GEORGIA DEPARTMENT OF PUBLIC HEALTH

Pediatric Audiology Training Curriculum

A Resource for Audiologists in Georgia

4/1/2015

Georgia's Universal Newborn Hearing Screening Program has developed a training curriculum to assist Audiologists with up to date, best practice information on diagnostic audiological procedures, specifically auditory brainstem response (ABR) threshold testing.

INTRODUCTION:

Georgia's Universal Newborn Hearing Screening and Intervention (UNSHI) Program is dedicated to ensuring newborns, infants, and children receive appropriate audiological care after referral from newborn hearing screening and childhood monitoring of hearing loss. To support provider outreach and education, UNHSI has developed a training curriculum to provide Audiologists with information on diagnostic audiological procedures, specifically auditory brainstem response (ABR) threshold testing. UNHSI has partnered with Children's Healthcare of Atlanta (CHOA) and Pediatric Ear, Nose, and Throat of Atlanta (PENTA) to develop this curriculum.

INSTRUCTIONAL GOAL:

By completion of this curriculum, the Audiologist should be able to explain and conduct comprehensive audiological diagnostic evaluations on infants, birth to six months of age. Additionally, the Audiologist will be able to explain their role within the medical home.

INSTRUCTIONAL RESOURCES:

- http://pediatrics.aappublications.org/content/120/4/898.full?ijkey=oj9BAleq21OlA&keytype=ref&siteid=aapjournals
- http://infanthearing.org/ehdi-ebook/2014_ebook/5Chapter5Assessment2014.pdf
- http://www.audiology.org/resources/documentlibrary/Documents/201208_AudGuideAssessHear_youth.pdf
- Diagnostic Audiology for Audiologists, FM Verification, and Pediatric Amplification Workshop 2012 are three recorded workshops/seminars available to view for free at: http://infanthearing.org/workshop/index.html
- James W. Hall textbook, New Handbook for Auditory Evoked Responses (2006)

LESSON PRE REQUISITES:

- View entire National Center for Hearing Assessment and Management (NCHAM) workshop titled, "Diagnostic Audiology for Audiologists"
- Read and understand the 2007 Joint Committee on Infant Hearing (JCIH) Position Statement and EHDI E-Book, Chapter 5

UNHSI Diagnostic Audiological Protocol

This protocol is intended as a guide for audiologists who are performing diagnostic evaluations for children birth to five, who are at risk of, suspected of, or identified with auditory impairment, disorder, or disability. Audiologists performing audiological evaluations must hold a valid and current Georgia Audiology license. Audiologists designated to provide assessment and management of infants and children with hearing loss must have the commensurate knowledge, skill, and instrumentation necessary for use with current pediatric hearing assessment methods and evaluation procedures (The Pediatric Working Group, 1996).

The goal of the audiological evaluation is to determine degree and type of hearing loss. Hearing loss can be categorized into four types of hearing loss: conductive, sensory, neural, and mixed. Conductive hearing loss occurs when there is an issue between the external and inner ear, which can be transient in nature and may be medically treated (e.g. middle ear effusion or

perforated tympanic membrane). Sensory hearing loss is generally permanent and indicates a problem with the inner ear. A neural hearing impairment can be due to a failure in the neural portion of the auditory pathway. A mixed hearing loss is a combination of conductive and sensory hearing loss at the same frequency.

All infants who "refer" the initial hearing screening and the subsequent rescreening should have appropriate audiological and medical evaluations to confirm the presence of hearing loss at no later than 3 months of age (JCIH, 2007). Confirmation of an infant's hearing status requires a battery of audiological procedures to assess the integrity of the auditory system in each ear, to estimate hearing sensitivity across the speech frequency range, to determine the type of hearing loss, to establish a baseline for further monitoring, and to provide information needed to initiate amplification-device fitting if appropriate (JCIH, 2007). A comprehensive audiologic assessment includes a detailed case history, otoscopy, and behavioral and physiologic measures. Additionally, the objective of an audiological evaluation is to obtain ear specific information, even for children referring on only one ear. Recommended testing procedures can be found at http://www.audiology.org/resources/documentlibrary/Documents/201208_AudGuideAssessHear_youth.pdf.

