Essential Pediatric Audiology for All Audiologists

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Course Description

• Facing the challenges of a child in the audiometric test suite can be daunting at times.
• This presentation is designed to assist you in making the most of the test time. Tips and strategies and evidence based practice will be presented.
Topics Covered

• Evidence Based
  – Physiologic Methods
  – Behavioral Methods

• Clinical Tips to Maximize Information
  – Physiologic Methods
  – Behavioral Methods
Objectives

- This is a session about how to maximize doing physiologic and behavioral testing in young children.
- This is a session that uses research to aid in best practice
Participants will be able to:

• Design an optimal infant test battery.
• Develop an action plan for obtaining a complete audiometric profile with infants/toddlers.
• Integrate family-friendly practices into the audiological management of children.
I’m an “adult” audiologist. Why do I need to worry about providing services for children?
Need for Pediatric Audiologists

• 2,000,000 live births in US each year
• 95% hospital screen = 1,900,000
• 4% refer rate = 76,000 will need to be tested by an audiologist
  This does not include the
  – Other referrals,
  – Later onset of hearing loss, and
  – Audiological management of the children already identified with hearing loss
Availability of Pediatric Audiologists

Pediatric Audiologists per 10,000 Births per year*

*NCHAM
They need you!
Ok, you got my attention. Tell me what I need to work with this population.
Must haves – things that don’t cost

- An audiologist must...
  - Utilize age-appropriate testing techniques (ear-specific, frequency specific, child specific, state-of-the-art)
  - Be able to run test equipment with their eyes in the back of their head
  - Have very quick hands and anticipate the child’s moves
  - Be flexible, creative, compassionate
  - Know how to work with multiple disciplines, personalities, cultures, family dynamics
  - Family-friendly scheduling
  - Patience and a friendly smile
Must haves – things to budget for

- A sound room/booth large enough for strollers, baby bags, high chairs, pediatric chairs and tables, standard chairs, and of course test equipment and materials
- A variety of toys, books, flashlights – all things that can easily be cleaned
- Lots of bubbles
- Portable and diagnostic audiometers with insert earphones, Immittance system, OAEs, otoscope, and ABR )
An ABR costs a lot of money. Why do I need it? What do I do with it?
Testing Children

- Auditory Brainstem Response (ABR)
Auditory Brainstem Response

• The underlying assumption is that a temporal relationship exists between the sensory stimulation and the resulting neural response.
Auditory Brainstem Response (ABR) Protocol

- Air Conduction
  - Click
  - Tone Bursts at 500 Hz, 10000 Hz, 2000 Hz and 40000 Hz

- Bone Conduction
Limitations of Click Response

• Need good neural synchrony
• Not frequency specific
  – Miss losses not centered at 2-4k Hz e.g. low and high frequency configurations and potentially mid frequency losses if 4k and above have normal thresholds
Normal Condensation/Rarefaction Click
9 month old
26 week gestation did not pass newborn hearing screen (ABR)
ABR-Frequency Specificity

- Click ABRs can miss hearing losses especially if only presence or absence of wave V is used as a criteria.
- Stapells and Oates, 1997 showed high, mid and low frequency losses missed by click ABR as wave V still present at ‘normal’ levels.
NR to Click ABR
Comparison of ABR and Behavioral Thresholds (verify, verify, verify!)
How to obtain a frequency specific audiogram using electrophysiological measures?

- **Tonal stimuli**
  - problem is the shorter the duration of onset, the less tonal but the better ability to elicit a response (abrupt onset there is more spectral spatter--energy in unwanted frequencies)
ABR-Frequency Specificity

- Tonal ABR and behavioral thresholds
  - Thresholds estimated to within 20 dB on average with better response agreement between behavioral and ABR tonal thresholds in Ss with SNHL
ABR-Frequency Specificity

- **Stimulus**
  - Gating function: frequency specificity vs. place specific. Some studies show little difference with different (linear vs. Blackman) gating functions (Oates and Stapells, 1997; Purdy and Abbas, 2002) although in theory, should be better (Gorga & Thornton, 1989)
ABR-Frequency Specificity

