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Getting On The Right Track: Untangling Complex Pediatric Audiology Cases, in partnership with Phoenix Children's Hospital

Wendy Steuerwald, AuD, Director of Audiology

Allie Sayer, AuD, Audiologist II

Laura Marchman, AuD, Audiologist I

Lynn Eyde, AuD, Audiology Manager

Paige Petersen, AuD, Audiologist II

Deborah Flynn, AuD, Lead Audiologist



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Learning Outcomes

After this course, participants will be able to:

- Describe methods to give unexpected results to parents and patients in a clear way.
- Explain why using the results of multiple audiology measures is necessary to obtain an accurate picture of the patient's auditory status.
- Discuss the importance of counseling and follow-up in the patient care journey.

Ella – An Unnecessary Referral, or a Candidate for Cochlear Implants?

Allie Sayer, AuD, CCC-A



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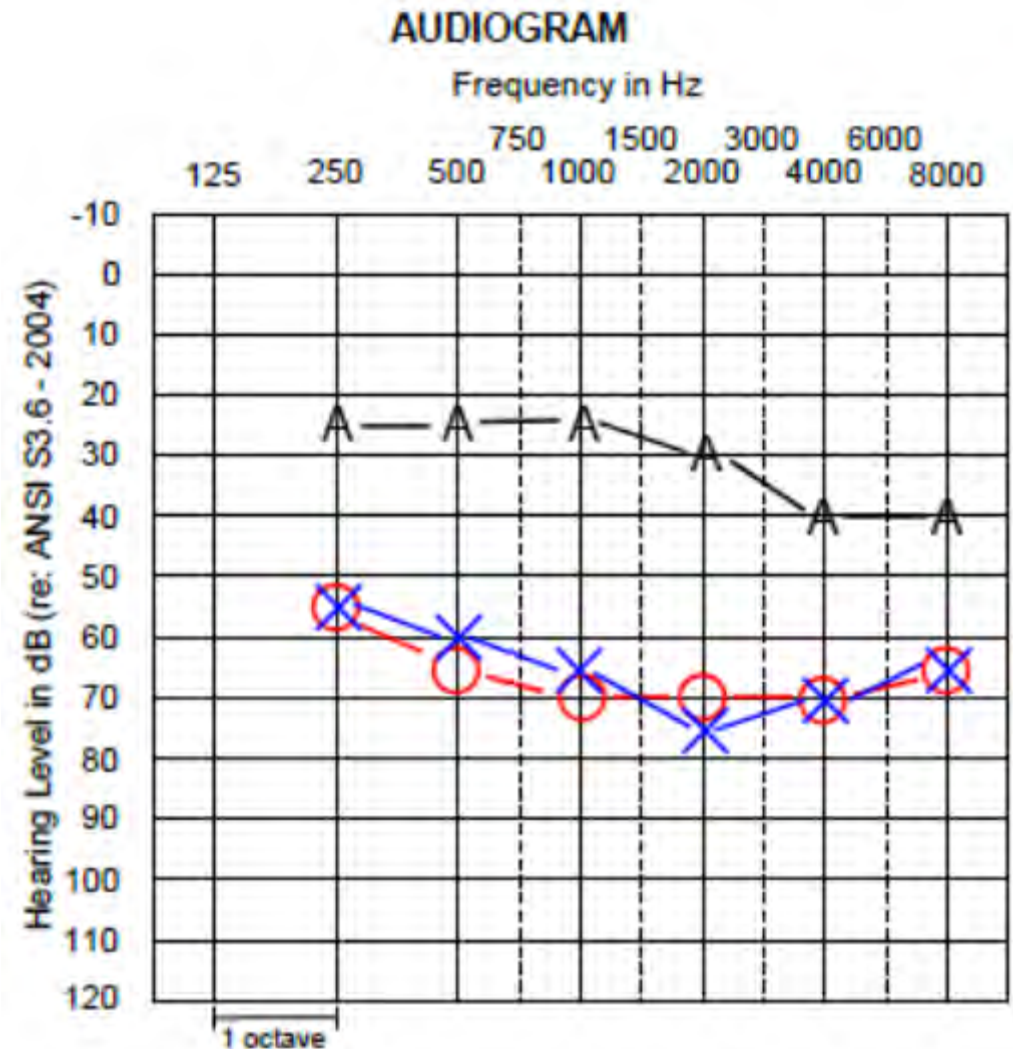
History

- Referred by outside audiologist to ENT for cochlear implant consultation
 - Poor speech and language progress
 - Difficulty communicating at home (bilingual household)
 - Academic difficulties
- Congenital moderate to moderately-severe sensorineural hearing loss diagnosed at 6 months of age following referred NBHS
 - Genetic testing completed – negative
 - Never had imaging with CT or MRI
- Fit with hearing aids just after one year of age

Outside Records

- Pure Tone Average: 68 R/67 L
- Speech testing not completed
- Interpretation in report: “Responses to NBN in soundfield suggests good aided benefit in quiet. However, pt is likely missing high frequency phoneme information, even with REAL ear measurements confirming appropriate match to target, bilat.”

RECOMMENDATION: Further evaluation with managing audiologist, or with a cochlear implant audiologist at our facility.



Pediatric Cochlear Implant Candidacy

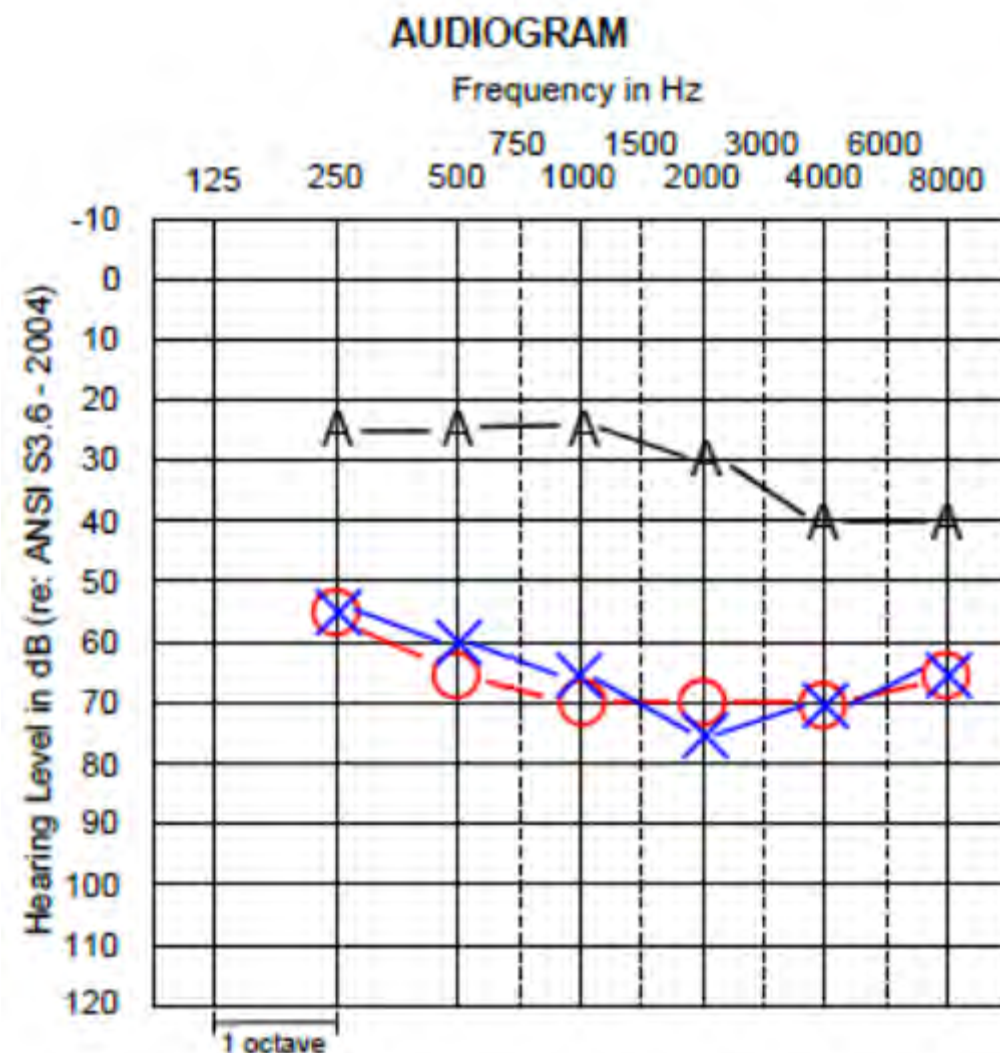
- FDA Indications
 - Varies by manufacturer
 - General pediatric candidacy:
 - Severe to profound sensorineural hearing loss
 - Poor speech understanding or limited benefit from appropriately fit hearing aids
 - Most strict manufacturer cutoff is $\leq 20\%$
- Off-label implantation
 - Asymmetric hearing loss
 - More residual hearing
 - Children <7 months of age

ACIA Guidelines

- For a child at any age, refer for a cochlear implant evaluation when a patient meets any of the following criteria:
 - Audiometric thresholds are ≥ 70 dB
 - Word recognition scores $\leq 50\%$ correct
 - Poor functional performance, limited progress, poor quality of life

Back to Ella

- ✓ • Audiometric thresholds are ≥ 70 dB
- ⊘ • Word recognition scores $\leq 50\%$ correct
- ✓ • Poor functional performance, limited progress, poor quality of life



Pure Tone Average: 68 R/67 L

ENT Follow-up

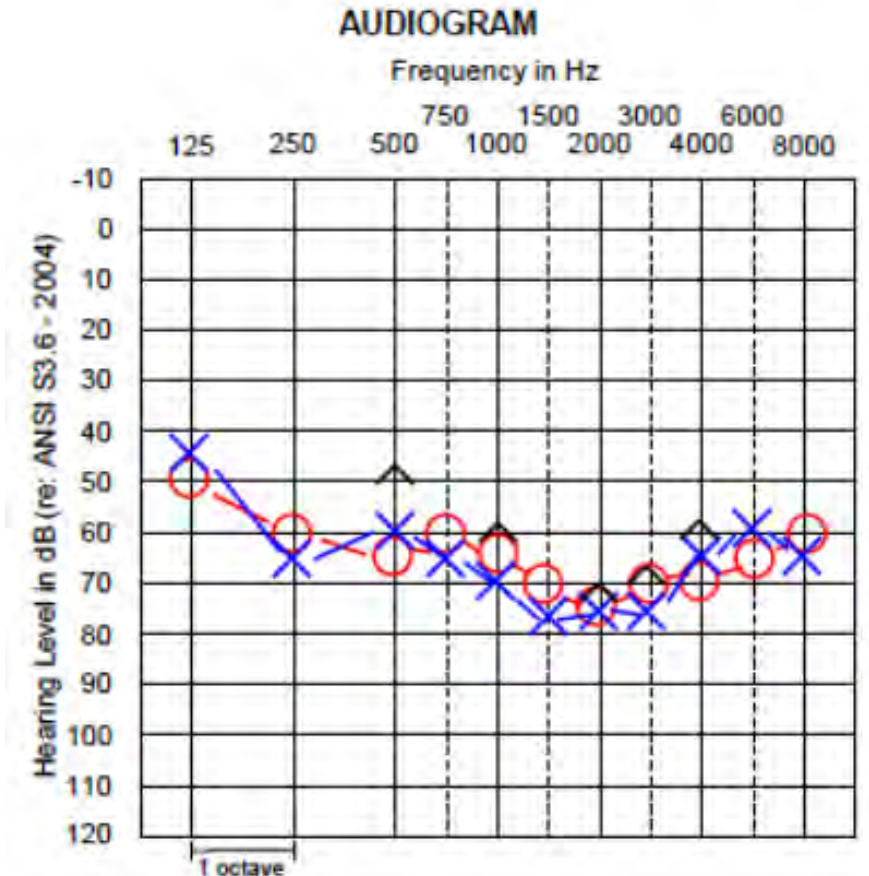
- Speech testing – 51%
 - Bilateral aided only – no unaided or ear-specific
 - Sentences (AZ Bio) in quiet
 - Loud conversational level
 - Noted difficulty scoring due to articulation
- SLP evaluation
 - “Formal assessment of receptive and expressive language was not completed as this evaluation was focused on assessment of auditory skills.”
 - Severe delay in auditory skills
 - Difficulty understanding WH questions in conversation
 - Missing key words in sentences

Our First Visit

- Now 9 years 8 months old
- Ella denies hearing difficulties, though parent report is consistent with ENT and outside records
- 4th grade – has an IEP and uses an FM system at school
 - Receives speech therapy at school
- Ella confirms English is preferred language and that she knows “barely any Spanish”

Test Results

- Otoscopic exam unremarkable
- Type A tympanograms
- Ipsilateral reflexes absent at 100 dB 500-4000 Hz bilaterally
- Moderate to severe sensorineural hearing loss
- **Unaided speech testing:**
 - SRTs at 70 dB HL bilaterally
 - WRS at max output of 110 dB with PBK-50 ½ Lists
 - Right: 80%
 - Left: 88%