Diagnosis of hearing loss or audiological evaluation should not be delayed due to suspicion of middle ear dysfunction. A full battery of audiometry should be conducted to determine if there is a permanent hearing loss component and if the middle ear dysfunction is affecting hearing at that time. Presence of middle ear dysfunction as identified with tympanometry does not necessarily result in a hearing loss. Vice versa, the presence of middle ear dysfunction with hearing loss may prompt more aggressive treatment by a medical physician to minimize delays in language exposure.

An appointment confirmation call to parents/caregivers of infants who are scheduled for a diagnostic audiological evaluation is recommended. When confirming the appointment, convey the importance of follow up and evaluation, recommend an immediate family member to be present at appointment (emotional support), provide pre-test instructions (hungry, sleep-deprived, etc), and address any parental concerns. An audiologist on staff should be made available to talk with scheduled families if requested.

Immediately after assessment for infants referred from newborn hearing screening, the following should be completed:

- Review results of the audiologic assessment, implications of the audiologic diagnosis, and recommendations for intervention with the parents/caregivers verbally, including:
    - Information about typical speech, language, and listening developmental milestones
    - Information about risk indicators for progressive and delayed-onset hearing loss and
    - Document in chart or on report if the results were provided verbally
- Provide any relevant educational brochures or handouts on diagnosis and other appropriate subject matters to parents and/or immediate caregivers
- Provide a written report to the family/caregiver, to the infant's primary care provider, and to the referral source with consent. Chart should contain documentation for all persons/facilities receiving report
- Report to Public Health by documenting in SendSS

- Document in SendSS audiological evaluation results, testing, notes, and recommendations
- If child cannot be located in SendSS, complete Georgia's Surveillance of Hearing Impairment form (Appendix B) and submit to the UNHSI District Coordinator for the health district in which child resides
- Patient medical record/chart should contain documentation that referral reported to Public Health

Auditory Brainstem Response (ABR) Procedures

For natural sleep testing: Patient must be under 4 months of age (corrected) or mature enough to lie completely still with his/her eyes closed for an extended period of time. Parent is informed that infant needs to be tired enough upon arrival to remain sleeping for approximately one hour. Suggestions include depriving the child of sleep prior to testing (including time in transit) and bringing child to the appointment hungry, asking parent to feed the child after electrode preparation. *Examples of information sheet provided at end of document.*

For sedated testing: Parent is informed of testing procedures and pre-test instructions verbally and in writing per facility to facilitate patient readiness and minimize risk of rescheduling and delaying testing.

ABR Equipment Set Up

Room Arrangement

ABR equipment should be set in a private and enclosed room with comfortable seating for the mother and baby to feed and sleep. Room location should be off a lightly or minimally used hallway where environmental noise is minimal. Lighting in the room should allow for dimming of lights or supported by small lamp.

Equipment Specifications

- Ensure ABR equipment is calibrated per manufacturer
  - Equipment is calibrated at minimum annually
- Collection of normative data for air and bone conduction is recommended to determine if correction factors are necessary
- Do not use a power strip- it is highly recommended this NOT be used as it allows electrical interference. If the equipment is only plugged into the wall while testing, power surge isn't as much of an issue and plugging into a power strip is actually more likely to introduce electrical artifact than plugging into the wall directly
  - There is a piece of equipment called an "isolation transformer box" that is highly recommended. It is very heavy and not portable. A ferrite box is a more portable, cost-effective way to minimize electrical artifact
- Disable wireless internet function on your laptop or desktop
- Remove unnecessary software from the computer
- Do not use jump drives or memory sticks as they can actually carry a virus that can be introduced to the computer
- Turn off all unnecessary external computer monitors/ electrical equipment in the same room as the system
  - If turning off extra equipment is unsuccessful at eliminating electrical noise, unplug the unused equipment in the room

- Do not use cellular phones when operating equipment
- Separate test box from laptop
- Arrange cables so that the electrode and insert cables aren't touching each other or the floor
- Use Velcro strips to wrap electrode and insert cables so they are not touching the ground
- Braid electrodes wires when possible

Test parameters

Test stimuli parameters and calibration values are derived from British Columbia Early Hearing Program (BC EHP) Diagnostic Audiology Protocols. The following stimulus parameters are used as default; however they may be changed for optimal waveform detection at the audiologist's discretion.