- **Stimulus**
  - Polarity: alternating may eliminate stimulus artifact
  - Calibration: lack of standards for ABR, different for pure tone stimuli
  - Repetition rate: studies? Time is important
ABR-Frequency Specificity

- Filter settings: infants have low frequency energy in their ABR (Suzuki et al., 1977; Picton et al., 1981; Hyde, 1985)
Conclusion: substantial literature in most areas to support the use of frequency specific stimuli using the ABR as a way to predict the audiogram
Threshold estimation by the tone-evoked auditory brainstem response: a literature meta-analysis.

• In this review and meta-analysis of 32 studies, the tone-evoked ABR was evaluated for its ability to accurately predicted behavioral thresholds in normally hearing and hearing-impaired infants, young children and adults.

• Results revealed acceptably low behavioral thresholds estimation in normally hearing, and reasonably accurate threshold estimation in hearing-impaired subjects including 500 Hz, which had been open to speculation about accuracy
What information do Audiologists need to accurately estimate an audiogram with ABR in infants?

- Appropriate stimulus and recording parameters for infant ABR
- Appropriate interpretation of results based on test battery
- Accuracy of threshold prediction when using click and tone-burst ABR
Protocol for Infant ABR

- Sedation ??
- Filter settings at 30-1000 (no higher than 100)
- Rate <30 stim/second
- Recording window of 15-25 ms
- Low Electrode Impedance
  - Below 3K Ohms and balanced
- AC - Click (AN), TB (.5, 2, 4, 1K)
- BC - TB (.5, 2k)
Tips for Infant ABR

• Repeat
• Increase # of sweeps at threshold Averaging “MAGIC” # of Sweeps
• Bracket large (20-40dB), then small
• Verify, verify, verify
Tips

• Prep the child before asleep, while eating if doing unsedated/natural sleep ABR
• Work fast—prioritizing which frequencies you need first and fill in gaps as time allows
• Repeat responses for those unclear and close to threshold
• No need to do high levels at all frequencies
Tips for Infant ABR

• Sleeping baby
  – Test at nap time
  – Don’t sleep in the car
  – Sedate over 3 months

• Comfortable Baby
  – Dry, swaddled

• Parents present?
HB 5 months

Hx: question of Waardenburg Syndrome, white forelock, and areas of no pigmentation on the skin
Hx: question of Waardenburg Syndrome, white forelock, and areas of no pigmentation on the skin
CB 5 months

Hx: parental concern about hearing
CB 5 months

Hx:
parental concern about hearing
IB 5 months

Hx: prior
ABR – ?
loss right
and normal
left
Hx: prior ABR – ?
loss right and normal left
IB 5 months

Hx: prior ABR –Nov- ? loss right and normal left
IB 5 months

Hx: prior ABR –Nov- ? loss right and normal left
SS 3 months

Hx: IDM, microphthalmia and anophthalmia, CNS abnormalities
SS 3 months

Hx: IDM, microphthalmia and anophthalmia, CNS abnormalities
SS 3 months

Hx: IDM, microphthalmia and anophthalmia, CNS abnormalities
SS 3 months

Hx: IDM, microphthalmia and anophthalmia, CNS abnormalities
NS 22 months

Hx: CP, choeoathetosis (involuntary movement), hypotonia, low vision, microcephaly
DG 20 months

Hx: speech and language delays, could not test behaviorally, PDD
DG 20 months

Hx: speech and language delays, could not test behaviorally, PDD
DG 20 months

Hx: speech and language delays, could not test behaviorally, PDD
CH 7 months

Hx: DiGeorge Syndrome, CHARGE Syndrome, FTT, cleft palate, left-side VP shunt, Chiari malformation, ASD, immunodeficiency, agenesis of the corpus callosum, chronic OME
CH 7 months

Hx: DiGeorge Syndrome, CHARGE Syndrome, FTT, cleft palate, left-side VP shunt, Chiari malformation, ASD, immunodeficiency, agenesis of the corpus callosum, chronic OME
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CH 7 months