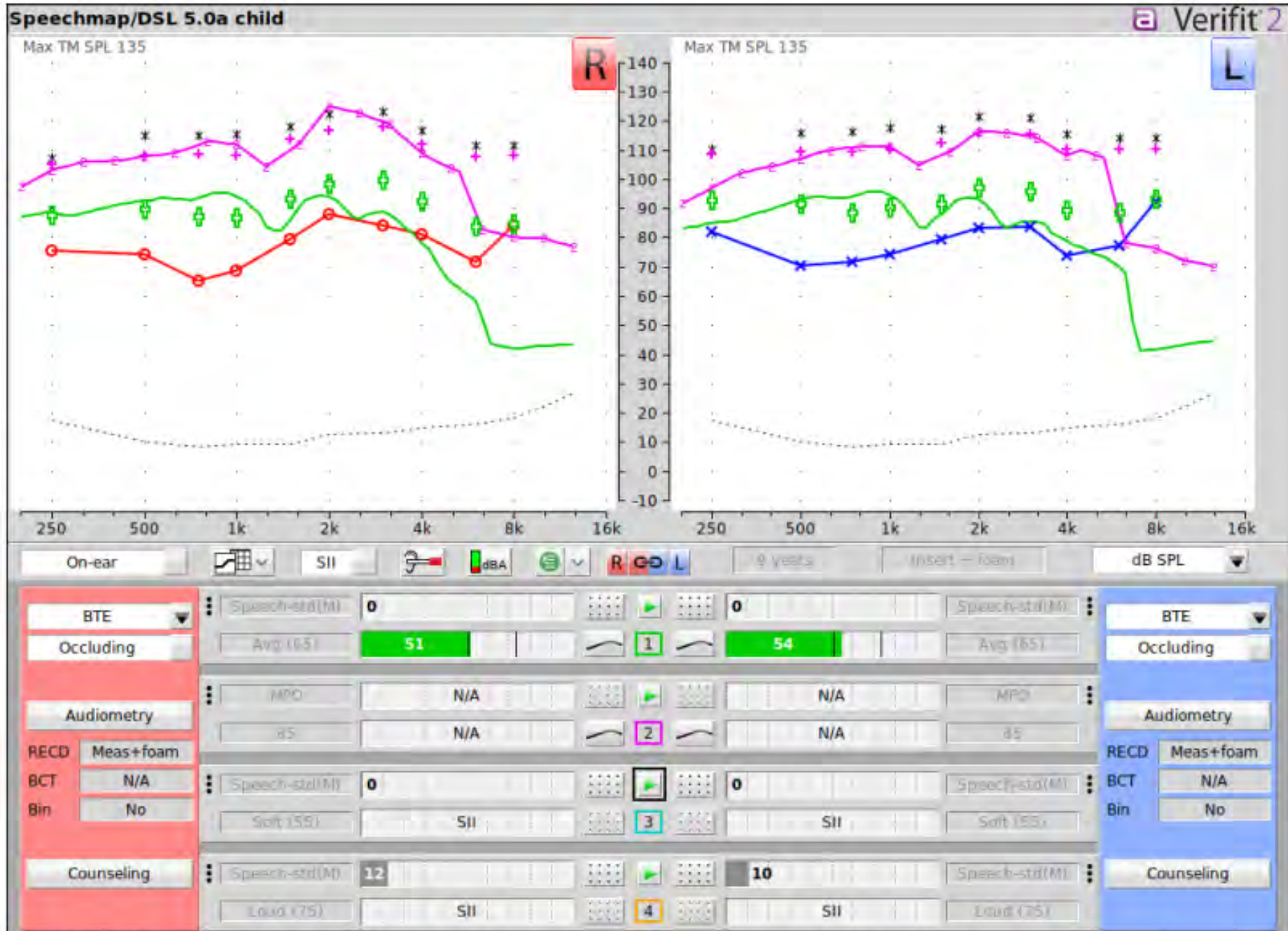


Hearing Aids

- Routine cleaning and maintenance of hearing aids
- New earmold impressions
- Outdated audiogram in programming software
- Feedback test was limiting gain
- Frequency lowering enabled
- Datalogging showed 14 hours/day

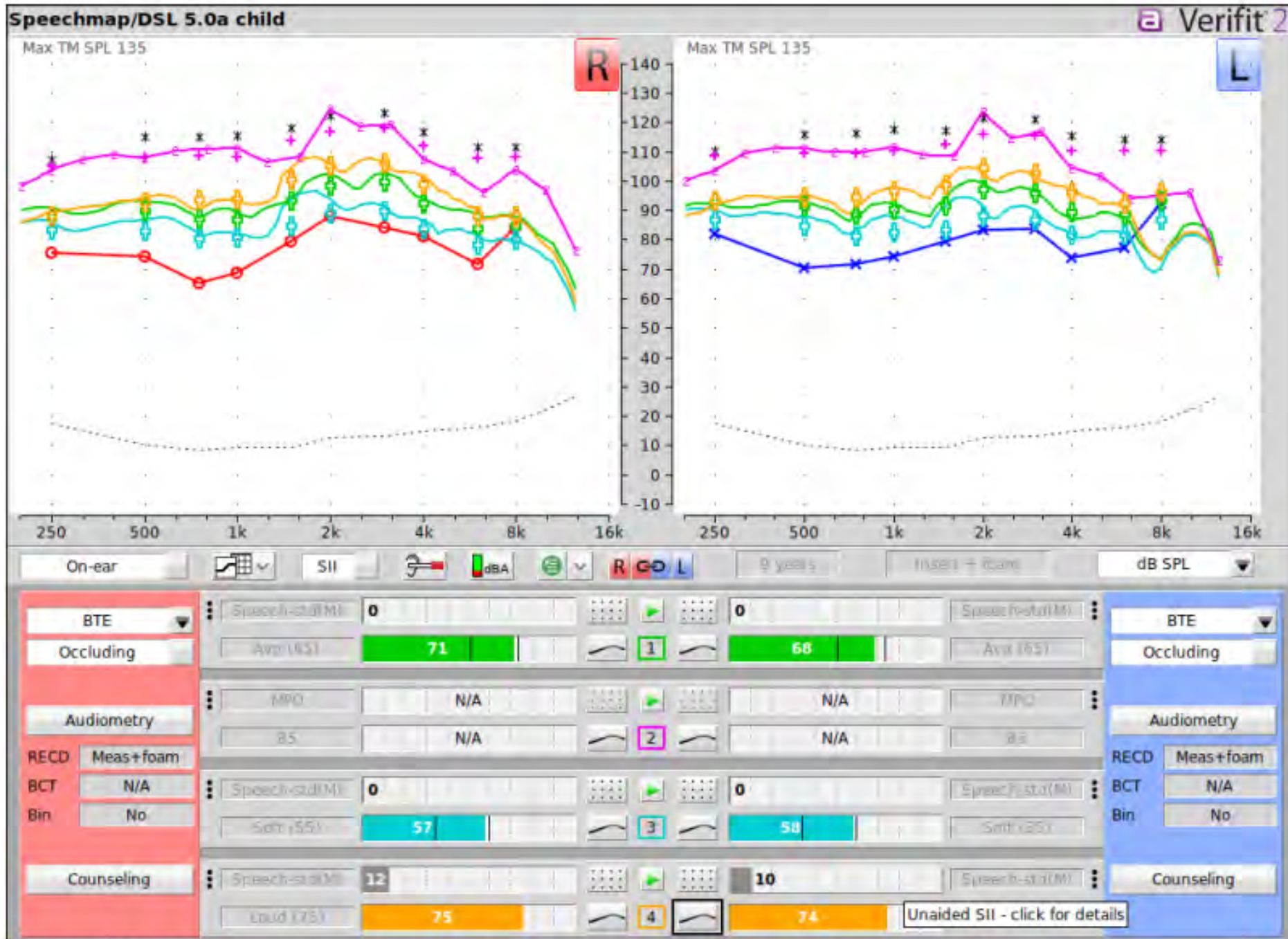


Ella



Connect both left and right on-ear probe microphones. Insert instruments into client's ears. Select one of Test 1 through Test 4.

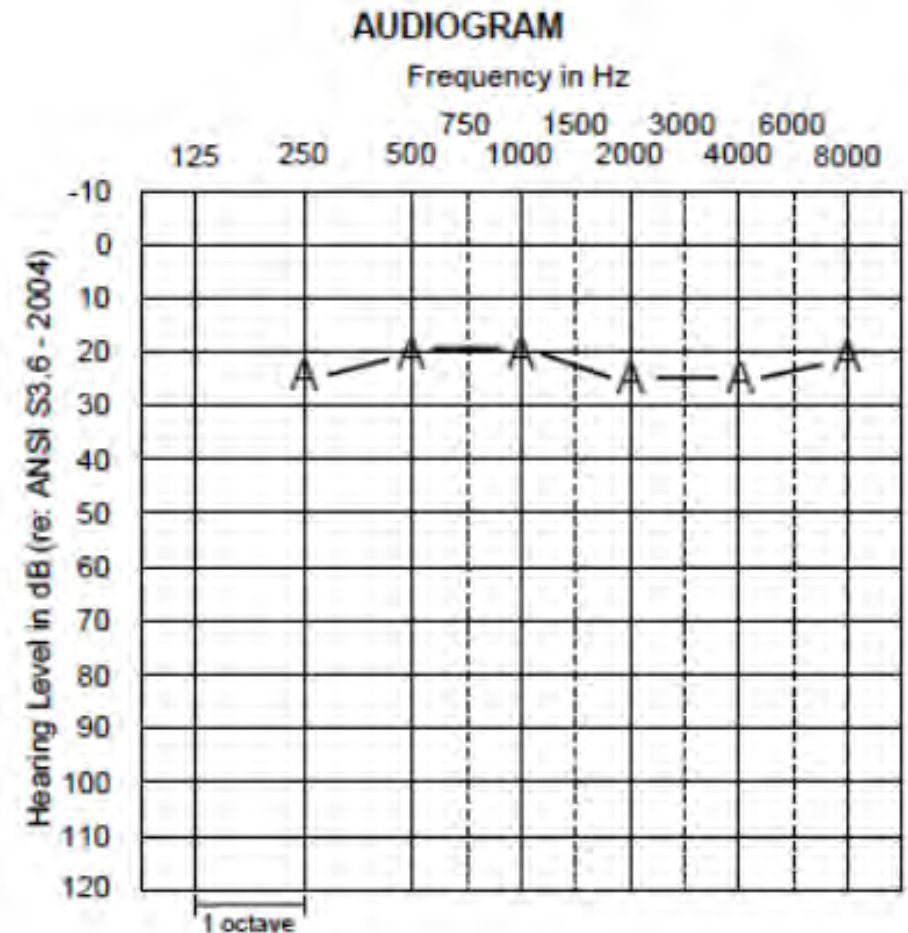
✓ Ella



Connect both left and right on-ear probe microphones. Insert instruments into client's ears. Select one of Test 1 through Test 4.

Aided Testing

- SRT at 20 dB
- WRS using LNT-Easy at 60 dB SPL
 - Whole Word: 80%
 - Phoneme: 89%



Plan

- Not a candidate for cochlear implants.
- Continue to monitor for changes
- Expand aided testing
 - At follow-up, similar results were obtained for each ear alone – good benefit from hearing aids.

Recent Results

- Ongoing difficulty at home due to language barrier
 - Improving articulation with therapy now both in school and privately
- Increased test difficult for speech in quiet:
 - LNT Hard (average speech): 84% whole words, 95% phonemes
 - LNT Hard (quiet speech): 80% whole words, 93% phonemes
 - CNC (average speech): 80% whole words, 93% phonemes
- Pediatric AZ Bio (+10 SNR): 75%

Take Home Messages

- Details matter.
- Cross check principle.
- Question your own work first.

