TELEAUDIOLOGY INFANT HEARING ASSESSMENT TOOLKIT

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Description

A hub-and-spoke paradigm and synchronous (real-time) methods are used to conduct infant diagnostic hearing assessments. Located at the spoke site are the infant, family, and trained staff who will assist with placing equipment on the infant. Located at the hub site is the audiologist who will perform testing and evaluate test results via remote control software applications.

Maintenance and calibration of equipment must be performed at the spoke site locations.

Creating Teleaudiology Infrastructure

1. **Choose designated hub site, where the audiologist will perform remote diagnostic evaluations.**

2. **Choose designated spoke site(s), where trained personnel will place equipment on the infant.**

   a. Make sure spoke site has an available room with low ambient noise levels. This room should serve as the test location.

3. **Purchase/locate necessary equipment for testing:**

Necessary Supplies for Teleaudiology Infrastructure		
Equipment	**Software**	**Additional Requirements**
Video otoscope (Welch Allyn Viewer)	Software allowing remote access to spoke site computer	Adequate upstream speed at spoke site (must be at least 3 megabit)
ABR equipment	*Software allowing video and audio connection between hub and spoke sites	Permissible ambient noise levels at spoke sites [see (Scollie, 2016)]
OAE equipment	Welch Allyn Viewer for otoscopy	Internet connection at spoke site
Tympanometry equipment	IHS Programs for ABR and OAE	Trained technicians at spoke site
Computer to run hardware and software programs		
Web Camera		
Ancillary supplies (probe tips, specula, etc.)		
*If using Skype for Business, will also need Logitech Far End Control software.		

4. **Train medical personnel at spoke site(s) on proper placement of equipment and procedures for conducting infant diagnostic evaluations.**

   a. See quick reference guides: Can be distributed to personnel during and after training.

      i. Equipment Set Up

      ii. Diagnostic Audiology Overview

      iii. Otoscopy Quick Reference Guide

      iv. Tympanometry Quick Reference Guide

      v. OAE Quick Reference Guide

      vi. ABR Electrode and Ear Insert Placement

      vii. ABR Quick Reference Guide

b. See training videos: Can assist personnel with learning how to place equipment.

    i. Infant Otoscopy

    ii. Swaddling

    iii. Scrubbing for Electrodes

    iv. Placing Electrodes and Inserts

    v. Removing Electrodes and Inserts

    vi. Bone Conduction

5. Determine remote software applications.

a. Software allowing remote access to the spoke site computer

    i. Option: TeamViewer

b. Software allowing video and audio connection between the hub site and spoke sites

    i. Option: Skype for Business

        1. Advantages: HIPAA compliant, cost effective, user friendly

        2. Disadvantage: somewhat informal connection between the audiologist and family

    ii. Option: Cisco Systems

        1. Advantages: more formal connection between the patient and provider, HIPAA compliant, clearer imaging

        2. Disadvantages: more expensive, both the hub site and spoke site need to purchase the program

6. Obtain permission from spoke site network credentialed.

a. Store contact information for future reference.

7. Develop shared protocol between hub site and spoke site(s) for scheduling appointments.

Before the Appointment

1. Ensure adequate upstream speed at the spoke site(s).

   a. The upstream speed at the spoke site needs to be at least 3 megabit.
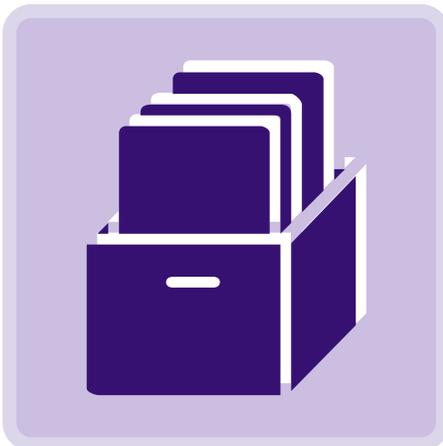
   b. Can be tested at: www.speedtest.net

   Speedtest by Ookla - The Global Broadband Speed Test

   Test your Internet connection bandwidth to locations around the world with this interactive…

   Speedtest.net

2. Schedule an appointment time with the spoke site and send out a reminder in advance.

3. Ensure the following equipment is located in the hub site location.

   a. Two computer screens: one for each software platform

      i. If using Skype for Business, set up a high quality profile picture.

