag of Tricks

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Tests an Audiologist Might Perform

- **Tympanometry** is a test that is used to evaluate how the eardrums and middle ear are working – all ages
- **Visual Reinforcement Audiometry (VRA)** is a behavioral method of testing hearing used mostly for infants and toddlers ages 6 months to 2 years.
- **Oto-acoustic Emissions (OAE)** is a test during which your child hears soft sounds in each ear, and a response is measured from the ear through the same earphone- all ages

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Tests an Audiologist Might Perform

- **Conditioned Play Audiometry (CPA)** is a behavioral method of testing hearing used mostly for children ages 2 to 5 years.
 - Blocks, peg boards, puzzles etc.
- **Traditional Audiometry** is a behavioral method of testing hearing used mostly for children and adults 5 years or older.
 - Raise hand, say beep
- **Auditory Brainstem Response (ABR)** is a test that determines whether your child hears soft sounds in each ear through a tiny earphone.

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End of the “Diagnostic Journey”(actually never ends)

- ENT consultation
- Amplification fit w/in 1 month
- Ongoing audiology monitoring
- Enrolled in Early Intervention
- Remember 1-3-6 months (CDC)
- OK “1-3-6 weeks”

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PCP Follow-up Packets

Hearing Loss Management Guide

PCP “1-3-6” Roadmap for Newly Diagnosed Infants/Children with Hearing Loss

Developed by:
Oklahoma State Department of Health
Newborn Hearing Screening Program
&
Oklahoma Audiology Taskforce

Phone: 405-271-6617
Toll Free: 1-800-786-2223
NewbornScreen@health.ok.gov

Hearing Loss Management Guide

PCP “1-3-6” Roadmap for Newly Diagnosed Infants/Children with Hearing Loss

Binder Content

“1-3-6” Tools

- “1-3-6” EHEHA AP Patient Checklist for Pediatric Medical Home Providers
- “1-3-6” EHEHA AP Guidelines for Pediatric Medical Home Providers
- “1-3-6” Learning about Hearing Loss – A Roadmap for Families

Pediatric Audiology

- A Practitioner’s Guide to Pediatric Audiologists in Oklahoma

Genetics & Hearing Loss

- Hearing Loss, Genetics and Your Child (Brochure)
- Oklahoma Genetics Services Directory
- Genetics of Early Childhood Hearing Loss – The Facts

Early Intervention for Communication

- EHCAM Communication With Your Child (Brochure)
- Discover Your Early Intervention Resource Guide
- The efficacy of early identification and intervention for children with hearing impairment. Downes MP, Yankagga-Hess C. Pediatric Clinics of North America. 2016; 60(1):74-87. (Abstract)

Parent Stress

- When the System Works: Back Family
- When the System Works: Tyler’s Story

PCP Follow-up Packet:

Early Hearing Detection and Intervention (EHDI) Patient Checklist for Pediatric Medical Home Providers

Patient Name: _____ Date of Birth: ____/____/____

Initials: _____

Medical Home Required Screening Results (EHEHA)

Initials: _____

Optional Screening Results (EHEHA)

Initials: _____

Children Requiring Evaluation?

Initials: _____

Enrolled in Early Intervention (EHCAM, Part II)

Initials: _____

Requiring Pediatric Hearing Services

Initials: _____

Family Provider Contact Information

Initials: _____

Early Intervention Service Coordinator

Initials: _____

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PCP Follow-up Packet:

UNIVERSAL NEWBORN HEARING SCREENING, DIAGNOSIS, AND INTERVENTION
LEARNING ABOUT HEARING LOSS - A ROADMAP FOR FAMILIES

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PCP Follow-up Packet:

EARLY HEARING DETECTION AND INTERVENTION (EHDI)
GUIDELINES FOR PEDIATRIC MEDICAL HOME PROVIDERS

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Hearing Aids

Hearing aids provide a signal that makes low, moderate, and high intensity sounds audible but not uncomfortable and provide excellent sound quality in a variety of listening environments

Photo Courtesy of Wadco Corporation

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Cochlear Implants

A cochlear implant is an implanted device that changes sound from vibrations or sound waves into electrical pulses that provide direct stimulation to the auditory nerve.