Cross-Checks and Close Monitoring to Optimize Pediatric Outcomes

Laura Marchman, AuD
CCC-A



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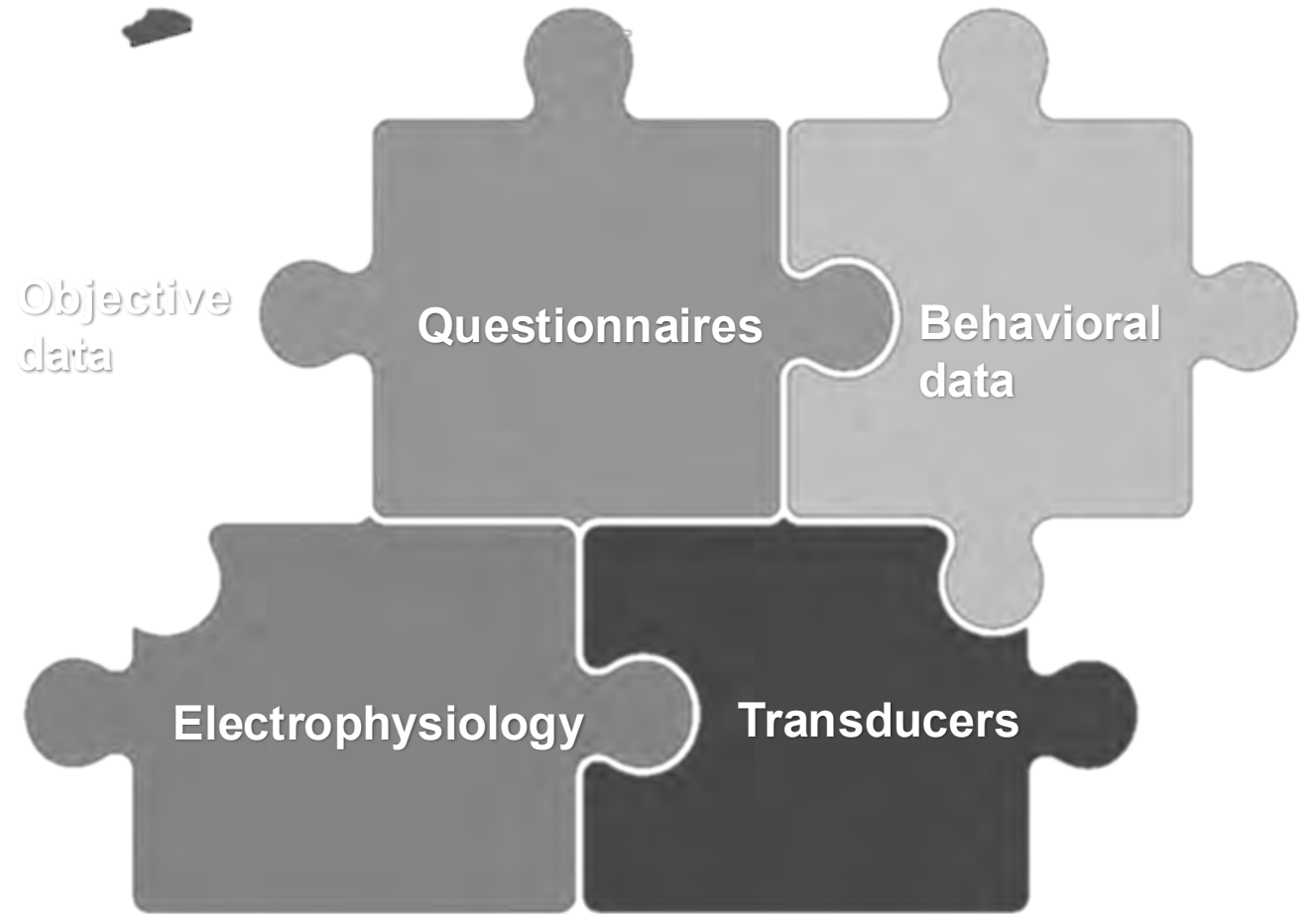


Concepts

- Cross-check principle
- Close monitoring of cCMV



What is the cross-check method?



The Cross-check Principle

- No single test tells the whole story
- Objective + Behavioral + Functional = Complete picture and best practice!
- If results don't align, dig deeper
- Relying on 1-2 test may lead to incorrect diagnosis, or unclear answers



Cross-Check Methods

- Test methods (Immittance, OAEs, Behavioral, Electrophysiology, APD, Vestibular)
- Transducers
- Speech testing (aided and unaided)
- Verification and validation measures
- Questionnaires



cCMV – Congenital Cytomegalovirus

- Congenital CMV affects 1 in 200 births
 - 1 in 5 babies with cCMV with have with have health problems
- Leading non-genetic cause of hearing loss



cCMV – Long Term Effects

- Developmental and motor delay
- Vision loss
- Microcephaly (small head)
- Lack of coordination or weakness
- Seizures
- Intracranial calcifications
- Hearing loss – *Fluctuating or progressive*
- Among others



cCMV – Monitoring schedules

- Diagnostic audiologic evaluation by 3 months
 - Even if infant passes newborn hearing screening
- Every 3-6 months until age 1
- Every 6 months until age 3
- Annually until age 6
- If there is a significant change in hearing, thresholds should be monitored closely until hearing stabilizes



cCMV – Considerations

- Fit with amplification that can accommodate a progressive hearing loss
- On going education: Cochlear implantation may be in the future for many cCMV patients
- Consider vestibular evaluations

Introducing “Penelope”

- 16 yr old female
- Transfer patient
- Developmental delays
- Wearing bilateral Phonak Sky M50-SP hearing aids

Case History/Record Review

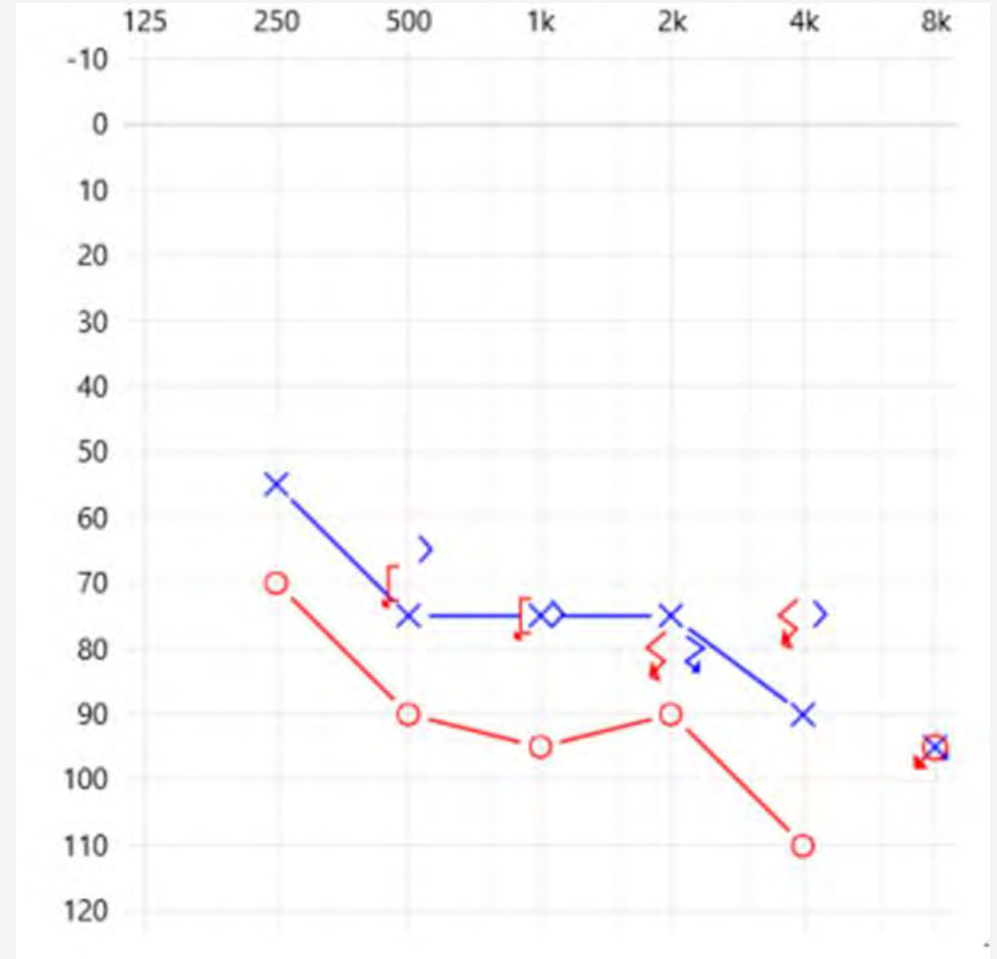
- BAER in 2018
 - Right ear: Mild hearing loss
 - Left ear: Mild sloping to severe hearing loss
- Was fit with hearing aids at an outside facility
- Attends school for children with special needs, has IEP
- Receives speech, occupational, and physical therapies
- Suspected cCMV

Case History Continued

- Patient observation:
 - Not talking
 - Not looking at tester when spoken to
 - Unable to answer any questions
- Parent report concerns of hearing change, but that Penelope was “doing well”

Audiogram

- Type A tympanograms
- Absent DPOAEs
- Testing initiated with 2 testers
 - Inconsistent responses in moderate range
- Levels increased, responses became consistent



SRT:

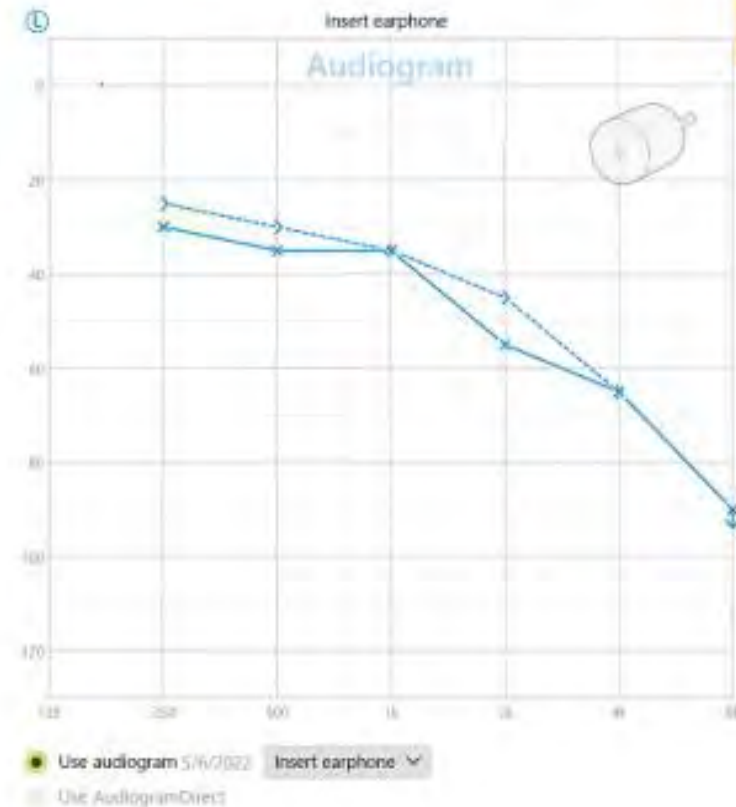
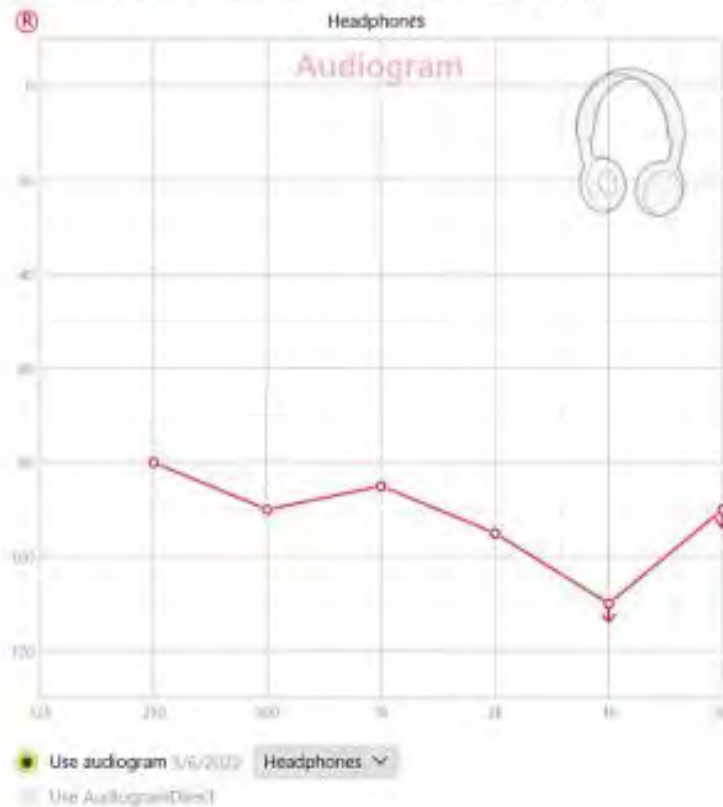
- Right: 100
- Left: 75