Hx: DiGeorge Syndrome, CHARGE Syndrome, FTT, cleft palate, left-side VP shunt, Chiari malformation, ASD, immunodeficiency, agenesis of the corpus callosum, chronic OME
Take Home Message

• A Click ABR alone is NOT enough
• You can and should obtain TB ABR
• TB ABRs will have different morphology and latency than click ABRs, especially at 500Hz
• Waveform recognition is a pattern recognition task and requires PRACTICE!
• Verify, Verify, Verify
How do I estimate the audiogram?
Auditory Brainstem Response

- Ability to predict the type and degree of loss as well as the audiogram’s contour
  - click, to within 5 dB of behavioral threshold
  - Tone burst correction factors for normal hearing individuals
    - 500 Hz 20 dB
    - 1000 Hz 15 dB
    - 2000 Hz 10 dB
    - 4000 Hz 10 dB
Is air conduction sufficient?
Born at 33 weeks, tested at 8 days
Bilateral microtia and atresia; Treacher Collins

Control at -5dB
TJ 3 months

Hx: Atresia
Bone conduction ABR

- stimulus spectrum is different
  - due to different transducers
- dynamic range is different
  - b/c rarely exceeds 45-55 dB maximum stimulus level
- relationship between output of the oscillator and the “dial reading” will differ between instruments
Bone conduction ABR

- First obtain unmasked threshold
- If ears are asymmetric then masking will be needed
- Response will resemble air conduction ABR and can be obtained at levels very close to behavioral thresholds
Bone conduction

Unmasked

masked
Bone conduction ABR

• if click and tone burst ABRs are normal do not need to do bone conduction ABR
• parameters are the same as for air-conduction clicks except -- use alternating polarity
  – will eliminate electrical artifact from the bone oscillator
Behavioral thresholds and ABR thresholds have very good agreement.
Limitations of ABR

- Not a test of hearing
Auditory Steady State Response
Auditory Steady State Response

- Variable findings
- Some suggestion that there is better threshold estimation in individuals with hearing loss
- May provide more information for severe-to-profound group
- Some studies say just as good as tonal-ABR results, others say better, yet others say not as good
Tlumak AI, Rubinstein E, Durrant JD.

Meta-analysis of variables that affect accuracy of threshold estimation via measurement of the auditory steady-state response (ASSR)

Conclusions

• 80-Hz ASSR is a reasonably reliable method for estimating hearing sensitivity in the mid-to-high frequencies in those with and without hearing loss.

• More accurate threshold estimations using 80-Hz ASSR are obtained as carrier frequency increases in those with hearing loss.

• Electrode position is not related to mean threshold differences at any carrier frequency in either those with or without hearing loss.

• Assuming validity of comparisons across studies using 80 vs. 40 Hz threshold estimates ... improved accuracy of threshold estimation using 40 Hz when testing at lower carrier frequencies (e.g. 0.5 kHz).
Tlumak et al., 2007
Conclusion cont.

• more accurate threshold estimates via 80-Hz ASSR might be obtained with the use of AM tones than MM tones in the hearing-impaired population

• there appear to be practical limits of the number of sweeps in signal averaging of the 80-Hz ASSR (at least in the hearing-impaired population)

• there are differences between 80-Hz ASSR mean threshold differences found between stimulus conditions monaural and binaural multiple frequency (at least in the hearing-impaired population).
I have an immittance system. Do I need OAEs?
Not all Immittance Systems are created equal...

• Immittance equipment
  – Must have...
    • Tympanometry at multiple frequencies
    • Acoustic Reflexes (Ipsilateral and Contralateral)

• Why?
Babies

• 1000 Hz tone should be used instead of 226 Hz tone
  – Why?
    • Ear Canal/Middle Ear Characteristics
      – mass and resistive components more prominent
    • Ear canal volume too small
    • Shape of ear canal is slit like
    • Ambient room noise – may read as occluded
    • False readings with 226 Hz tone
High Frequency Tympanometry

- 76 infants (151 ears) presenting for out-patient screen/re-screen at ACH
- Adjusted ages: 37.5 wks - 6 months, 28 days
- HFTs compared with pneumatic otoscopy yielded an observed agreement of 87.5%, Kappa = 0.72 (p<0.0001)
- Results: HFTs in good agreement with both pneumatic otoscopy and OAEs.