- Rate:
  - Click: rate of 29.1 clicks/second
  - Tone burst: rate of 39.1 bursts/second
- Stimulus Polarity:
  - Tone burst: alternating (air and bone conduction)
  - Click: rarefaction (air and bone conduction)
- Visual Display Scale: 0.25-0.3 microvolts
  - Only increase the display number higher than 0.3 when the waves are too big to fit on the page and always keep visual displays consistent between ears
- Filter setting:
  - Low frequency 30 Hz; High frequency 1500 Hz
  - Gain setting: 100,000-150,000
  - Notch Filter: optional for air conduction

Listening Check

A listening check on both earphones at one frequency should be completed to ensure equipment is working. Additionally, if bone conduction testing will be needed, a listening check should be completed with the bone oscillator.

If listening check reveals inadequate (reduced intensity or distorted) stimulus, ensure transducer cord is properly plugged into equipment and tubing in good condition. If problem persists, reschedule patient and contact equipment manufacturer.

Infection Control

Infection control is an important part of direct patient care. It is essential that audiologists wash their hands between each baby and after handling the cart and supplies. This is to protect from baby-to-baby infection, baby-to-equipment infection, and equipment-to-baby infection, as well as to protect the audiologist from infection. The following techniques should prove helpful in providing a healthy environment for babies and clinic personnel. Consult with your facility's Risk Manager (Infection Control person) to obtain specific procedures required for your hospital/clinic.

Hand washing technique can be found at:
http://www.who.int/gpsc/5may/How_To_HandWash_Poster.pdf

Establish a daily cleaning routine including anything that will come in direct contact with the baby, or the assessment materials, such as cart or tables. Clean equipment and work surfaces by:

- Use cleaning materials recommended by your facility
- Discard individual baby disposable supplies in an approved receptacle after the assessment of each baby
- Wipe cables and electrode leads with alcohol or disinfectant wipes between babies

Patient Set-up/ Introduction:

1. Audiologist confirms physician order and appropriateness of order prior to testing, especially in case of sedation.

2. Case history is obtained by the Audiologist.

3. Otoscopy is completed to evaluate external auditory canal and tympanic membrane status.

4. Tympanometry is conducted. *For infants under 6 months of age, a probe tone of 1000 Hz is the most reliable to determine the presence or absence of middle ear pathology. For infants and children older than 6 months of age, a 226 Hz probe tone is most appropriate.*

5. Otoacoustic Emissions (DPOAES or TEOAES) are completed and repeated.

6. Prepare for ABR testing:
   - Skin is prepared using an appropriate electrode prep material prior to baby sleeping in case of non-sedated ABR, or following initiation of sedation
   - For single channel ABR recording, three disposable electrodes are placed: vertex or high forehead and behind both ears high on the mastoid
     - If conducting 2-Channel ABR, four disposable electrodes are placed: midline high forehead, midline low forehead above nasal bridge, one on right and left mastoids
   - Insert earphones are placed in the test ear(s) and verified in the correct ear(s)
   - If possible, avoid clipping the transducer stimulus boxes to the patient. Clip to a pillowcase instead. Do not let the tubing of the transducers touch the electrode
   - All wires should be kept from touching and overlapping when possible. Bring the electrodes from the back of the baby and the earphones from the front if wires overlap or touch
   - Impedance is checked and should be less than 5 ohms and within 3 ohms of the other electrodes
     - If impedance cannot be obtained as described after troubleshooting, the audiologist will use his/her discretion whether to proceed with testing

Strategies to improve (reduce) impedance:

- Avoid placement of electrode on hair
- If debris or oils are visible on skin, wipe site with alcohol pad prior to prepping skin
- Rescrub the area
- Replace electrode for which impedance is too high
- Replace other electrodes
- Place saline drop or conducting paste on electrode pad

- Utilize tape if necessary to ensure placement
- Use battery contact cleaner or an alcohol prep pad to clean the metal snap on the electrode if you are measuring high impedances despite having good contact with the skin
- Verify electrode leads are functioning- place all leads in a glass of water or saline solution. If impedance measure as open there is a problem with the electrode or box, change electrode leads and retry water test. If problem persists there is an equipment problem with either your test cord or test box
- Keep loose electrodes in an air tight zip-lock bag after the package has been opened. This will help keep the "wet gel" from drying

Testing:

Basic Protocol

1. When evaluating a newborn that did not pass their newborn hearing screening, an evaluation on **both ears** must be conducted, even if only one ear did not pass repeated screens.
2. Air conduction click to at a high intensity (70-90dB nHL). *If the ABR response to high intensity click by air conduction is absent or significantly abnormal, an assessment for ANSD should be initiated.*
3. Tone bursts: 500Hz, 1000Hz, 2000Hz, 4000Hz, and 250Hz are available. Prioritize order based on importance for each patient.
    - To ensure not missing a cookie bite hearing loss, order tone burst frequency testing so that there is not a separation of more than 1 frequency octave (e.g. 4000, 1000, 2000, 500 Hz or 2000, 500, 4000, 1000 Hz)_
4. If tone burst thresholds are greater than 20 dB nHL for one or more frequencies, a bone conduction click, masked if needed, should be conducted. Depending on air conduction thresholds, and if available, tone burst bone conduction should be conducted if time permits to best evaluate hearing and formulate recommendations.
    - Typically we do not test below 15-20dBnHL as this is considered normal hearing by ABR without correction factors.
    - A minimum of 1000 sweeps is recommended to ensure a stable response. Reliability is increased by repeating an average at least once. If under time limitations, response repetition may be skipped at supra-threshold levels (at least 30 dB greater than suspected threshold). At a minimum, response repetition should be recorded at threshold and when getting no response (ghost run).
    - Standard threshold search procedures include a higher intensity of at least 70 dB nHL. If a clear response is seen, decrease intensity in a time efficient manner (no greater than 30 dB nHL steps) to determine threshold within 5 dB nHL. Threshold determination below 15-20 dB HL is generally not necessary
    - Unless otherwise indicated, tone burst testing should start in one ear, and then repeat same stimulus in the opposite ear. Alternating ears when possible allows ability to obtain bilateral information if child wakes up or test session needs to be discontinued. If all results are normal test can be called complete at this point
    - If click, 4000, or 500 Hz is abnormal continue to assess 1000 and 2000 Hz stimuli time permitting and Bone conduction assessment should be attempted at a low and high frequency, with contralateral masking as necessary. Masked click at a minimum as not all units have tone burst bone conduction capability

Troubleshooting Electrical Noise:

1. If 60 or 50Hz electrical noise is present, turn on notch filter and evaluate if electrical noise is interfering.
2. Click on View EEG button on the collection screen. Place electrodes into a cup of water and walk the cup of water around the room to identify the noise source. Watch the EEG window, as you approach the noise source(s), the EEG will become noisier.
3. Try increasing low frequency filter slightly to reduce noise (not to exceed 100 Hz), but caution as this may diminish threshold responses until electrical noise is reduced. Document filter changes in report.
4. Move system to a different room if electrical noise cannot be resolved.

Suspected ANSD protocol and Interpretation

If the ABR response to high intensity click by air conduction is absent or significantly abnormal, an assessment for ANSD should be initiated.

Complete recording at high-level (≥90 dB nHL) click stimulus in each of the three polarities options (rarefaction, condensation, and alternating) and inspect waveform for cochlear microphonic (CM). Repeat in opposite ear. If CM is present, and the ABR waveform is poorly developed or absent, results may indicate Auditory Neuropathy Spectrum Disorder (ANSD).

To distinguish CM from stimulus artifact, use two tools:

- The CM should reduce in amplitude when alternating click polarity is used compared to rarefaction and condensation polarities
- Conduct one additional average with the earphone tubing clamped or disconnected. With the earphone tubing clamped or disconnected, the CM should disappear as there no stimulus present. If it does not disappear, it is probably stimulus artifact
- If presence of a CM continues to be debated, the rate of the click stimulus is increased to 71.1 clicks/second. If the waveform amplitude remains the same and latency does not shift, the response is a cochlear microphonic. If the waveform becomes smaller or the latency increases, the response is neural and this is not likely ANSD

In addition, if wave V is suspected, but no latency shift is observed with decreased intensity then that provides evidence that the waveform does not reflect appropriate neural synchrony. If ANSD is evident from CM, yet wave V is observed with no latency shift, then some evidence of neural synchrony is suspected. (Note: When reporting these findings, DO NOT document them as threshold, as they do not correlate with estimated behavioral thresholds).

If tympanometry is abnormal and the ABR is grossly abnormal with no CM, ANSD is not ruled out yet. The CM is not always observable with a conductive component. Therefore, if a child has abnormal tympanograms (Type B) and the ABR shows a significant hearing loss, the ABR will need to be repeated to rule out ANSD and hearing aids should not be fit until a repeat has been done when ears are clear of middle ear dysfunction and tympanometry is normal (Type A).

