Survey of Best Practices: Pediatric Hearing Aid Fitting

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• Survey participants
AAA Definition of Evidence-Based Practice

“"To practice according to best clinical practices for making decisions about the diagnosis, treatment, and management of persons with hearing and balance disorders, based on the integration of individual clinical expertise and best available research evidence."”

(http://www.audiology.org).
Current Guidelines:

• AAA Pediatric Amplification Protocol 2003;
• ASHA Guidelines for the Audiologic Assessment of Children From Birth to 5 Years of Age;
• Year 2007 Position Statement: Principles and Guidelines for EHDI Programs;
• CASLPO PPG on Assessment of Children for Audiologists;
• CASLPO PPG on Prescription of Hearing Aids for Children
“There is a current trend to develop test protocols that are “evidence based.” . . . But, before we develop any new fitting guidelines, maybe we should first try to understand why there is so little adherence to the ones we already have” (p.26).

## Some Guideline Implementation Challenges

<table>
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<tr>
<th>Guideline</th>
<th>Practitioner</th>
<th>Context</th>
<th>Broader Health System</th>
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<td>Relative advantage</td>
<td>Time</td>
<td>Workplace Structure</td>
<td>Nature of financial compensation</td>
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<td>Compatibility</td>
<td>Lack of authority to change practice</td>
<td>Organizational agenda</td>
<td>Support for change</td>
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<td>Complexity</td>
<td>Lack of support</td>
<td>Available resources</td>
<td>Regulation of health professionals</td>
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<td>Costs</td>
<td>Perception of legitimacy/source of guideline</td>
<td>Staff capacity</td>
<td>Financial stability</td>
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<tr>
<td>Flexibility</td>
<td>Knowledge/Skill</td>
<td>Staff ‘turn-over’</td>
<td>Pressure</td>
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A survey of factors influencing the implementation of best practices in pediatric audiology/amplification
Objective: Gather information on:

1. The clinical measures that are currently being implemented in pediatric audiology practices in North America;
2. The barriers to implementing protocols and/or guidelines in pediatric audiology practice; and
3. What might facilitate implementation of protocols/guidelines in pediatric audiology practice.
E-Survey:

1. Protocol for assessment/amplification in your practice;

2. Hearing Assessment Protocols;

3. Hearing Aid Selection and Fitting Protocols;

4. Verification Protocols;

5. Evaluation / Validation Protocols
Pediatric Audiology Definition

- The branch of audiology that deals with the audiological care of infants, children, and adolescents. The upper age limit of such patients ranges from age 12 to 21 years. For the purpose of this survey we will set the upper age limit to 12 years of age.
Results
Respondents:

- Of the 491 respondents, 432 identified themselves as “pediatric audiologists” based on our provided definition.
- Most states/provinces represented.

![Pie chart showing distribution of respondents: 86% full-time, 14% part-time, 0% not employed, 0% retired.](image-url)
Number of hearing aids fit each month

78% prescribe, fit, and verify the hearing aids for children in their care.
72% of respondents indicated that they follow the same/similar protocol in practice. The following responses best describes how the pediatric hearing aid fitting protocol was developed.

75% reported having a lot of control over the protocol.
Rank (putting the most important factor first) how important the following factors were/are when the pediatric hearing aid fitting protocol was/is developed:

1. **Best practices guidelines recommendations**

2. **Ability of audiologist(s) to be able to implement the guideline given their experience skill**

3. **Availability of equipment**

4. **Amount of available appointment time**

5. **Cost**
Assessment
Assessment Guidelines (CASLPO)

- Transducer: (1) insert earphones; (2) supra-aural headphones

- Soundfield testing does not result in sufficient information for proceeding with intervention, if required, and as such is not appropriate for determining auditory thresholds, unless the use of headphones is contraindicated.

- The child, seated in the test room, is facing forward with the reinforcing toys at eye level, and ideally at 90 degrees to the right and/or left side(s).
Assessment Guidelines

- ASHA: “Insert earphones are recommended, unless contraindicated, followed by bone conduction as needed; sound-field testing may be necessary or useful with some children.”
- AAA: “Ear-specific and frequency-specific air and bone conduction thresholds are essential for providing information needed for accurate hearing aid fitting (The Pediatric Working Group, 1996).”

“Individual or age appropriate ear acoustics should be accounted for in the hearing instrument selection fitting process. Real-ear-coupler-differences are used to individualize the HL to SPL transform.”
When measuring a child's hearing threshold levels who is greater than 6 mos of age but less than 3 years of age, I use the following audiometric transducer most of the time.