(Martin, Stroud, Smith-Olinde, 2004)
High Frequency Tymp Types

70/80 ears had single peak
10/80 ears had “flat-sloping”
Acoustic Immittance

- Studies evaluating high frequency tympanometry in infants.
  - Gliddon & Sutton, 2001
  - Kei et al., 2003
  - Margolis et al., 2003
  - Calandruccio et al., 2006
  - Lyra e Silva Kde et al., 2007
  - Swanepoel de et al., 2007
Acoustic Immittance

- Standard 226 Hz tympanometry in Infants
  - Tympanometric patterns are not the same in newborns compared to older infants/children
  - Not effective for determining fluid i.e. ‘normal’ appearing results can be found when surgically confirmed fluid found
  - Ear canal movement suspected (Paradise et al., 1976) and determined (Keefe et al., 1993) but not sole contributor to tympanometric findings (Holte et al., 1990)
Case Study

- 2 month old referred for diagnostic ABR
- 15 dB difference between a/c and b/c click stimuli
- Mild-to-moderate CHL
Case Study
(Dr. Hanks, Gaulladet University, paper presented through CDC)

- 3 mo referred for diagnostic ABR
- Absent ABR to click and TB stimuli
- Mixed hearing loss
Ok, I will check my equipment when I get back to the office... What about OAEs?
TEOAEs

- Stimulus: Brief click or tone burst
  - Click spectrum should be relatively smooth
- TEOAE response above noise floor – pass
- No TEOAE response above noise floor - fail
- Prevalence in normal hearing individuals – 99+%  
  - Some people have no TEOAEs but have normal hearing
- Significant clinical value
Stimulus 0.3 Pa
Patient IL088 O
Ear... TM
Date... 10 yrs

Mode= STIMULUS Gain
NonLin CLIKN 0.0 dB

Cochlear Response

NOISE
Limit 4.9 mPa (peak) 47.8 dB
No. Lo 181
No. Hi 435
2No. Lo 29%
Level 36.8 dB

RESPONSE
Echo 22.9 dB
Depre 98 %
A-B 5.2 dB

STIMULUS
Peak 84 dBsp
Stabil 92 %

TEST TIME
Lmin, 45 sec

FILE NUMBER
95090203.BIN
No. of files stored= 145
DPOAEs

• Stimulus:
  – Pairs of tones are presented across 1000-6000 Hz
  – OAE response = $2f_1 - f_2$

• Prevalence in normal hearing individuals – 99+%  

• Stimulus: Two pure tones

• Significant clinical value
Kids Grow Up

Do I need to do ABRs forever?
Basic Pediatric Auditory Evaluation

- Case History and Parental Report
- Related Screenings / Referral Information
- Age-Appropriate Behavioral Assessment Protocols
- Objective Assessment Protocols
- Integration and Interpretation of Results
- Counseling with Family and Professionals
- Recommendations
- Referrals
Need for Behavioral Test Methods

• Behavioral methods assess hearing
• Assessment is part of intervention
• Not all infants are assessed before 6 months--must not always rely on objective methods
Behavioral Assessment
Test technique

• Visual Reinforcement Audiometry - VRA
• Conditioned Play Audiometry - CPA
• and variations in between – VROCA, TROCA
Test technique as a function of age

- VRA beginning at 5-6 months to 2 years
- Play audiometry 3 to 4 years
- Audiometrically Adult ~ 6 years
- Developmental age is the key
- What about 2??
Conditioned Audiometry Caveat

Really no different than testing adults

- Instructions > Conditioning
- Stimuli are the same
- Response: hand raise > head turn or play task
- Reinforcement: feedback re correct responses

But, you’ll need room for these accommodations ...
Room Arrangement

**Figure 1.** Test-room arrangement.
Response:

head turn

- to see the reinforcer toy
- Clear cut & easy to judge
- Data to support good inter-observer agreement
Reinforcement - Where

Where the child can see it!