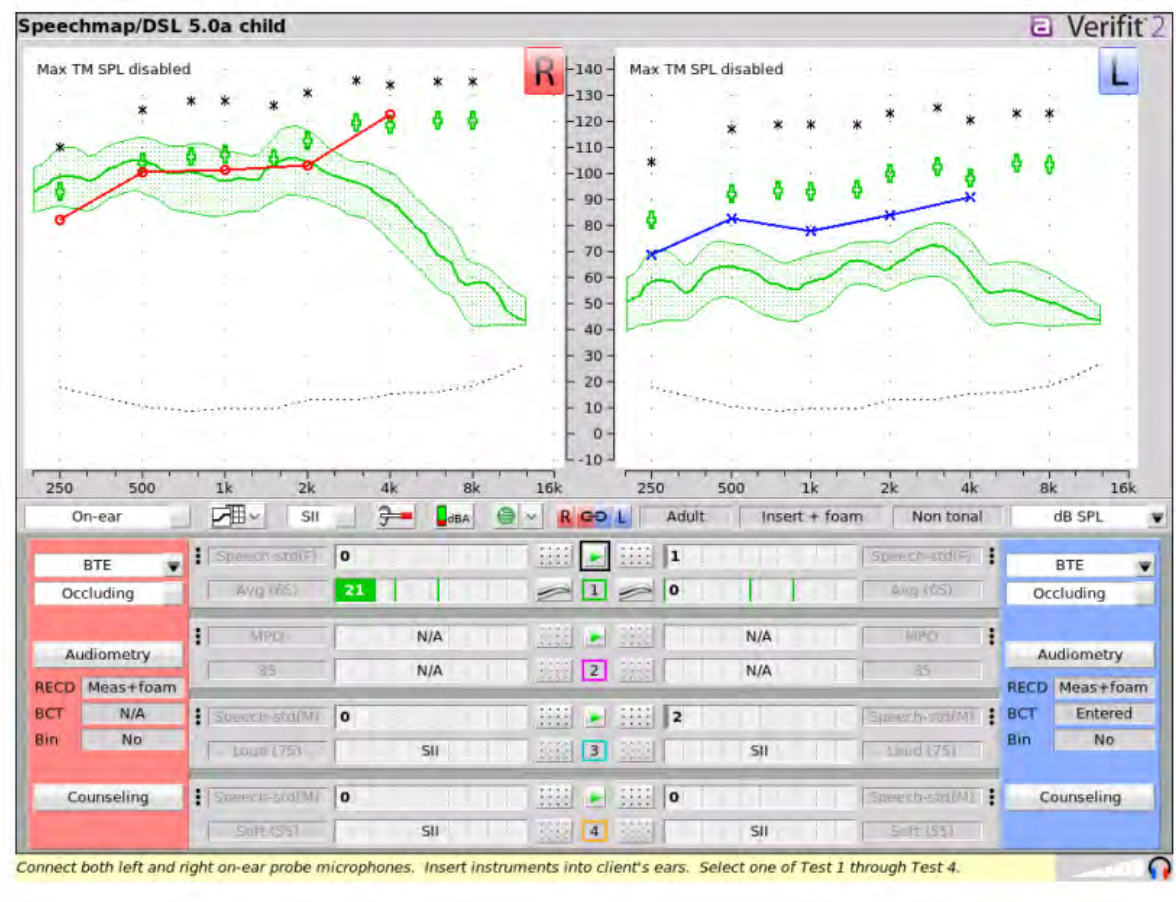
WRS:

- Right: 0% at 110
- Left: 50% at 105

Hearing aid Programming

Last audiogram updated in hearing aids 5/6/22:



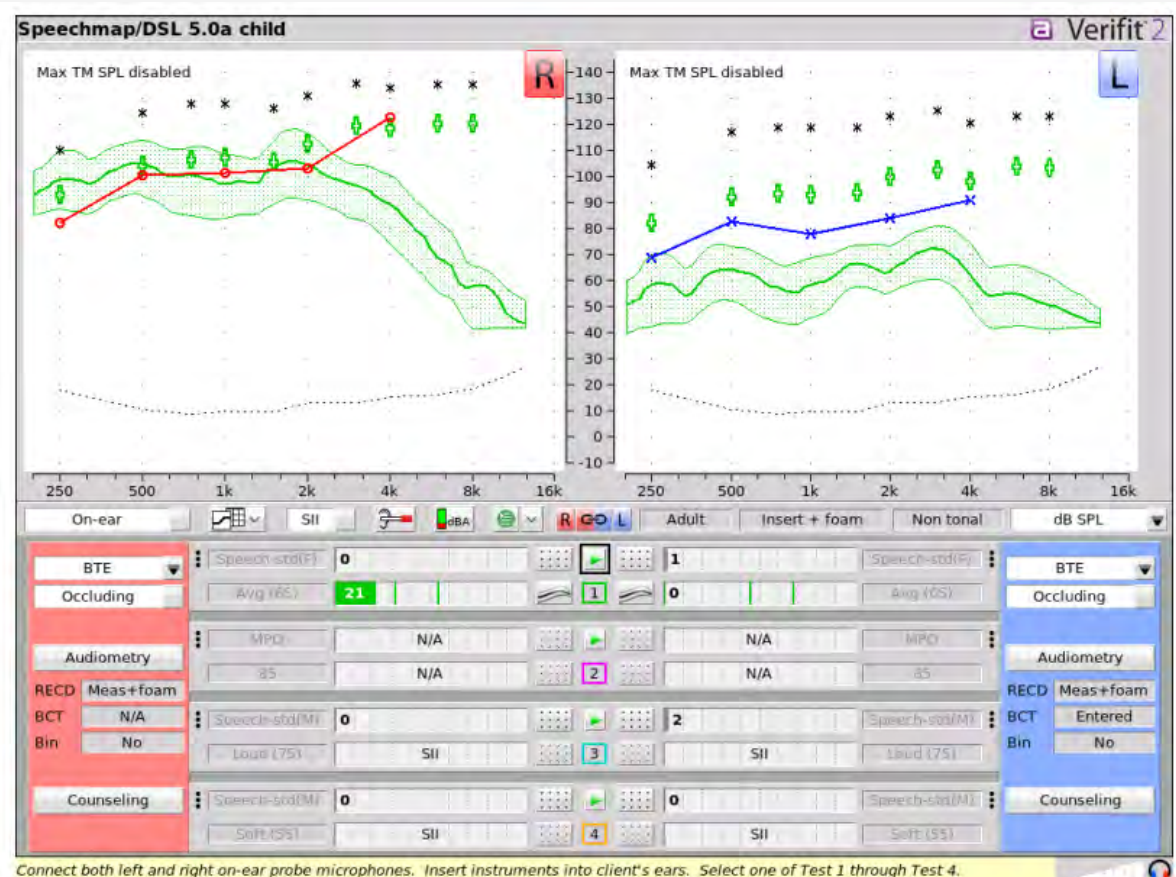


Initial Hearing Aid Programming

- Probe tube replaced, placement confirmed
- Last data log:
 - Right ear: Jan 2025
 - Left ear: March 2024

Of note:

- Right ear WRS: 0% at 110
- Left ear WRS: 50% at 105



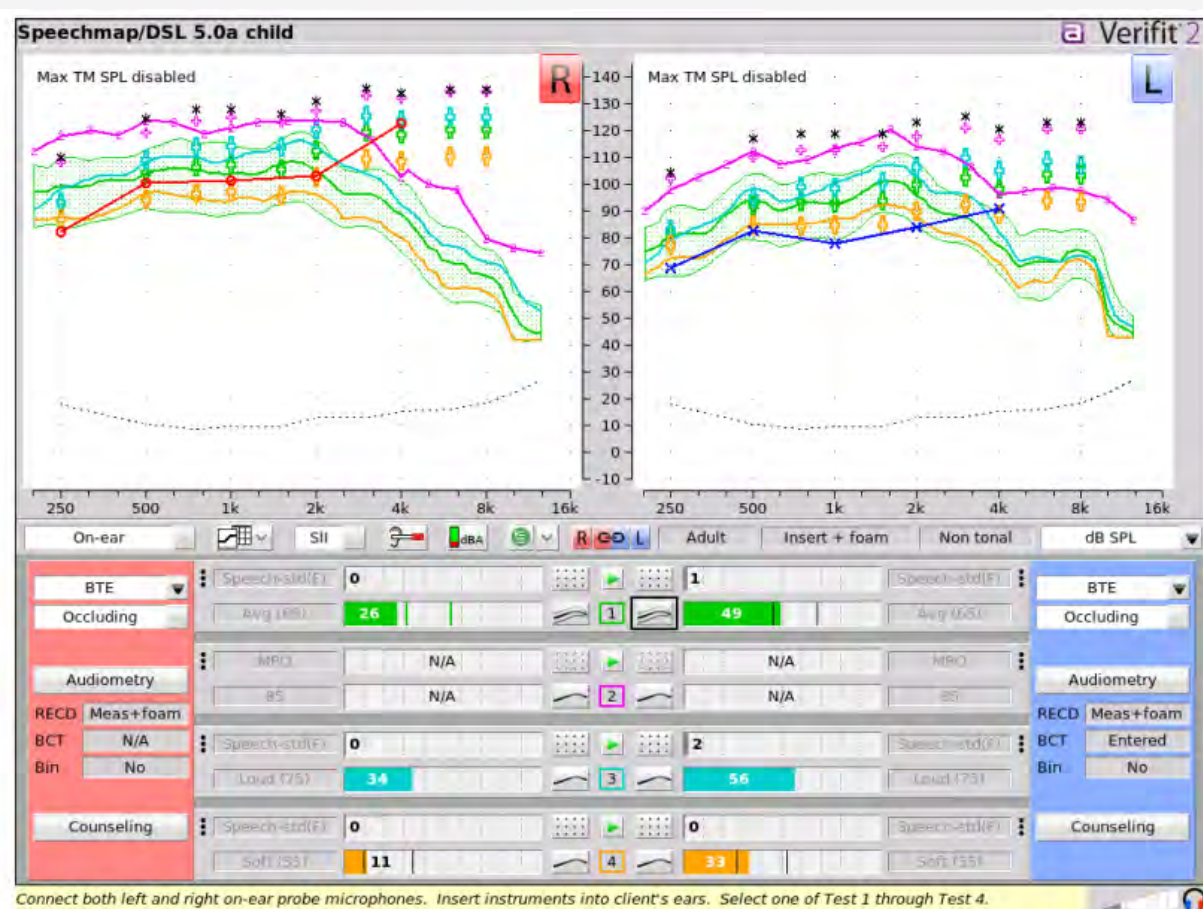
Underfit Amplification Consequences

- Limited access to sound
- Limited access to education
- Delayed cochlear implant evaluation

Of note:

- Right ear WRS: 0% at 110
- Left ear WRS: 50% at 105

✓ Penelope



Programming changes

- Limited due to severity of hearing loss
- Sound recover activated
- Family immediately reported a difference!

What went sideways?

Red Flags that Demand action

Audiologic:

- Any threshold shift >10 dB at any frequency
- Declining word recognition scores
- Poor progress with current amplification
- Inconsistent responses (may indicate fluctuation)

Functional:

- Parent reports of decreased responsiveness
- Speech/language plateau or regression
- Teacher concerns about hearing
- Child complaints about hearing difficulty

Next Steps

- Cochlear implant evaluation
- Vestibular evaluation



Key Takeaways

- Each patient is different! Care plans should be created for each individual
- cCMV is progressive, until proven otherwise
- Close monitoring isn't optional—it's standard of care
- Cross-checks catch what we'd otherwise miss
- Our documentation can protect patients AND clinicians