   b. Patient file

   c. Optional: headset
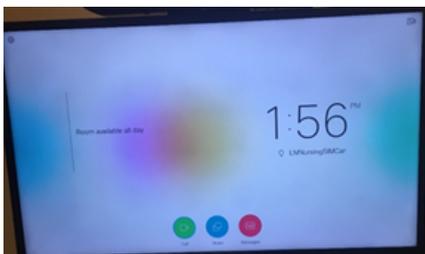
1. **Obtain connection with spoke site personnel at scheduled appointment time.**
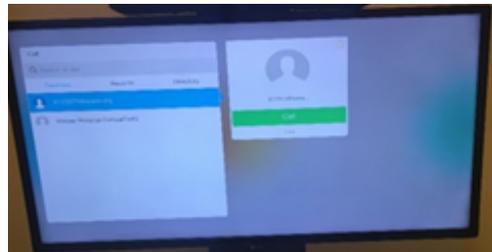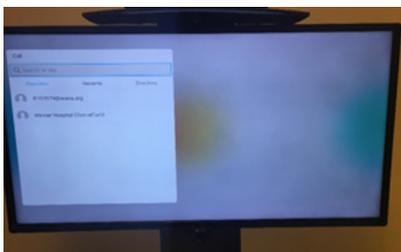
    a.   If using Skype for Business:
    1)   Call spoke site.
    2)   Make sure both callers accept appointment to connect video conference.
    3)   At the bottom of the call screen click on the video camera icon and select "Start my video". This will allow video access to receiving end.
    4)   Unmute speaker by clicking on the microphone icon at the bottom of the screen to allow receiving end to hear calling end.
    5)   Make sure steps 3 & 4 are completed on both ends of Skype conference call.
    6)   Click on the microphone icon to mute sounds and the video icon to end video of clinician during testing.
    7)   Open video camera Far End Control application for camera adjustments.
    8)   The Logitech Far End Control software will need to be on hub site computer.

    b.   If using Cisco Systems:
    1)   Turn on video monitor and Cisco systems.
    2)   Dial the Forever TeleAudiology bridge number to connect with spoke site on Cisco video conference unit. To do this, use arrows and check mark button on remote to select the green call button on the video monitor screen:

    3)   Select "Call" to connect with spoke site on Cisco video conference unit:

2. Open TeamViewer application.

    a.   Type in partner ID number and click "Connect".

    b.   Type in password and hit "Enter" on keyboard.

    c.   Use TeamViewer application for remote access control of the spoke site computer.

3. Wait for infant and staff at spoke site to enter room and get situated for appointment.

4. Audiologist at hub site should introduce himself/herself and briefly explain the appointment.

5. Inform spoke site staff to start with otoscopy. Staff can reference Quick Reference Guides for how to complete otoscopy.

    a.   Open video otoscopy software (Welch Allyn Viewer) on spoke site computer:

    b.   Spoke site nursing staff will position otoscope in each ear.

    c.   Observe otoscopy.

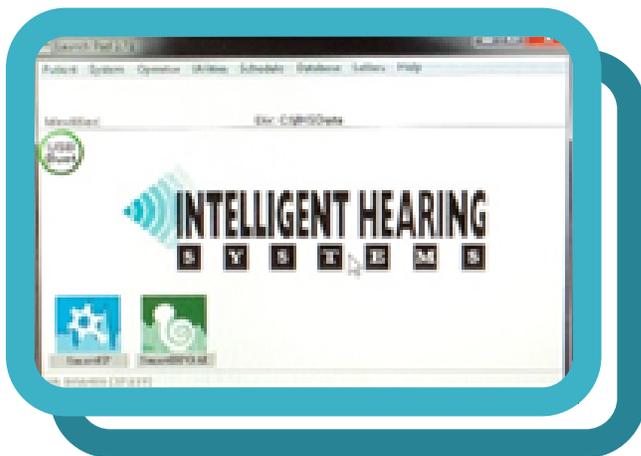   d.   Proceed if canal is clear for testing.

6. Inform spoke site staff to prep the infant for ABR testing. Staff can reference Quick Reference Guides for how to complete these steps.

    a.   Spoke site staff will then complete the following steps (see training videos for guidance):

        1)   Scrub infant for electrode placement.

        2)   Place electrodes on infant.
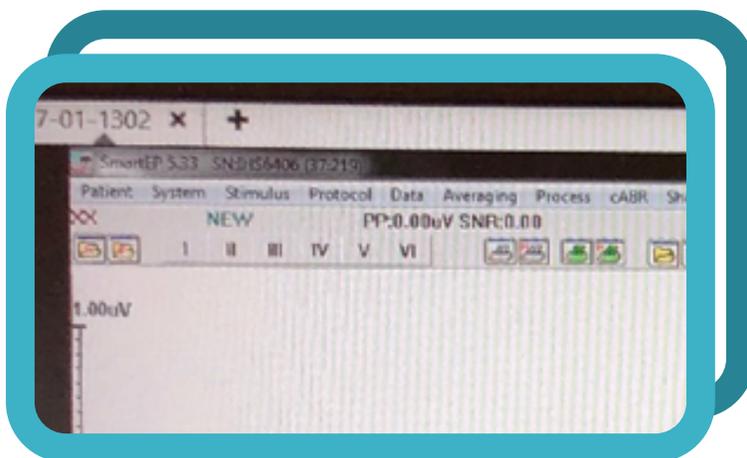
        3)   Place inserts in infant's ears.