- **Insert earphones:** 58%
- **Standard or Supra-aural earphones:** 24%
- **Soundfield with loudspeakers at 0 degrees azimuth:** 11%
- **Soundfield with loudspeakers at 45 degrees azimuth:** 6%
- **Others:** 1%
Assessment

- For children older than 3 years of age, when measuring their hearing threshold levels I use the following audiometric transducer most of the time:

  - Insert earphones: 80%
  - Standard or Supra-aural earphones: 20%
  - Soundfield with loudspeakers at 0 degrees azimuth: 0%
  - Soundfield with loudspeakers at 45 degrees azimuth: 0%
Survey Results: RECD measurement at Assessment

- 64% of respondents seldom or never (0 – 25% of the time) measure the RECD during assessment
  - Canadian audiologists attempt to measure it at assessment more frequently

Barriers to RECD measurement at assessment

- Time
- Cooperation
- Confidence/skill in making the measurement
- Clarity as a necessity in the guideline?
Assessment: RECD Measurement

- **CASLPO:** Real Ear to Coupler Difference measurements are an **obligatory** component of the provision of hearing aids for children.

- Individual RECD measurement during the **assessment** procedure aids in defining hearing loss, counseling and choosing appropriate treatment strategies.
Assessment: RECD Measurement

**AAA** - Measurement of RECD “is important in a population whose ear canals and eardrum impedance generally are different from the adult averages that typically are used to conduct these transforms. In addition, the RECD is used to adjust the electroacoustic fitting so the final output in the real-ear will be correct for an individual child. This use of the measurement is especially important when real-ear aided response measures are not possible.”
I do not believe the RECD to be a useful measure

I do not have time to measure the RECD

The clinical protocol at our office does not incorporate a RECD measurement into the...

I do not know what a RECD measurement is

The child will often not cooperate for the measure

I own real-ear equipment, however I do not feel confident in making the RECD measurement...

I do not own a real-ear system so I cannot make the RECD measurement

I don't think that measuring the RECD provides any additional information at the assessment...

I measure the RECD only at the fitting and/or verification stage
Case Example:

<table>
<thead>
<tr>
<th></th>
<th>250</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>3000</th>
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<th>6000</th>
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<tbody>
<tr>
<td>Foam</td>
<td>8</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>17</td>
<td>18</td>
<td>17</td>
<td>18</td>
<td>17</td>
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<tr>
<td>Earmold</td>
<td>-1</td>
<td>6</td>
<td>11</td>
<td>14</td>
<td>17</td>
<td>17</td>
<td>16</td>
<td>14</td>
<td>19</td>
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<tr>
<td>Foam</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Earmold</td>
<td>-19</td>
<td>-8</td>
<td>-2</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>-4</td>
<td>-4</td>
</tr>
</tbody>
</table>

RECD foam v. earmold
3 month old v. 46 month old
Facilitators: RECD measurement at assessment

- Insert earphones can be connected to earmolds for assessment and RECD measured with same molds;
- Continued training to improve confidence in making the measurement;
- Educating re: strategies for increasing cooperation for the measurement;
- Clinical time / resources to obtain the measurement.
Facilitators: RECD measurement at assessment

- Understanding errors in defining hearing loss that may occur using average values;
- Clarity in guidelines
- Greater flexibility in verification/assessment equipment
Verification

Assessing performance of hearing aid settings as compared to prescriptive targets
Verification

- When fitting hearing aids to the pediatric population, I use *(prescriptive method)* % of the time.

- 92% of respondents use DSL most (80 to 100%) of the time. Consistent with Phonak Sound Foundations Cuper Project results.

- Some audiologists will use NAL for older children or for noisy listening programs
Verification: Real-Ear Measurements

- Real-ear measurement refers to the fitting / verification of the hearing directly on the child's ear using probe-tube/real-ear microphone measurements.

- In my practice I perform real-ear measurements directly on the child's ear to my prescriptive targets (what percentage) of the time.
42% obtain real-ear measures (in-situ) at least 70% of the time
My preferred verification method (the one I most frequently find I use) is the:

- Real-ear-aided response (REAR)/ Output based Speech Mapping (69%)
- Real-ear-insertion-gain response (REIG) (12%)
- Soundfield with loudspeaker at 0 degrees azimuth (10%)
- Soundfield with loudspeaker at 45 degrees azimuth (5%)
- Soundfield with loudspeaker at 90 degrees azimuth (4%)
When I verify my hearing aid fitting using real-ear measures, I measure the following: Check all that apply.