Maria

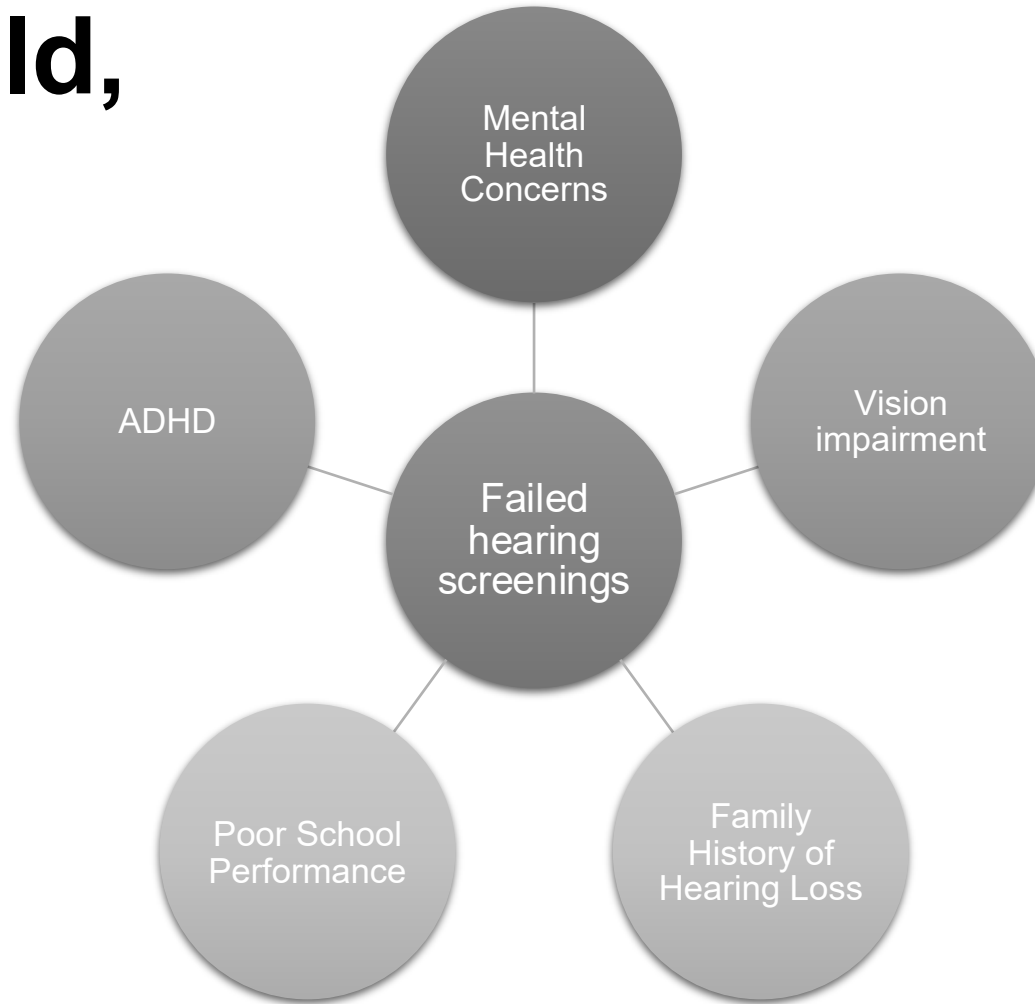
Lynn Eyde, AuD, CCC-A,
FAAA



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Maria, 12-year-old, Female

- Initial chart review



First PC Audiology Visit

Maria was referred for a pediatric hearing evaluation

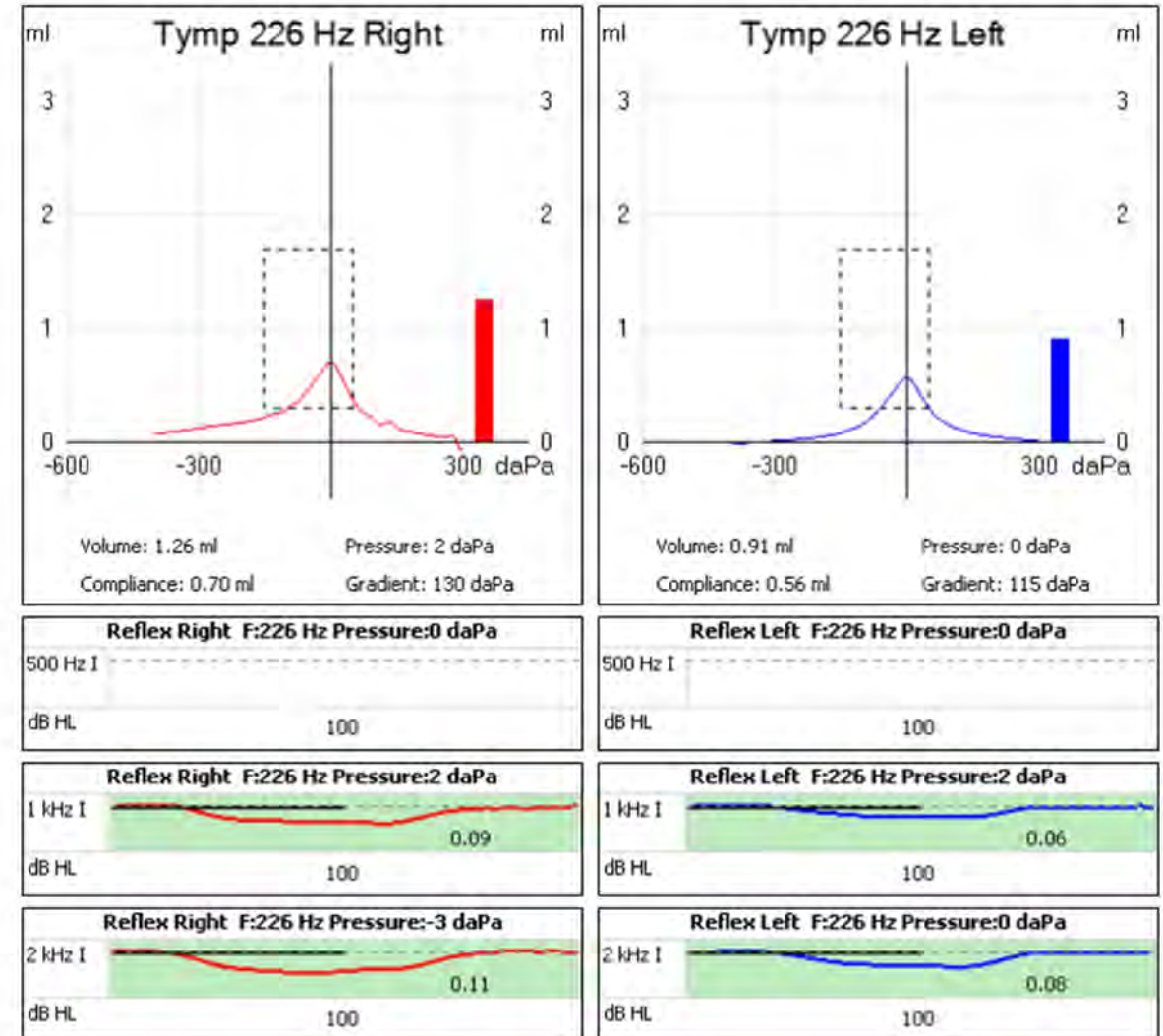
Patient was accompanied by her mother and grandmother

Parent/patient reported case history:

- Two failed screenings at school and one at the pediatrician
- Intermittent tinnitus
- Dizziness
- Patient denied hearing concerns

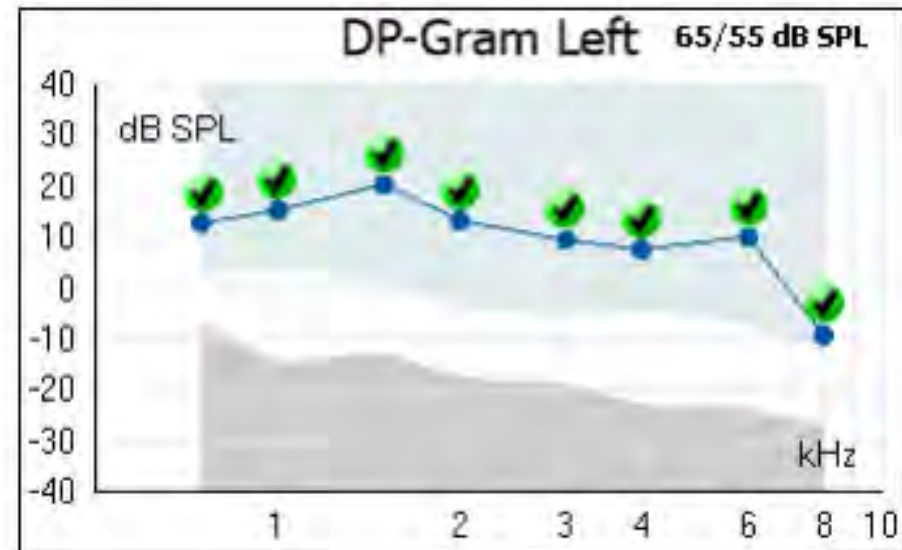
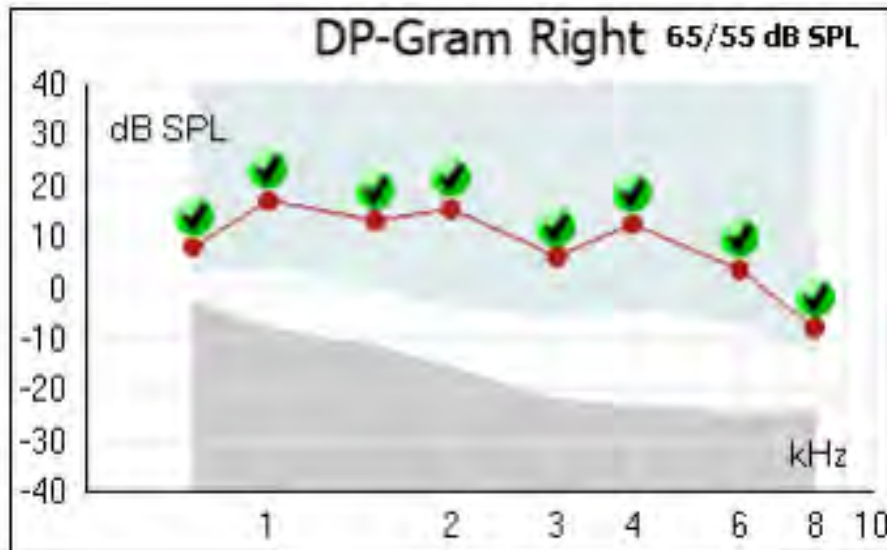
Hearing Evaluation Results

- Tympanometry results:
 - Type A, bilaterally
- Acoustic reflex results:
 - Present at a screening level at 1000 and 2000 Hz in both ears



Hearing Evaluation Results

- Distortion-product otoacoustic emissions:
 - Present at 750-8000 Hz, bilaterally





Hearing Evaluation Results

- Maria did not reliably respond during speech reception testing
 - Half-word answers
 - Supra-threshold response levels
- No reliable responses to tonal stimuli were obtained
- Maria answered open-ended questions from the audiologist while face-to-face and wearing headphones
- No strategies worked to obtain consistent responses

Cross Check Principle

No single test should be used alone

Ability to compare subjective and objective results

Helps to prevent misdiagnosis for both adult and pediatric patients

Maria's subjective responses were inconsistent with the objective test results

Testing was discontinued

Review of Results and Counseling

- The test results were reviewed with Maria, her mother, and her grandmother
- Inconsistencies of the testing and her responses to the were discussed
- The mother and grandmother were skeptical
- Two options for follow-up testing:
 - Repeat behavioral testing
 - Brainstem auditory evoked response (BAER) study during natural sleep
- Her mother elected to return for a BAER study in the office

Second Audiology Visit: Two Weeks Later

Maria and her mother returned for the BAER study in office

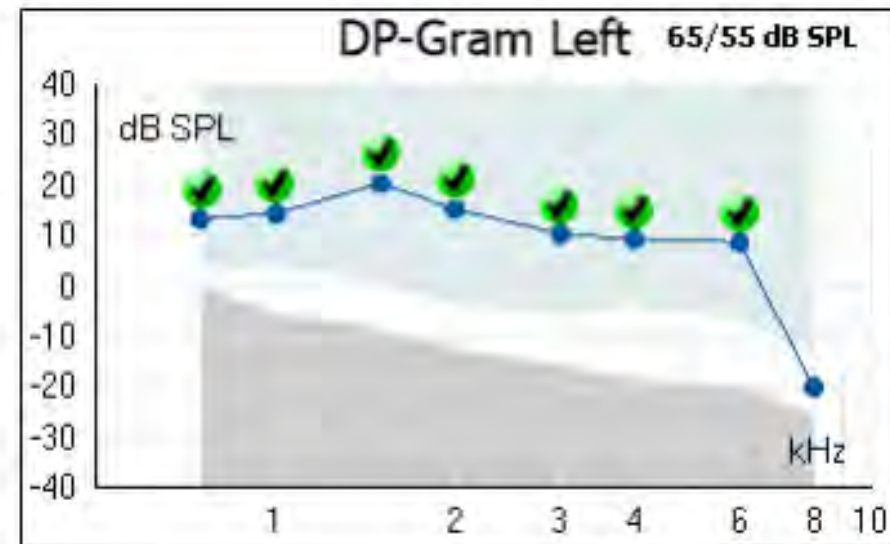
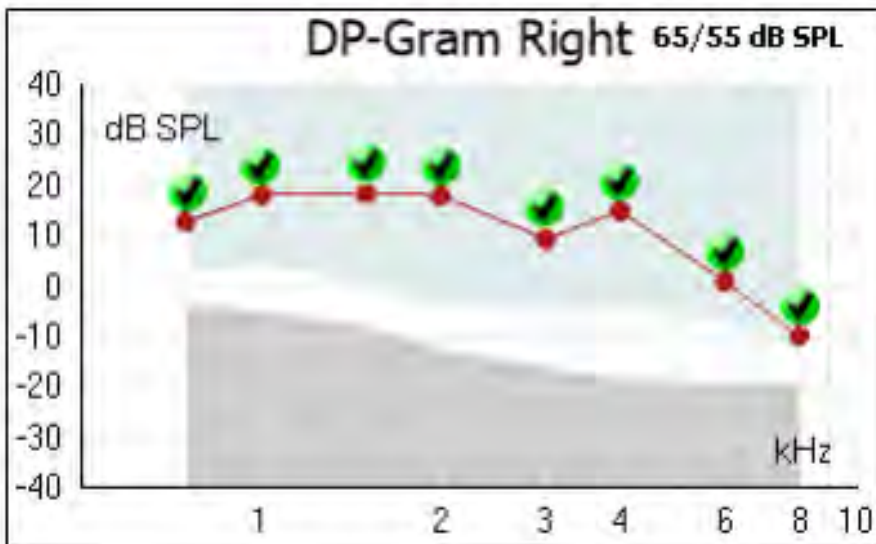
Maria had since been evaluated by an educational audiologist