7. Open ABR system software IHS Programs on spoke site computer.

a.   Select SmartEP.

b.   Set up patient by selecting PATIENT in the top left corner of the drop
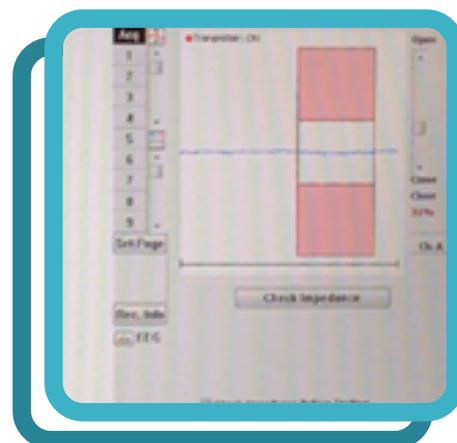   down menu. Select "New".

c.   Input the following information:
     1)   Identifier = chart #
     2)   First name
     3)   Last name
     4)   Date of birth
     5)   Gender
d.   Click "OK".

8.   **Run impedance measures.**

a.   Click on "Check Impedance" on the
       right side of IHS testing screen.
b.   Provide instruction to nursing staff
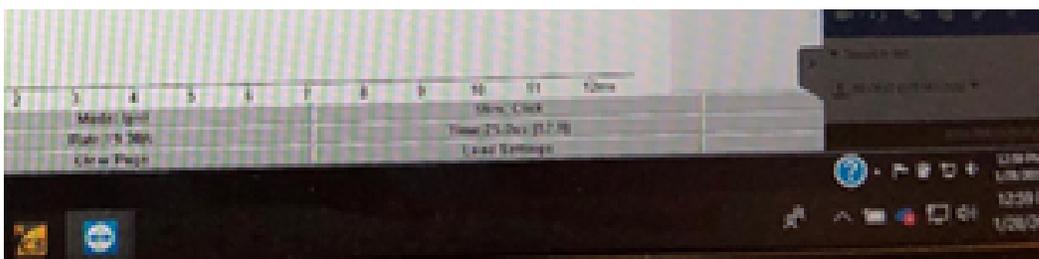   if impedance adjustments are
       necessary.

9. **Once electrode connections are acceptable, inform spoke site staff and parent that this is the time to get the infant to sleep.**

    a. Have the nurse swaddle the infant. Staff can reference training videos for how to swaddle the infant.
    b. Provide family and nursing staff with the following ideas to get the infant to sleep.
        1) Turn off lights.
        2) Allow time for family to feed infant.
        3) If infant arrived tired and in a car seat, try placing infant back in car seat.

10. **Set test parameters**

    a. Select Stim (located on bottom table of screen) and single click to open:

    b. If doing Chirp, select file and scroll to chirp you want (ex: iChirp4000.stm). Select "Open" or double click.
    c. Select stimulator: ER3 insert earphones or Bone Vibrator.
    d. Set intensity.
    e. Set ear.
    f. Set phase.
        The rest of the parameters should be at default.
    g. Include filtering parameters used:
        1) System
        2) Amplifier settings
        3) Gain and filter settings by default

11. **Once infant is asleep, ensure that spoke site staff has removed pacifier/bottle (infant cannot be sucking during testing).**

12. **Begin ABR recording. Start with air conduction, then and do bone conduction.**

    a. Check ambient noise level of testing room. Permissible ambient noise levels range from 72 to 103 dbHL when testing to 25 dB HL using insert earphones (Scollie, 2016).

| | Maximum Permissible Ambient Noise Levels (MPANL) if Testing to 0 dB HL (ANSI S3.1) | | | | | | | MPANL if Testing to 25 dB eHL | |
| | Ears not covered | | | Insert earphones | | | | Ears not covered | Insert earphones |
	125 to 8000	250 to 8000	500 to 8000	125 to 8000	250 to 8000	500 to 8000		500 to 8000	500 to 8000
125	24	30	39	59	67	78		64	103
250	16	16	25	53	53	64		50	89
500	11	11	11	50	50	50		36	75
1000	8	8	8	47	47	47		33	72
2000	9	9	9	49	49	49		34	74
4000	6	6	6	50	50	50		31	75
8000	9	9	9	56	56	56		34	81

    b.   Move camera view away from clinicians.

    c.   Mute clinician microphone to limit noise interaction during testing.