... at child’s eye level
visual reinforcer
loudspeaker
infant

assistant

reinforcer control

signal generator

microphone

examiner

oops
Reinforcement - What

Toys
Positive
Not Negative

A variety

History
Red jeweled light
Our pumpkin

3 dimensional toys vs.
video vs slides
Room arrangement

Toys on one side or two?

Task – detection? localization too?

COR vs VRA
Role of examiner in the room with child

- to keep the child appropriately attentive at midline
- provide social reinforcement
- maintain a quiet environment
- maintain rapport with and cooperation of parent
- assistance with earphones
Lots of toys for distracting
Seating

• Parent hold?

• High chair
Alternate test room arrangements

Phonak Focus   Sound Foundations
Pediatric Hearing Assessment
Alternatives to test room examiner

Automated systems - IVRA
Conditioned Audiometry Caveat

- Really no different than testing adults
- Instructions > Conditioning
- Stimuli are the same
- Response: hand raise > head turn or play task
- Reinforcement: feedback re correct responses

Stimulus  >  Response  >  Reinforcement
Tones, speech  >  Head turn  >  Toys to view
Development of VRA Protocol for multi-site studies of newborn hearing screening measures

NIDCD R10  Identification of Neonatal Hearing Impairment - Susan Norton, P.I.

_Ear and Hearing_ October 2000 issue

CDC/ATPM  Efficacy of OAE/AABR Protocol for Identifying Hearing Loss in Newborns

- Jean Johnson, P.I.

Johnson et al., _Pediatrics_ 116(3), Sept 2005

_AJA_, Dec 2005
Behavioral validation of hearing status

- monaural thresholds
- speech and tones (1, 2, 4 kHz)
  - ATPM .5, 1, 2, 4 kHz
- Minimum response level of 20 dB HL
  - ATPM 15 dB HL
- at 8 - 12 months corrected age
- Visual Reinforcement Audiometry
- 3000+ babies at risk for hearing loss
  - ATPM 1000 babies
Requirements of a Behavioral Protocol

We have a protocol for adults. Do we have one for babies?

- Tight enough to be assured we’re all doing it the same way
- Loose enough to accommodate individual infant differences/preferences
- Do-able within one visit
Instructions: **Conditioning**

Stimulus and Reinforcement paired

- Initial training/conditioning *must be perceptible*
  - Level that is audible

- For infants with severe to profound hearing loss:
  - Vibrotactile stimulus
  - Low frequency bone conducted stimulus

- For infants with normal hearing, a spontaneous head turn (repeated) may be sufficient for conditioning
Stimuli and transducers- conditioning

- Speech or tones?
- Soundfield speakers or earphones

ATPM results:
Success in VRA did NOT correlate with conditioning factors such as beginning stimulus type or beginning transducer
Have instructions have been understood?

- Demonstrate understanding of task with probe trials, before descending in level to bracket threshold, i.e. demonstrate *stimulus control*
  
  ... the strength of the discriminative stimulus (tones, speech) in producing the desired response (head turn)

- Get to this point quickly, i.e. 2 consecutive correct responses
Transducers – threshold testing

Babies wear earphones
Stimuli - threshold testing

- Pure tones: Warbled, pulsed, or narrow bands of noise?

VRA as a function of bandwidth: Once the child is under stimulus control, VRA threshold is not influenced by stimulus type e.g. broad band, narrow band or pure tones are effective in eliciting responses  Thompson & Folsom, 1985

- Speech for SAT
Test Stimulus *Duration*

- 2 sec warbled or pulsed tones
- Onset vs offset

if you don’t turn it off, you won’t get a response

OR

if you wait long enough, you’ll get a head turn

no matter what
Test frequencies and sequence

- .5, 1, 2, 4 kHz

- Order of test frequencies determined according to referral question and/or preliminary information

- SAT first or later?