In a rare population, a Wave I might be present with no CM. This pattern is not associated with ANSD. The underlying mechanism of this pattern is not understood and follow up care may vary depending on the child and medical history. Document pattern in findings in the report and monitor child closely through behavioral testing and parental report.

If acoustic reflex thresholds are not obtained at the time of the ABR, they should be obtained during follow-up testing. For ANSD patients, 1000 and 2000 Hz ipsilateral acoustic reflexes are performed at minimum. For ANSD patient reflexes should be elevated or absent.

Interpretation:

Marking ABR Waves:

- Routinely use 0.3 scale to mark waves so a typical wave V is appropriately large on the screen, and so small amplitude wave Vs can be detected; only increase the display number higher than 0.3 when the wave are too big to fit on the page
- Always keep visual displays consistent between ears
- Mark V down to threshold
- Mark I and III when possible and on high intensity runs so interpeak and absolute latencies can be measures and analyzed
- Label thresholds in dBnHL/ or dBeHL depending on your equipment.
- Always label No Response runs and threshold runs with dBnHL
- Always label print outs with ear and stimulus. If stimulus varies throughout the page mark each individual wave

Normative Values:

- Use and print age and intensity appropriate norms when possible
- Always calculate and analyze interpeak and absolute latencies to verify normal neural and lower brainstem function
- The use of a latency intensity (L/I) function can be helpful in verifying latencies and type of hearing loss. An example can be found at the end of this page

Example of normative values for waveform latencies to a click stimulus at 70dBnHL:

Age	Wave I	Wave III	Wave V	I-III	III-V	I-V
38-42 weeks	**1.99- 2.11**	**4.74- 4.93**	**6.99- 7.32**	**2.73- 2.81**	**1.90- 2.34**	**5.03- 5.21**
SD	**0.24**	**0.29**	**0.29**	**0.32**	**0.26**	**0.33**
Term- 2mos	**1.9- 2.01**	**4.54- 4.78**	**6.7- 7.06**	**2.64- 2.75**	**2.23- 2.28**	**4.84- 5.07**
SD	**0.24**	**0.25**	**0.24**	**0.26**	**0.23**	**0.27**
3-6mos	**1.83- 1.87**	**4.27- 4.45**	**6.36- 6.58**	**2.47- 2.6**	**2.15- 2.21**	**4.52- 4.74**
SD	**0.24**	**0.25**	**0.24**	**0.26**	**0.23**	**0.27**
7-12mos	**1.8- 1.82**	**4.19- 4.25**	**6.25- 6.33**	**2.38- 2.45**	**2.07- 2.13**	**4.39- 4.49**
SD	**0.24**	**0.25**	**0.24**	**0.26**	**0.23**	**0.27**
13-24mos	**1.77- 1.79**	**4.11- 4.16**	**6.1- 6.19**	**2.23- 2.35**	**1.97- 2.03**	**4.3- 4.35**
SD	**0.24**	**0.25**	**0.24**	**0.26**	**0.23**	**0.27**
Adult	**1.65**	**3.76**	**5.61**	**2.11**	**1.86**	**3.94**