        1)   Skype for Business: Press microphone icon to mute.

        2)   Cisco Systems: Press microphone with red line crossing through it on remote.

    d.   Run impedance measure again immediately before beginning ABR recording.

    e.   Advised to follow the following ABR protocol: Complete 4,000 Hz chirp in both right and left ears.

    f.   The suggested corrections for the IHS iChirp stimuli nHL thresholds in order to obtain an eHL value per frequency are approximately as follows:

SmartEP: iChirp Stimuli - Peak V Latency and Amplitude Values

Mean values and standard deviation of auditory evoked response thresholds (dB nHL) and latency (ms) at four intensity levels

Stimuli	Response Thresholds	Latency (ms)			
		80 dB	**60 dB**	**40 dB**	**20 dB**
Broadband	20 ± 6	8.2 ± 0.2	8.7 ± 0.2	9.8 ± 0.3	10.9 ± 0.5
500 Hz	20 ± 4.7	7.3 ± 0.1	8.1 ± 0.2	9.3 ± 0.3	11.3 ± 0.4
1000 Hz	20 ± 8.1	7 ± 0.1	7.7 ± 0.2	8.6 ± 0.2	10.4 ± 0.1
2000 Hz	18 ± 7.8	6.2 ± 0.1	6.7 ± 0.1	7.4 ± 0.1	8.7 ± 0.3
4000 Hz	21 ± 8.7	6 ± 0.1	6.4 ± 0.07	7.1 ± 0.1	8 ± 0.2

Graph courtesy of Intelligent Hearing Systems

    g.   Click acquire to begin recording.

13.   **If a conductive loss is suspected at the 4000 Hz Chirp in either ear, switch to bone conduction protocol.**

    a.   If bone conduction testing DOES confirm suspected conductive loss, finish with bone conduction testing using a tone burst stimulus at 500 Hz, 2000 Hz, and 1000 Hz.

    b.   If bone conduction testing DOES NOT confirm suspected conductive loss, return to air conduction testing frequencies.

14.   **If conductive loss is not suspected, continue air conduction testing with a 500 Hz chirp in both right and left ears.**

    a.   Complete air conduction testing with a 2000 Hz Chirp and 1000 Hz Chirp in both right and left ears.

15.   **Have the spoke site staff monitor insert placement and electrodes. If the infant becomes fussy, spoke site staff should notify audiologist at hub site so testing can be paused for readjustments as needed.**

    a.   Audiologist also needs to be monitoring infant on placement and movement.

16. **To have both right ear and left ear appear on screen, press "Set Page".**

    a. Go to "Page Mode".
    b. Select page mode: "Split".

17. **After air conduction threshold testing is completed, turn camera back to clinician and turn microphone on.**

    a. Describe the bone conductor to nursing staff, and request to get it out.
    b. Instruct spoke site staff on where to place the bone conductor. See training videos to assist with placement of bone conductor.

18. **Once bone conductor is placed repeat instructions from Step 12 B & C to move camera view and mute microphone.**

    a. Please note at this time the bone oscillator cannot be used with chirp stimulus.

19. **Complete bone conduction testing frequencies.**

    a. Begin with 4000 Hz tone burst stimuli, continuing with 500 Hz tone burst stimuli, 2000 Hz tone burst stimuli, and 1000 Hz tone burst stimuli.

20. **Notify the spoke site staff when testing is done or if another test needs to be performed.**

    a. If another test needs to be completed, inform the nursing staff what steps need to be done for the additional test, since on-site training covered only otoscopy and ABR.

21. **Inform spoke site staff that they can remove electrodes and ear inserts from infant when appropriate.**

22. **Provide a brief break for infant and family (approximately 5 minutes) to collate and interpret results.**

23. **Explain the tests completed at the appointment and the results from the test.**

    a. Counsel family on the meaning of the results; i.e. what are their communication pathway options, what next steps can they take, what decisions do they need to make right away, etc.

After Appointment

1. Inform spoke site staff to retrieve necessary Release Forms for patient's pediatrician/primary care physician, in addition to forms for early intervention services, such as the state's Early Hearing Detection and Intervention program.
2. Say goodbye to patient and family.
3. Sign off Skype for Business or Cisco Systems.
   a. To disconnect from Skype for Business, click on the telephone icon at the bottom of the call screen to End Call.
   b. To disconnect from Cisco systems, you must hit end on Forever TeleAudiology Bridge or it will continue to stay connected.
4. Print and place audiologic test results in patient file. Place faxed signed consents, HIPPA, and releases from the remote site in patient file.
5. Write report.
6. Fax results and report to approved sites.