- Frequency jump around
- Keep track of responses and stimuli that didn’t get responses

- One ear first, then the other?
Threshold procedures

Steps

Carhart & Jerger: 5 dB

VRA: 10 dB? 5 dB?

Test-retest reliability will reflect stepsize
Threshold testing protocol

- Stopping rules
- Threshold vs. minimal response levels?
- Air and Bone Conduction?
Control Trials

Silent intervals, just like stimulus trials, but with no reinforcement

... to check validity
... to provide feedback to examiner in test room
Tips from the Trade:
Consider a “fill-in-the-blank” audiogram

• Quickly establish several soundfield thresholds to condition/observe how child responds to sound
• Obtain insert responses at frequencies that would determine general slope of HL and/or symmetry between ears (2k, .5k)
• Obtain bone conduction responses to determine SN vs. CHL
• Continue to “fill-in-the-blank” until the child tires or at subsequent visits until a complete audiometric profile is obtained
Interpretation

• Does the rigor of the protocol affect interpretation?

• Why the difference across studies?

• Is the difference in the details?
Auditory Behavior Index

- Typical sound-field MRLs for Normal Hearing Children Birth to 24 months
- Levels required for minimum response
  - Younger infants > older infants
  - Pure tones >> Noise bands >> Speech

Index of responsivity not sensitivity
MRLs are not norms for audiometry, especially not for conditioned responses to sound
Interpretation: UW infant-adult comparisons

(Wilson and Moore, 1978)
**Interpretation: Gravel - Phonak**

<table>
<thead>
<tr>
<th>Time</th>
<th>500 Hz</th>
<th>1000 Hz</th>
<th>2000 Hz</th>
<th>4000 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 months</td>
<td>20 dB HL (15)</td>
<td>25 dB HL (15)</td>
<td>25 dB HL (15)</td>
<td>25 dB HL (15)</td>
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<tr>
<td>7 months</td>
<td>10 dB HL (10)</td>
<td>10 dB HL (10)</td>
<td>10 dB HL (10)</td>
<td>10 dB HL (10)</td>
</tr>
<tr>
<td>10 months</td>
<td>10 dB HL (5)</td>
<td>10 dB HL (10)</td>
<td>10 dB HL (10)</td>
<td>10 dB HL (5)</td>
</tr>
<tr>
<td>12 months</td>
<td>15 dB HL (5)</td>
<td>15 dB HL (10)</td>
<td>15 dB HL (10)</td>
<td>10 dB HL (10)</td>
</tr>
</tbody>
</table>
Interpretation:
Examples from Phonak booklet
Interpretation:

Gravel – conductive hearing loss
Interpretation:
Talbott – VRA compared to play in children with sensorineural hearing loss

Talbott (1987)
Interpretation: Talbott data

Figure 3. Histogram of minimum response differences at 500 Hz for 25 matched pairs. See legend for Figure 2 for further explanation.

Figure 4. Histogram of minimum response differences at 1000 Hz for 20 matched pairs. See legend for Figure 2 for further explanation.

Figure 5. Histogram of minimum response differences at 2000 Hz for 15 matched pairs. See legend for Figure 2 for further explanation.

Figure 6. Histogram of minimum response differences at 4000 Hz for 10 matched pairs. See legend for Figure 2 for further explanation.
Ways to Delay Habituation

- Multiple reinforcers
- Duration of reinforcement
- Intermittent reinforcement
Ways to Delay Habituation
Lots of toys for distracting
Ways to delay habituation

- Give baby a break
Expectations
VRA Success

- 96% tested reliably
- 92% completed 4 freq, ear-specific audiogram
- 56% accomplished in 1 sessions
- 44% accomplished in 2-3 sessions
  - Habituated, failed to condition, fussy, abnormal tymp, poor reliability, refused inserts
    » (NIDCD R10 multi-center study)
    » n=3,134; 8-12 months CA
### Expectations based on multi-site studies

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of session (min)</td>
<td>18</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Stimulus trials</td>
<td>45</td>
<td>44</td>
<td>20</td>
</tr>
<tr>
<td>Beginning trials</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Reconditioning trials</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
Expectations