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Maximum output (loud tonal outputs)</td>
<td>204</td>
</tr>
<tr>
<td>Aided loud noise signals</td>
<td>7</td>
</tr>
<tr>
<td>Aided average noise signals</td>
<td>11</td>
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<tr>
<td>Aided soft noise signals</td>
<td>10</td>
</tr>
<tr>
<td>Aided loud puretones</td>
<td>4</td>
</tr>
<tr>
<td>Aided average puretones</td>
<td>7</td>
</tr>
<tr>
<td>Aided soft puretones</td>
<td>17</td>
</tr>
<tr>
<td>Aided loud speech (inputs ranging from 75...</td>
<td>171</td>
</tr>
<tr>
<td>Aided average speech (inputs ranging from...</td>
<td>248</td>
</tr>
<tr>
<td>Aided soft speech (inputs ranging from 45...</td>
<td>234</td>
</tr>
</tbody>
</table>
Barriers to real-ear measures

- Age / level of cooperation from the child
- Child is too young to sit up in front of a loudspeaker
- Availability of equipment
- Confidence in performing real-ear measures

- “I ATTEMPT this probably 95% of the time, choosing not to attempt on a combative patient approx. 5% of the time. It appears to be only successful approx. 70% of the time due to tolerance or cerumen. I think only the Canadians can routinely get real-ear measurements on the "terrible 2s". This IS A JOKE, tee-hee ;-).”
Facilitators to real-ear measures

- Real-ear measures are required for open-fit instruments.
- Simulated or predicted real-ear measures are most accurate if an individual measurement of the child’s RECD is obtained.
  - It is important that pediatric audiologists know that simulated fitting that takes place on the 2cc coupler to predict real-ear hearing aid performance requires an individual RECD measurement with the earmold.
Validation

Demonstration of the benefits and limitations of interventions/amplification
Validation – Best Practice Guidelines

CASLPO

- Audiologist/caregiver discuss satisfaction with fitting
- Behavioral measures, both formal/informal
- Involvement of other professionals

AAA

- Aided speech perception measures
- Functional Assessment Tools
  - Completed by educators
  - Completed by parents/caregivers
Aided soundfield verification

- Aided soundfield testing using puretones/warble tones still being conducted
- Primarily being used as a validation procedure
  - “... I like to add the warbled puretones on the audiogram. I understand the logistics with measuring digital hearing aids and compression, but it is nice to have parents and teachers see in a more understandable way how the student is hearing with their hearing aids (to an extent)”
  - “I do it as a follow-up measure, but my primary verification is real-ear”
“We use it for insurance purposes and because teachers like to see it. We do not use it as true verification and counsel parents and teachers as such.”

“We very rarely (maybe 2 times/year) perform aided testing as sometimes it's requested by a parent or speech therapist. I've found that aided testing is a great tool for counseling parents though, as some have difficulty understanding REMs”
Facilitators to moving away from tonal soundfield measures

- As better speech-based, age-appropriate, outcome evaluation tools become available with appropriate normative data we may see a shift from reliance on traditional soundfield aided tone tests for validation.
- Education of audiologists, other professionals and parents
- Changing habits
  - Taking important time away from other areas of the process to measure something that we know is not providing ‘best practices’ information
Aided speech soundfield testing

“Due mainly to the schools requesting the information, not because I feel it is an indication of benefit.”

“... don’t view as verification; it provides valuable information and validation.”

“In our practice we are constantly pushing the children to complete more and more complex speech perception tests. We feel speech perception is the best measure of speech reception – isn’t that the goal of amplification for children???”
Parental self-report measures

I use the following parental self-report measures after I have fit a hearing aid to infants and young children. Choose all that apply.
I do not currently use parental self-report...
I do not use functional assessment tools
Low-Verbal Early Speech Perception Task
Early Speech Perception Task
Phonetically Balanced Kindergarten List (PBK)
Northwestern University’s Children’s...
Pediatric Speech Intelligibility Test (PSI)
Functional Listening Evaluation
The SIFTER
The Pre-School SIFTER
Auditory Behavior in Everyday Life (ABEL)
Children’s Home Inventory for Listening...
Children’s Outcome Worksheet (COW)
Client Oriented Scale of Improvement – Child...
Developmental Index of Audition and...
Early Listening Function (ELF)
Functional Auditory Performance Indicators...
Hearing Aid Benefit Scale for Infants / Toddlers...
Infant-Toddler Meaningful Auditory...
LittLEARS Auditory Questionnaire
Parents’ Evaluation of Aural/Oral Performance...
Lexical Neighborhood Test
Multi-syllabic MLNT
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<th>Largest Gaps</th>
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<td>• RECD at Assessment</td>
<td>• RECD at multiple stages</td>
</tr>
<tr>
<td>• Soundfield as primary Verification</td>
<td>• Comfort obtaining probe mic measures</td>
</tr>
<tr>
<td>• Validation</td>
<td>• Specific Validation guidelines</td>
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Summary

- This sample clearly shows that pediatric audiologists are attempting to follow audiology guidelines for the assessment of children’s hearing and for the provision of appropriate amplification to children with hearing loss.

- There are still gaps that can be addressed by paying attention to implementation issues that arise at the level of the guideline; the individual practitioner; the context in which they work and the broader healthcare system.
Thank you.