- The results were reportedly “inconclusive”
- Educational audiologist recommended that she return to Phoenix Children’s for further evaluation and to also see an Otolaryngologist for her tinnitus

Maria reported that she now hears the bilateral tinnitus “most of the time” and it is most noticeable while at school

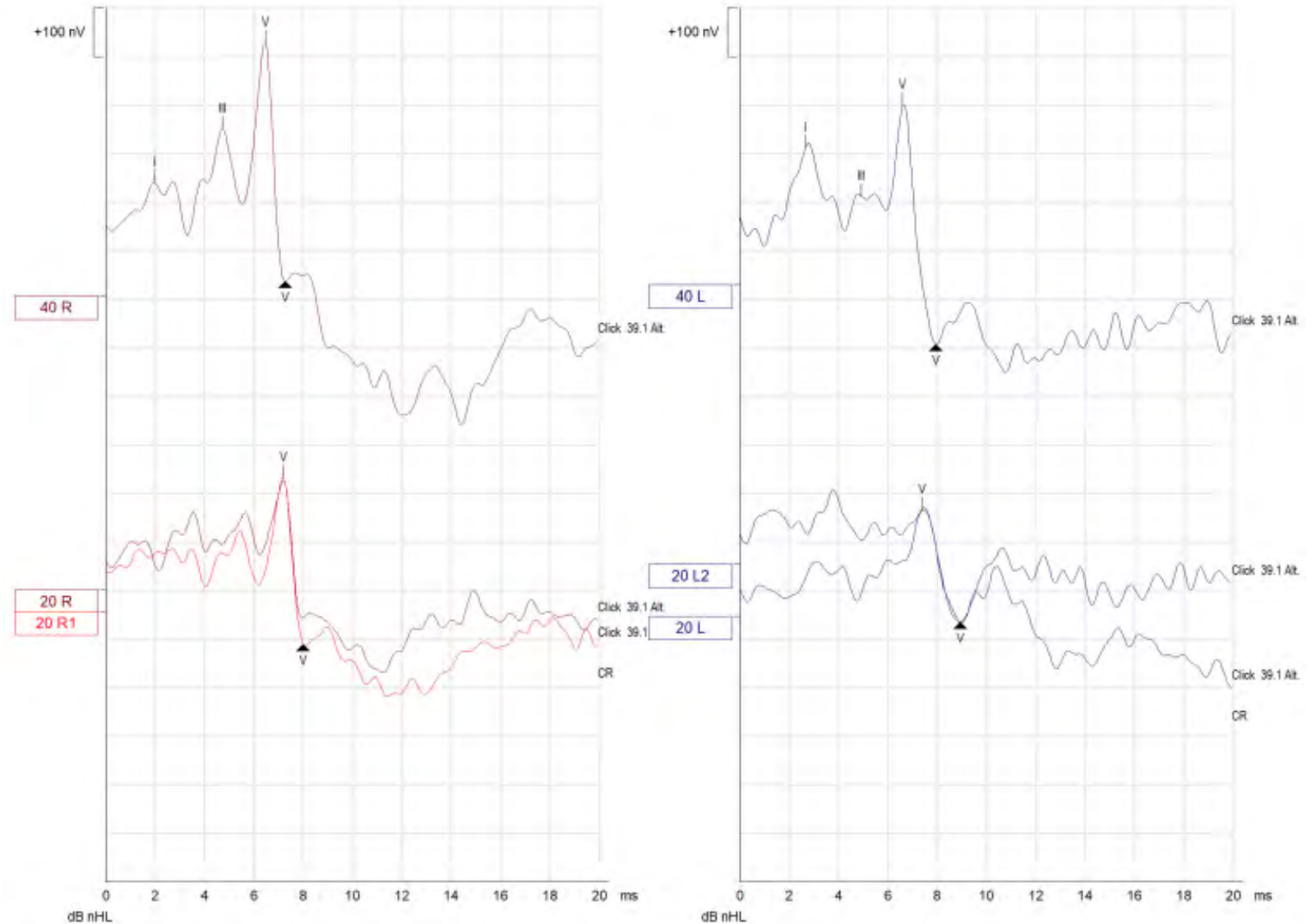
Hearing Evaluation Results

- Distortion-product otoacoustic emissions:
 - Present, bilaterally
 - Reduction at 8000 Hz in the left ear; tested multiple times

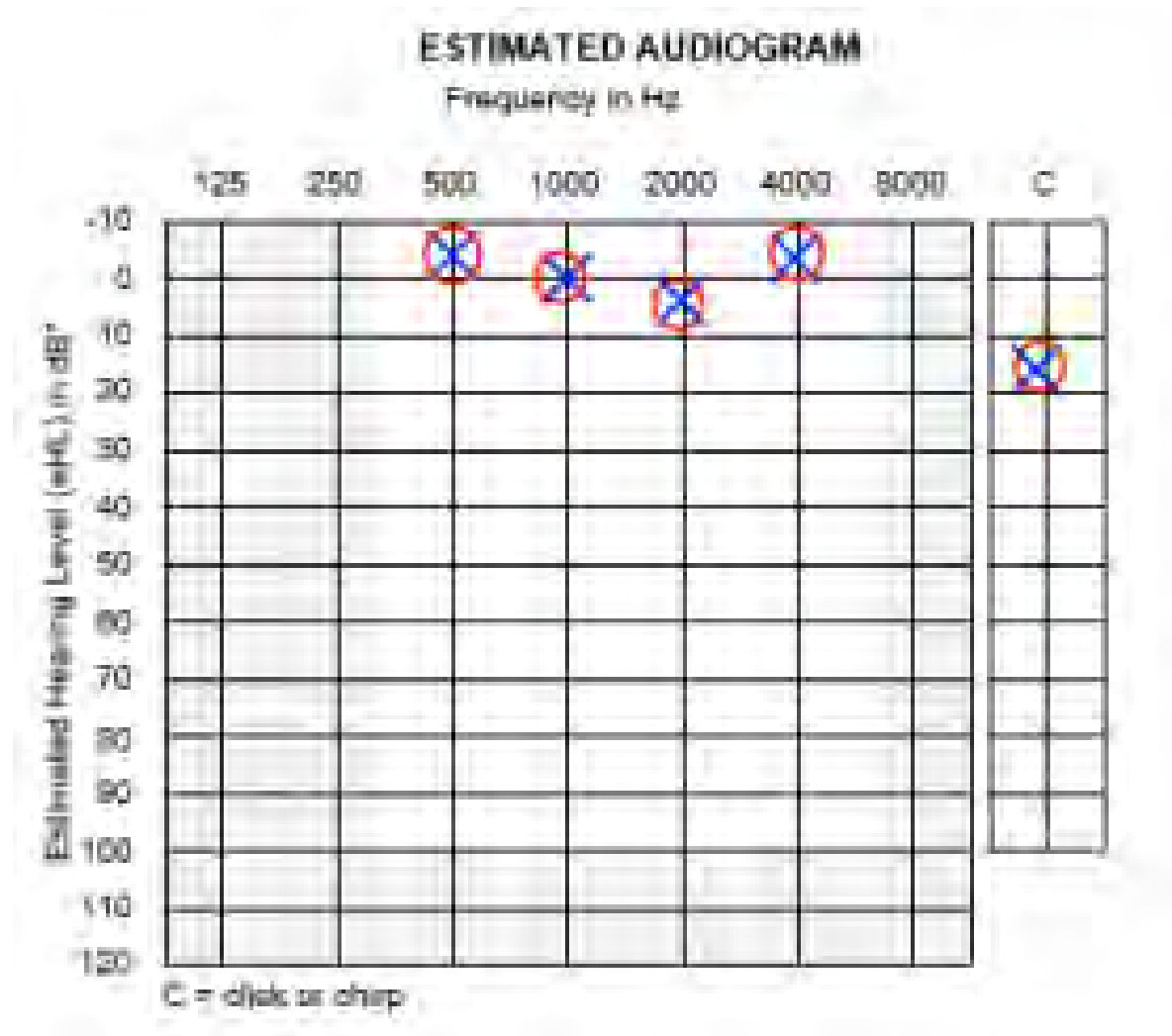


BAER Study Results

- Click: 15 dB eHL, bilaterally



ASSR Results





Review of Results and Counseling

- Test results were consistent with normal hearing sensitivity in both ears
- Maria's demeanor changed when the results were reviewed
- The mother expressed understanding of the results, yet confusion with the behavioral inconsistencies
- Hearing within the normal range now allows them shift on these other aspects



Review of Results and Counseling

- Inconsistent responses:
 - The mother expressed her confusion of the inconsistent results during behavioral testing
- School concerns:
 - Maria's poor school performance
 - ADHD evaluation
 - Auditory Processing Disorder testing
- Recommendations:
 - Neuropsychology evaluation
 - Follow-up behavioral testing in one year to monitor hearing sensitivity

Thank You!

Lynn Eyde, AuD, CCC-A,
FAAA



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A Straightforward Case.... Or Not?: Promoting Hearing Aid Adherence in Pediatric Patients

Paige Petersen, AuD,
CCC-A



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Objectives

- Identify common barriers to pediatric hearing aid adherence and follow-up
- Describe emotional, behavioral, and socioeconomic factors that influence hearing aid use
- Utilize datalogging and follow-up visits constructively to support adherence
- Recognize the role of interdisciplinary collaboration in pediatric hearing care



Defining Hearing Aid Adherence

The patient/family's active, empowered, choice to integrate hearing aids into their lifestyle

- Hearing aid adherence includes:
 - Consistent daily hearing aid use
 - Attending Audiology follow-up appointments
 - Maintaining earmolds and devices
 - Participating in Early Intervention services
 - Parent engagement and troubleshooting
- How do we measure it?
 - Datalogging
 - Follow-up attendance
 - Are the hearing aids being well-maintained?
 - Retention in EHDI, EI programs



Why This Matters

- Early auditory access is crucial for:
 - Speech and language development
 - Academic outcomes
 - Social-emotional development
- Inconsistent hearing aid use reduces benefit
- Loss to follow-up delays intervention and monitoring



Common Barriers to Adherence

Emotional adjustment after diagnosis

- Parents report grief, stress, anxiety, guilt
- Emotional adjustment influences appointment attendance, hearing aid consistency, engagement with intervention services

Hearing aid retention and comfort problems

- Behavioral issues and developmental phase
 - Child pulling off hearing aids
 - Testing boundaries
- Noise aversion
- Acoustic feedback
- Device discomfort

Social and school factors

- Poor school/daycare support
- Troubleshooting devices during the day
- Lack of teacher understanding
- Bullying concerns
- Child's fear of appearing different

Parent beliefs and perceived benefit

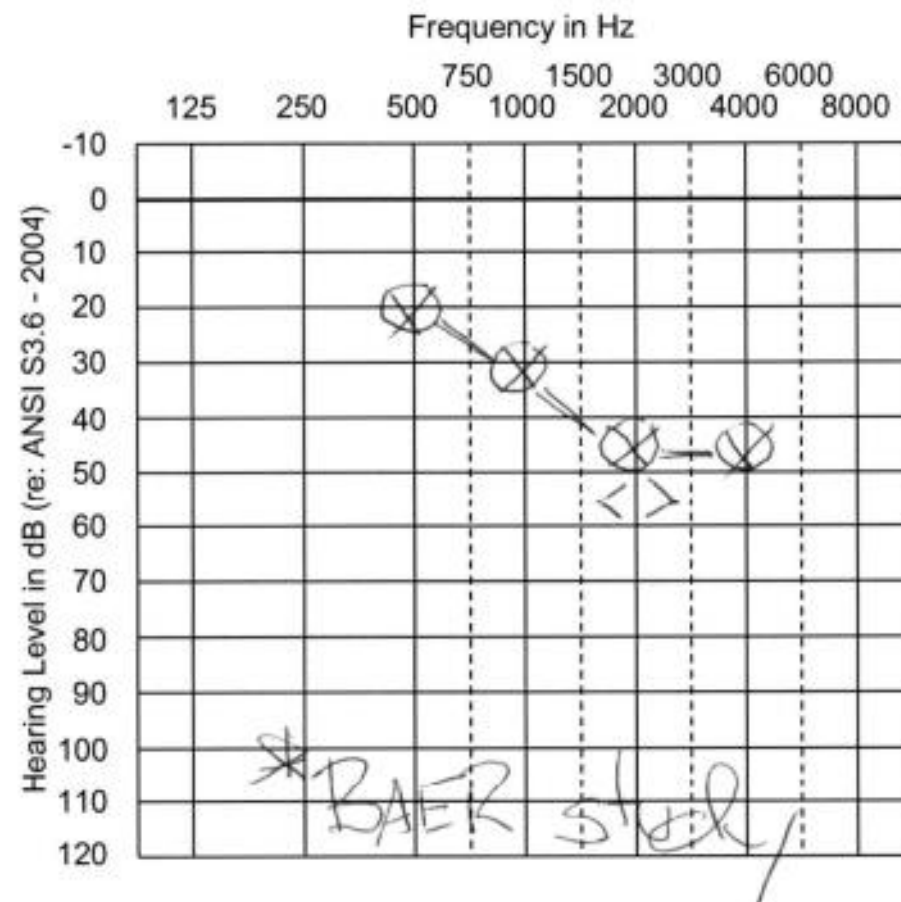
- "They respond normally at home"
- "She only needs hearing aids at school"
- Degree of hearing loss