- Infants with hearing impairment
  - Test may take longer time
  - Number of stimulus trials increases
  - Conditioning may be more difficult
  - Results just as reliable

» (NIDCD R10 multi-center study)
Factors that relate to Success in VRA

Probably

✓ Experience of the examiners,

i.e. Practice
Conditioned Play Audiometry

- To Play or Not to Play: 2 year olds!
Older children –
Modify response, modify reinforcement
Most Common Pitfalls of VRA Testing

Bamford, Gliddon, Green, Munro, Parry, Sutton & Wood

- Attempting conditioning to subthreshold stimuli
- Not establishing clear responses at suprathreshold before descending to threshold
- Not using time efficiently, often spending too long at high intensities
- Incorrect scoring as true responses i.e. scoring of movement other than a clear head-turn, or false positive (checking) responses
Most Common Pitfalls of VRA Testing, cont

- Use of toys or behavior by Tester 2 (or parent) that are too distracting for child and so inhibit responses
- Distinct and/or rhythmic phasing of attention by Tester 2 such that response cues are given to the patient.
- Overemphasis on quantity of results (number of thresholds obtained) rather than quality (reliability) of those thresholds obtained.
- Inadequate test set-up and communication between testers
We’ve to the results. Now what?
Counseling

• Audiologists need to be forthright in providing information to parents, but also willing to listen and reflect on the concerns and priorities

• Inexperienced clinicians may provide more information that a family can comprehend, especially at the time of diagnosis
Counseling

- When delivering difficult news, give families an opportunity to respond and express their feelings; don't be afraid of a little silence
- Families need hope based on the knowledge that much can and will be done to help them and their child
- The support of other parents is vital to many families
Counseling

• Present information in parent’s primary language
• Use professional interpreters when needed and whenever possible
• Use language that is below the parent’s language, keeping sentences short
Counseling

- Remember the family is the ‘patient’
- Respect the family’s rights to chose
- Think of the family as a partner
Wow—that is a lot of stuff....

What do I do now???
Do I need to do the same thing for every child?
Points to Remember

• At the outset of each clinic appointment ask families what they are hoping to accomplish visits. Return to their priorities at the conclusion of the visit to determine if their goals were met and confirm agreement on next steps.
Case Example 1

• Baby (6 week old) is referred because she did not pass the newborn hearing screening in the hospital or the re-screen and an evaluation is now needed.

• What do you need to do?
Case Example 2

- Baby was referred for audiologic evaluation because of risk indicator for late onset hearing loss. He passed his newborn screening and is now 4 months old.

- What do you need to do?
Case Example 3

- Toddler is referred for an audiologic evaluation because he did not pass the pre-school hearing screening (OAE).
Case Example

- Child is 2 and referred because of lack of speech and language development. Hearing evaluation is needed prior to the speech-language evaluation.
Tips: Case History

- Can mail ahead of time, interview style, form completed in waiting room
- Failure to obtain a sufficient history may reduce the value of the evaluation or lead to error(s)
- Provides information about the child’s cognitive and developmental status and estimate of child’s auditory skills
- Guides your selection of test protocol
  - What’s first?
  - What technique?
  - Is the child hearing impaired or is the test inappropriate?
Guidelines for Pediatric Practice

Guidelines for the Audiologic Assessment of Children from Birth to 5 years of Age

2007 Position Statement
www.jcih.org

www.mountsinai.on.ca/care/infant-hearing-program/health-professionals
Guidelines for Pediatric Practice

Pediatric Amplification Protocol
October 2003
www.audiology.org/resources

Early Detection & Intervention of Hearing Loss: Roles and Responsibilities for the Educational Audiologist
www.edaud.org
Useful websites

For professionals
www.infanthearing.org
http://www.cdc.gov/ncbddd/hearingloss/index.html

For parents
www.babyhearing.org
www.handsandvoices.org
They need you to do a good job!
New Zealand Diagnostic and Amplification Protocols

Appendix F
June 2011
Guessing procedures