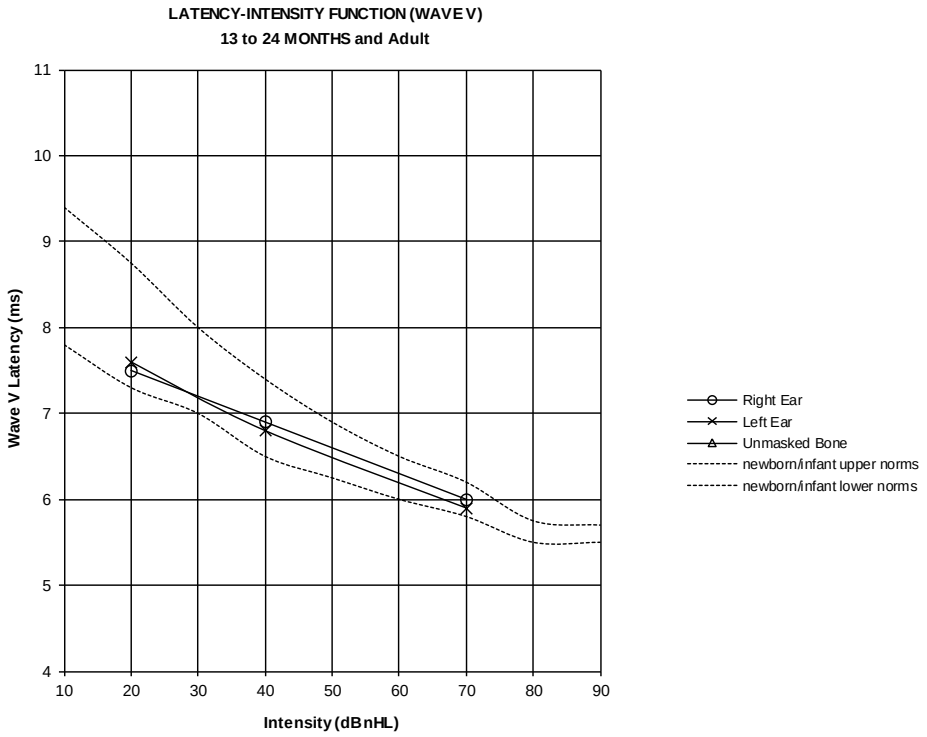
Age	Wave I	Wave III	Wave V	I-III	III-V	I-V
38-42 weeks +/- SD	**1.75- 2.35**	**4.45- 5.22**	**6.7- 7.61**	**2.41- 3.13**	**1.64- 2.6**	**4.7- 5.54**
Term- 2 mos +/- SD	**1.66- 2.25**	**4.29- 5.03**	**6.46- 7.3**	**2.38- 3.01**	**2.0- 2.51**	**4.57- 5.34**
3-6 mos +/- SD	**1.59- 2.11**	**4.02- 4.7**	**6.12- 6.82**	**2.21- 2.86**	**1.92- 2.44**	**4.25- 5.01**
7-12 mos +/- SD	**1.56- 2.06**	**3.94- 4.5**	**6.01- 6.57**	**2.12- 2.71**	**1.84- 2.36**	**4.12- 4.76**
13-24 mos +/- SD	**1.53- 2.03**	**3.86- 4.41**	**5.86- 6.43**	**1.97- 2.61**	**1.74- 2.26**	**4.03- 4.62**

Correction Factor numbers taken from Table A.3 of James W. Hall III "New Handbook of Auditory Evoked Responses"

NORMAL L/I FUNCTION:

ABR REPORT

NAME	DOB	EVAL DATE
Example normal	0	0
REFERRAL SOURCE		**AUDIOLOGIST**
0		0



		Absolute Latencies			Interpeak Latencies		
	dB nHL	I	III	V	I-III	III-V	I-V
Right Ear	70	1.80	3.80	6.00	2.00	2.20	4.20
Left Ear	70	1.90	3.80	6.00	1.90	2.20	4.10

NTREPRETATION:

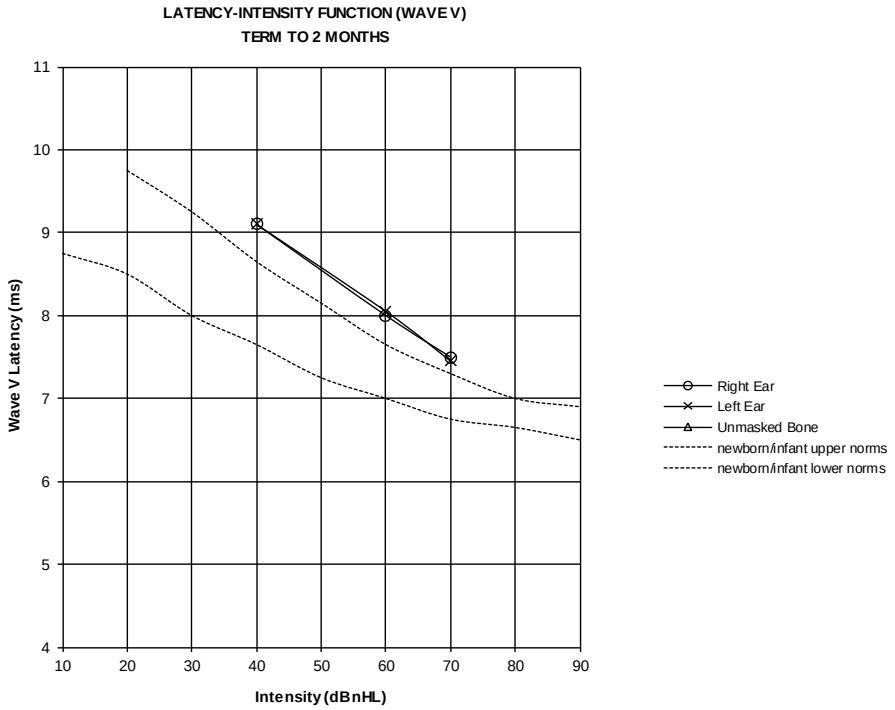
ABR wave V L-I function shows appropriate latencies and slope, indicating normal hearing bilaterally. ABR absolute and interpeak latencies are all within normal limits, consistent with normal lower auditory brainstem function and maturation.