Socioeconomic and health equity factors

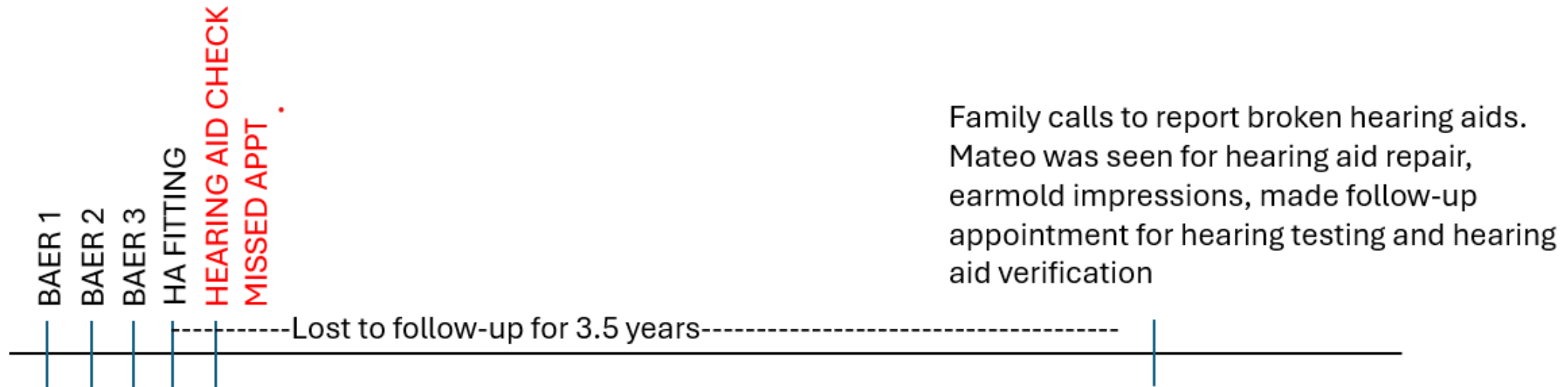
- Greater risk for loss to follow-up:
 - Public insurance
 - Rural families
 - Limited English proficiency
 - Transportation Issues
 - Lower health literacy
 - Lower maternal education

Case Study: “Mateo”

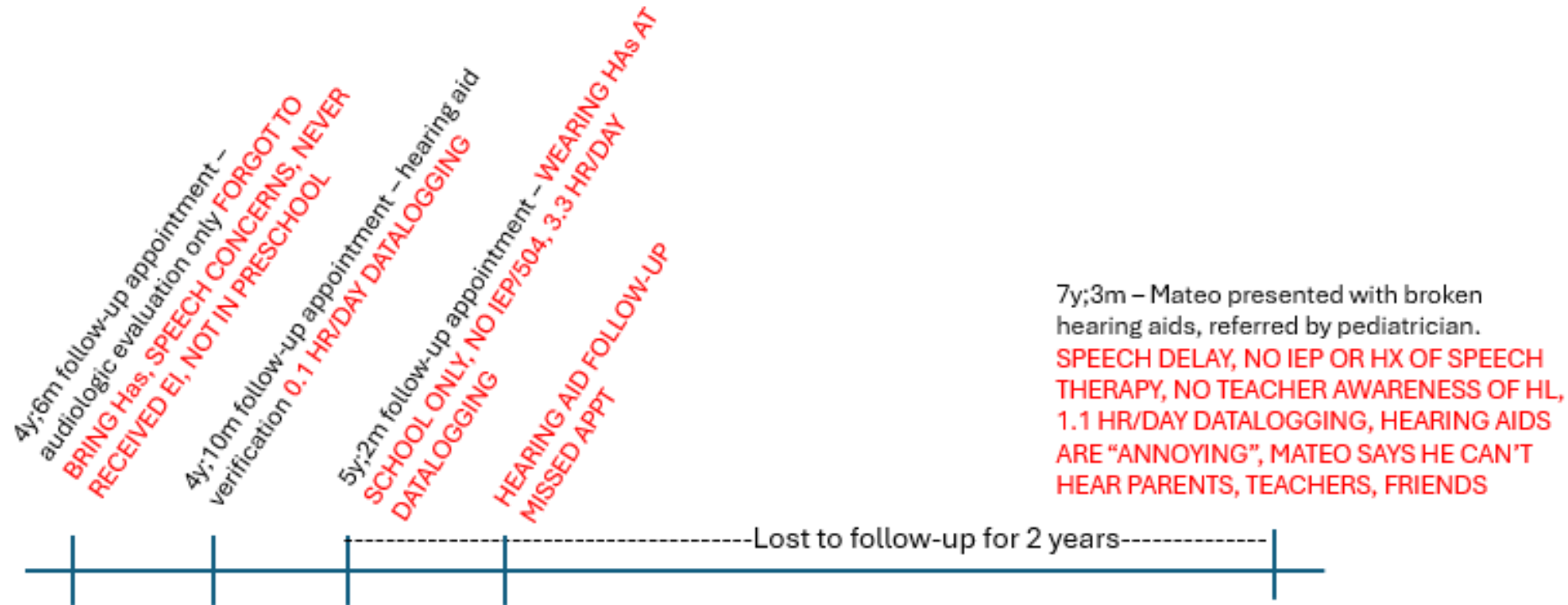
- BAER #1: 3 months old
 - Left ear: Findings suggested normal sloping to moderate SNHL
 - Right ear: CNT due to poor sleep
- BAER #2: 5 months old
 - Did not sleep for any length of time
- BAER #3 (under anesthesia): 8 months old: Bilateral mild sloping to moderate SNHL



The path becomes windy



A brief repeat encounter, then lost again



General facilitators to hearing aid adherence

Parents report the following as beneficial sources of support:

- Support from professionals, particularly home-visit professionals
- Hearing aid retention accessories
- Support in understanding why their child needs to wear hearing aids
- Support in finding strategies to use to get hearing aids in and keep them in
- Being connected to other parents of children with hearing loss in the community for support, advice, encouragement
- Practical device management training

Addressing Barriers to HA Adherence

- Parent beliefs and perceived benefit
 - Ongoing counseling and parent coaching about functional listening abilities and long-term language risks
- Emotional adjustment to diagnosis
 - Normalizing emotional responses and encourage mental health support for caregivers as needed
 - Avoid information overload with staged counseling
 - Provide written summaries of information and next steps
 - Offer parent support resources
- Hearing aid retention/comfort
 - Offer hearing aid retention solutions
 - Address noise aversion, acoustic feedback
- Increasing wear time
- Social/School factors
 - Collaborate with school and daycare staff on hearing aid use, 504/IEP planning
 - Ensure kids are getting psychosocial supports as needed
- Socioeconomic and health equity factors
 - Systemic changes like reminder systems, follow-up phone calls, flexible scheduling, interpreter access
 - Transportation assistance programs
 - Social work resources

Leveraging Community Resources and Partnerships

- Early Intervention Programs
 - Reinforce daily use
 - Provides caregiver coaching
 - Support speech/language development
 - Identify barriers the clinical audiologist may not see
- Audiologist's role:
 - Communication with EI providers
 - Share hearing/communication goals and device information
 - Provide hearing aid troubleshooting support
- School-Based Partners
 - TODHH
 - Speech/language pathologists
 - School audiologists
 - Classroom teachers
 - Special education coordinators
- School teams can:
 - Monitor device function and wear time
 - Support classroom listening access
 - Reinforce daily use
 - Communicate concerns to families and audiologists
- Offer community support resources like Hands & Voices and other parent-to-parent mentoring programs
- Communication with pediatricians can also be helpful in supporting follow-up adherence



The role of counseling

- Evidence-based counseling techniques include:
 - Motivational Interviewing
 - Patient-centered counseling
 - Shared decision making
- Important counseling micro-skills:
 - Active listening
 - Empathy statements
 - Open-ended questioning
 - Validation
 - Teach-back methods
 - Collaborative problem solving
 - Summarizing

Summary of Mateo's Barriers

- Delayed diagnosis
- Degree of hearing loss
- Extensive periods of loss to follow-up
- Low hearing aid usage leading to significant speech and language delays
- Hearing aids are “annoying”
- Parental knowledge gaps, lack of parental perception of benefit and long-term language risk
- Transportation issues
- No school awareness of hearing loss or hearing aid use, poor self advocacy

Barrier	Intervention
Retention/Comfort	• Updated hearing aids • Obtained new earmolds • Completed feedback test
Low hearing aid usage	• Close monitoring over the next year • More frequent check-in phone calls • Used datalogging constructively
Parent beliefs/perception of benefit/knowledge gaps	• Played hearing loss simulator for mom who recorded and shared this with other caretakers • Recommended speech and language evaluation for family to get a realistic picture of current skills
School Concerns	• Family signed ROI to communication with school • Recommended family request IEP/504 evaluation • Provided family a list of potential academic accommodations to discuss with school
Emotional Psychosocial Concerns	• Offered to connect family with other children with hearing loss and their parents • Gave family information about Hands and Voices
Socioeconomic/Health Equity	• Offered social work consult to assess for barriers to care and discuss transportation resources

Where we are currently

- Contact with school has been ongoing about every month or so
 - Established 504 accommodation plan
 - Speech and language evaluation in progress
 - School reports full-time use of hearing aids at school
- Mateo lost a hearing aid and promptly contacted clinic for one-time replacement
- Family has not missed any scheduled follow-up appointments
- Datalogging shows 7.8 hr/day use at most recent follow-up
- Mom reports Mateo is wearing hearing aids more at home and with his other caretakers. She notices a positive change in his behavior at home
- Mateo says he likes his hearing aids and is hearing his friends better



Key takeaways

- There are many barriers to consistent hearing aid use in pediatric patients
- Some barriers are easily modifiable, and others are ongoing and more challenging to solve
- The best outcomes happen when there is close partnership between providers, families, and community partners
- Each family has unique barriers to hearing aid adherence and it is crucial to use evidence-based counseling techniques to find out what the barriers are and identify solutions

Thank You!

Paige Petersen, AuD,
CCC-A



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Starting Over: Navigating Bimodal Care without a Map

Deborah Flynn, AuD



**Phoenix
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14-year-old female



Presented to our Department to re-establish care after 10 years with no recent medical records available.



She has a long-standing history of bilateral sensorineural hearing loss



She wears a hearing aid in the right ear and has a cochlear implant for her left ear but does not use it.

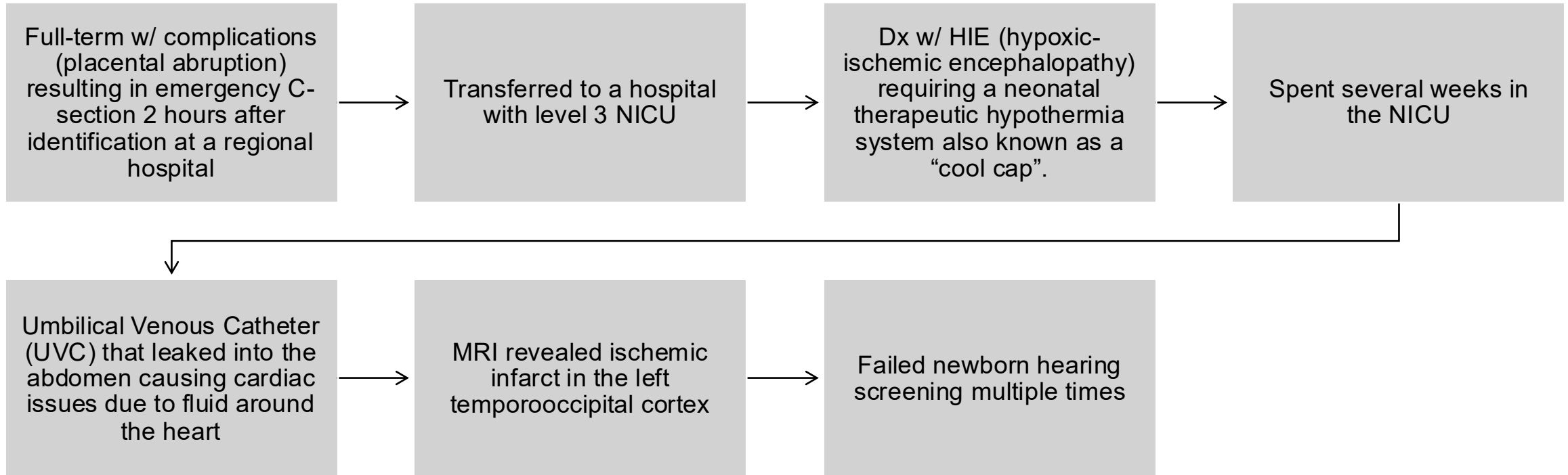


Her primary mode of communication is listening and spoken language. She does not sign.