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Osseointegrated Device

- Amplification system used when there is an anomaly of the outer and/or middle ear with a significant conductive hearing loss; however, normal inner ear and auditory nerve
- Surgery is recommended for these children around age 5-6 years of age

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FM Systems

- Personal FM Systems
- Sound Field FM Systems

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“The 6”

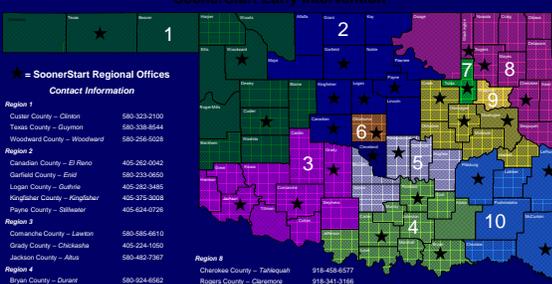
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Hearing Loss Auto-qualifiers for EI

- Hearing loss of 25 dBHL or greater in one or both ears (UHL and BHL)
- Auditory Neuropathy Spectrum Disorder regardless of sensitivity loss

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SoonerStart Early Intervention



★ SoonerStart Regional Offices Contact Information

Region	County	Contact Information
Region 1	Osage County – Clinton	580-323-2100
	Texas County – Guyton	580-338-8544
	Woodward County – Woodward	580-256-6028
Region 2	Canadian County – El Reno	405-262-0042
	Garfield County – Elfd	580-233-0650
	Logan County – Guthrie	405-262-3485
Region 3	Kingfisher County – Kingfisher	405-312-5038
	Payson County – Stillwater	405-624-0726
	Comanche County – Lawton	580-355-8510
Region 4	Grady County – Cheapeake	405-224-1050
	Jackson County – Altus	580-482-7367
	Bryan County – Durant	580-324-6562
Region 5	Carters County – Ardmore	580-223-8705
	Pottawatomie County – Ada	580-332-2011
	Cleveland County – Homer	405-321-4148
Region 6	Pottawatomie County – Shawnee	405-273-2127
	Oklahoma County – Oklahoma City	405-271-9477
	Tulsa County – Tulsa	918-835-8691
Region 8	Cherokee County – Tahlequah	918-458-6577
	Rogers County – Claremore	918-341-3188
	Washington County – Bartlesville	918-336-3006
Region 9	Creek County – Sapulpa	918-224-5531
	Murray County – Muskogee	918-483-2021
	Delaware County – Okemung	918-756-1983
Region 10	LeFlore County – Poteau	918-647-5166
	McCurtain County – Hefner	502-285-2525
	Pittsburg County – McAlester	918-425-1267

SoonerStart Early Intervention
Oklahoma State Department of Health
1000 NE 10th Street
Oklahoma City, OK 73117-1299
405-271-8333

Please feel free to contact your local county health department for more information about the SoonerStart Early Intervention Program.

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Intervention Options

- Auditory Verbal
- Total Communication
- Manual Communication



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Why the system works!

- Statewide Consistency
 - Shared vision
 - Same message
- Statewide Collaboration-Team Effort
 - PCP’s/ORL/etc.
 - Oklahoma Audiology Community
 - Hospital Nursery staff/volunteers
 - Home Visitation Programs
 - Collaborate with Midwives
 - NHSP Letters to Parents and PCPs
 - County Health Department Providers



Follow-up/Audiology Coordinator

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When the system works!



BABY “A”

DOB:	11/04/11
Follow-up screening:	11/21/11
Diagnostic ABR:	12/12/11
Enrolled in EI:	12/14/11
Amplification:	1/3/12

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Biggest Obstacles

- Minimal parental concern/misunderstanding information
- Hospital staff indicate follow-up is not important
- Physicians/providers tell parents to wait on follow-up
- Limited pediatric audiologists
- Lost to documentation
- Lack of screenings in rural areas



Discussion/questions

- Thank you for being a partner regarding early hearing, detection, and intervention in Oklahoma
- Questions?



Contact Information

Oklahoma State Dept. of Health
1000 NE 10th Street
Oklahoma City, OK 73117
Phone: 405-271-6617
Fax: 405-271-4892
Email: Debbiee@health.ok.gov

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