CONDUCTIVE HEARING LOSS L/I FUNCTION:

ABR REPORT

NAME	DOB	EVAL DATE
Demo Conductive	0	0

REFERRAL SOURCE	AUDIOLOGIST
0	0



		Absolute Latencies			Interpeak Latencies		
	dB nHL	I	III	V	I-III	III-V	I-V
Right Ear	70	2.64	5.29	7.50	2.65	2.21	4.86
Left Ear	70	2.59	5.24	7.45	2.65	2.21	4.86

NTREPRETATION:

ABR wave V L-I function shows delayed latencies with appropriate slope, indicating a mild conductive hearing loss bilaterally.

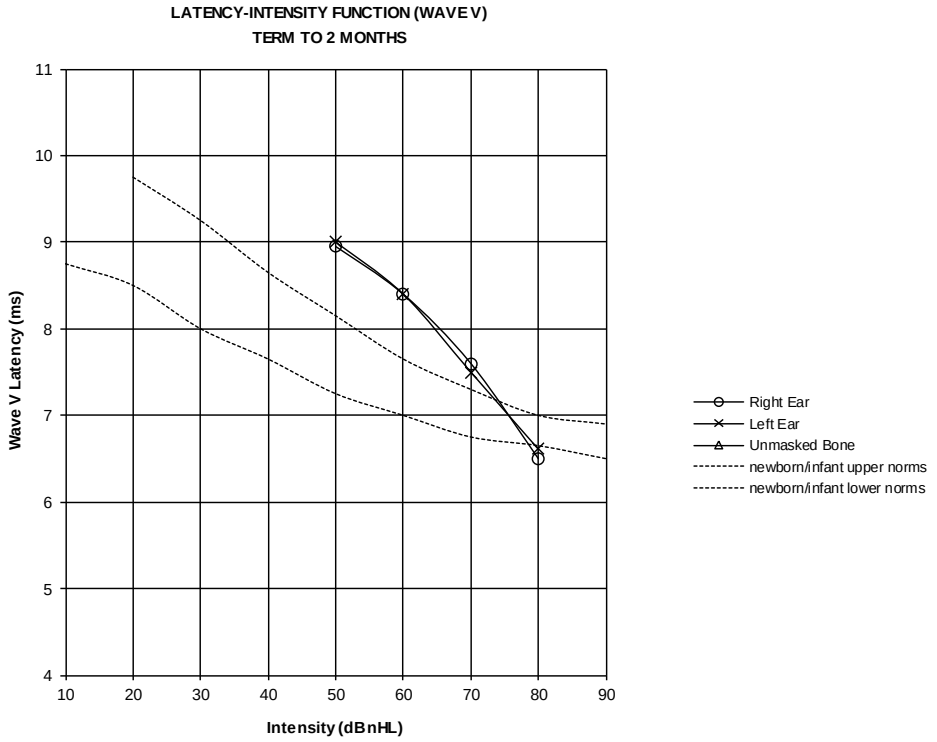
ABR absolute latencies are delayed overall due to the coductive hearing loss but interpeak latencies are all within normal limits, consistent with normal lower brainstem auditory pathway function and development.

IMPRESSION: Mild Conductive Hearing Loss Bilaterally.

SENSORINEURAL HEARING LOSS L/I FUNCTION:

ABR REPORT

NAME	DOB	EVAL DATE
SNHL demo	0	0
REFERRAL SOURCE		**AUDIOLOGIST**
0		0



		Absolute Latencies			Interpeak Latencies		
	dB nHL	I	III	V	I-III	III-V	I-V
Right Ear	80	1.65	4.25	6.50	2.60	2.25	4.85
Left Ear	80	1.70	4.40	6.61	2.70	2.21	4.91

NTREPRETATION:

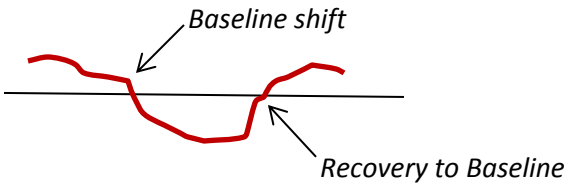
ABR wave V L-I function shows abnormal latencies and slope, indicating a moderrate sensorineural hearing loss bilaterally.

ABR absolute and interpeak latencies show some abnormalities including delayed absolute latencies of wave V, consistent with a sensorineural type hearing loss. ABR interpeak latencies are with normal limits, consistent with normal lower brainstem auditory pathway function and development.

IMPRESSION: Moderate Sensorineural Hearing Loss Bilaterally.

Tips & Tricks:

- Younger infants will have longer latencies than adults or older children
- Fast click rates will slightly delay latencies; slower rates will have slightly shorter latencies
- A wave latency will shift approximately 0.2 ms every 10 dB decreased in intensity
    - Lower frequencies will shift more than higher frequencies
- Symmetrical hearing should have symmetrical latencies
- If bone conduction artifact is high try moving the oscillator further away from the electrodes
- 4000Hz tone burst should have very similar latencies to click stimulus
- 500 Hz tone burst latencies should fall between 10-15 ms from higher intensities to threshold
- To identify a response, look for a baseline shift then a recovery back to baseline



Explanation of Results and Reporting:

Immediately after assessment for infants referred from newborn hearing screening, the following should be completed:

- Review results of the audiologic assessment, implications of the audiologic diagnosis, and recommendations for intervention with the parents/caregivers verbally, including:
    - Information about typical speech, language, and listening developmental milestones
    - Information about risk indicators for progressive and delayed-onset hearing loss and
    - Document in chart or on report if the results were provided verbally
- Provide any relevant educational brochures or handouts on diagnosis and other appropriate subject matters to parents and/or immediate caregivers
- Provide a written report to the family/caregiver, to the infant's primary care provider, and to the referral source with consent. Chart should contain documentation for all persons/facilities receiving report
- Report should include:
    - Significant birth and medical history, including hearing loss risk factors
    - ABR interpretation with thresholds listed
        - Waves should be printed out whenever possible, marked with stimulus, threshold, and ear
    - Test findings: tympanograms, OAEs, reflexes etc.
    - Impressions of overall findings
    - Recommendations for follow-up and intervention

    - Listing of educational materials and referrals provided
- Report to Public Health by documenting in SendSS
    - Document in SendSS audiological evaluation results, testing, notes, and recommendations
    - If child cannot be located in SendSS, complete Georgia's Surveillance of Hearing Impairment form (Appendix B) and submit to the UNHSI District Coordinator for the health district in which child resides
    - Patient medical record/chart should contain documentation that referral reported to Public Health

Billing notes:

- aABR: CPT 92586A is the code for Automated ABR testing to be used ONLY when completing testing in which the equipment interprets the results
- ABR: CPT 92585 is the diagnostic ABR code to be used diagnostic testing, which depends on interpretation from the audiologist
- Diagnostic DPOAE code (CPT 92587) defined as limited DPOAE of 3-6 frequencies with interpretation and report. This will likely continue to be the most commonly used OAE code
- DPOAE code 92588 is defined as a comprehensive diagnostic evaluation minimum of 12 frequencies with interpretation and report

Vivosonic Bluetooth troubleshooting:

If the Bluetooth comes unpaired from the vivosonic (and it's not asking you to enter the authorization code which is 0000), here is how to connect it:

- go to the Bluetooth icon on the desktop
- go to search devices
- click on the V0 device
- click "Bluetooth authorization" from the dropdown menu and make sure that the box for "authorize Bluetooth" is selected
- back to the original dropdown menu, click "connect to Bluetooth"
- make sure there are two green arrows at the bottom left of the V0 icon. This indicates connectivity

Automated ABR and Screenings:

ABR diagnostic equipment should not be used to conduct a "rescreen" on infants referring from newborn hearing screening. Screening (ABR) should be limited to equipment with automated "Pass" and "Refer" results with no interpretation.

References

American Academy of Audiology. (2012). Audiologic Guidelines for the Assessment of Hearing in Infants and Young Children, retrieved from http://www.audiology.org/resources/documentlibrary/Documents/201208_AudGuideAssessHear_youth.pdf

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The Pediatric Working Group. (1996). *Amplification for infants and children with hearing loss*. Nashville, TN: Vanderbilt Bill Wilkerson Press.