She has severe articulation errors. Previously in speech therapy but decided to stop due to lack of progress and interference with social life. Family was told that speech issues were related to a dental condition.

History



Audiology History

She was seen at our hospital for a dx BAER study at 2 months

- Results were limited to clicks demonstrating a moderate hearing loss with peaked tympanograms
- Did not sleep and mother had another appointment 1 hour after the start of the appointment
- Fup appt scheduled few weeks later

Returned for follow-up 9 months later for behavioral testing

- VRA demonstrated no greater than a mild precipitously sloping to severe/profound hearing loss for at least the better ear

ABR/BAER study scheduled

- Confirmed bilateral mild sloping to severe sensorineural hearing loss
- Scheduled for a hearing aid consultation six days later
- Referred to AZEIP, Neurotology, and genetics

History

Due to insurance, patient was fit with hearing aids at other facility



She consistently wore hearing aids in both ears until 5 years ago when she underwent cochlear implantation in the left ear



Reportedly, she has never really worn the implant

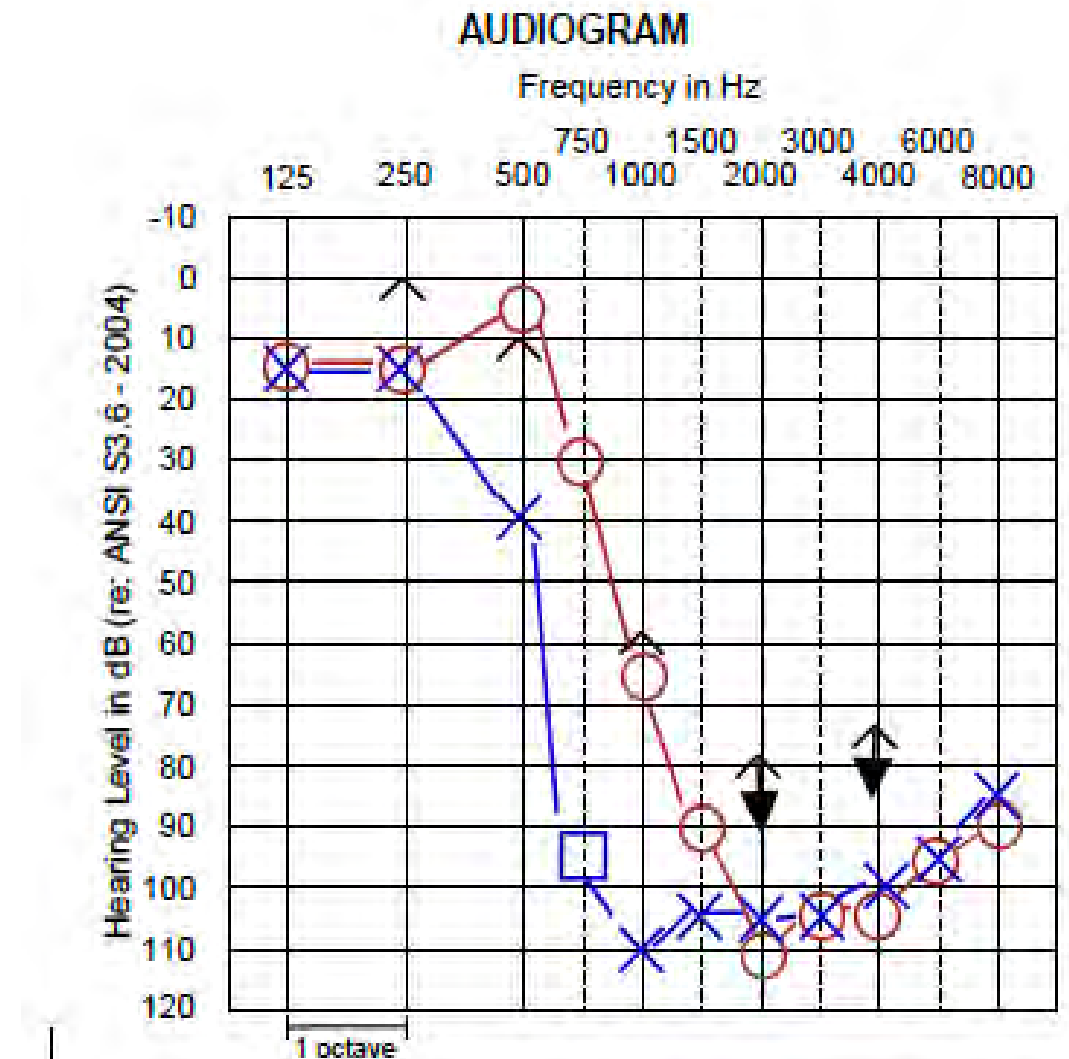
Compliant of robotic sound, has acoustic component but too short and will not stay in ear

She stated that she wear it for the morning session at school but datalogging did not confirm this

Does not wear it in the afternoon at school, or at home, or on the weekends

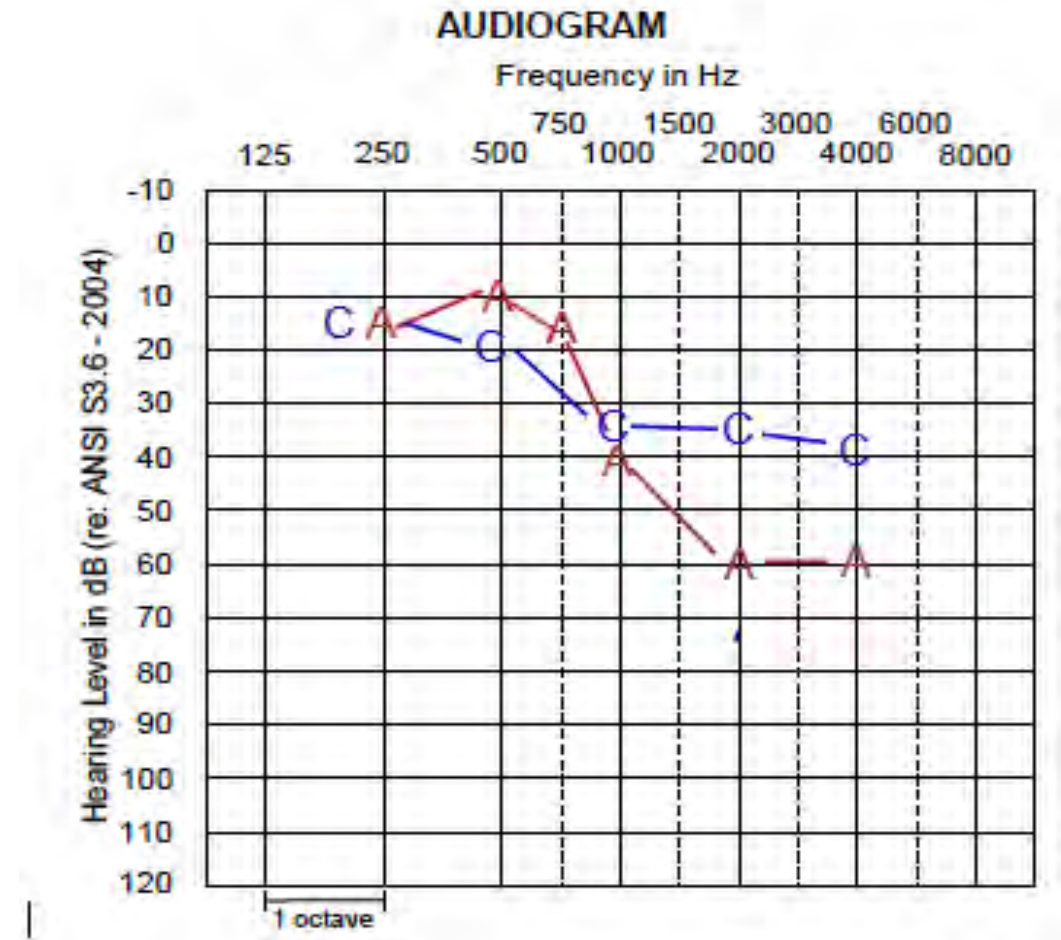
Unaided Audiogram

- Type A tympanograms, bilaterally
- Ipsilateral reflexes primarily absent except 500Hz in the right ear
- Normal precipitously sloping to profound L>R.
- Residual hearing in the left ear following implantation
- Speech Discrimination:
 - Right unaided: 36%
 - Left unaided: CNT
 - Pt became upset because she could not understand any of the words



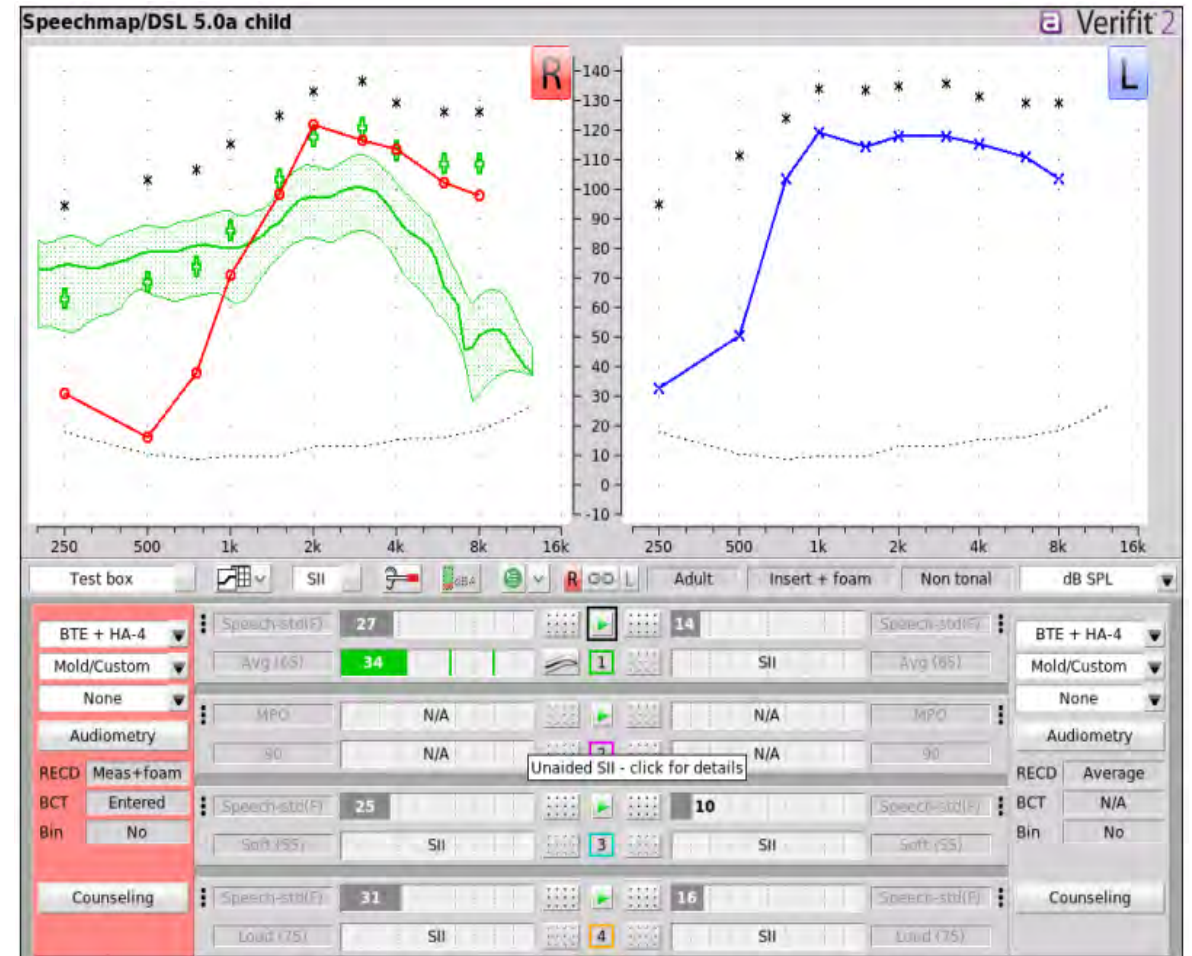
Aided Audiogram

- Aided testing completed with incoming setting from previous facility.
- Aided speech testing not completed due to patient distress.



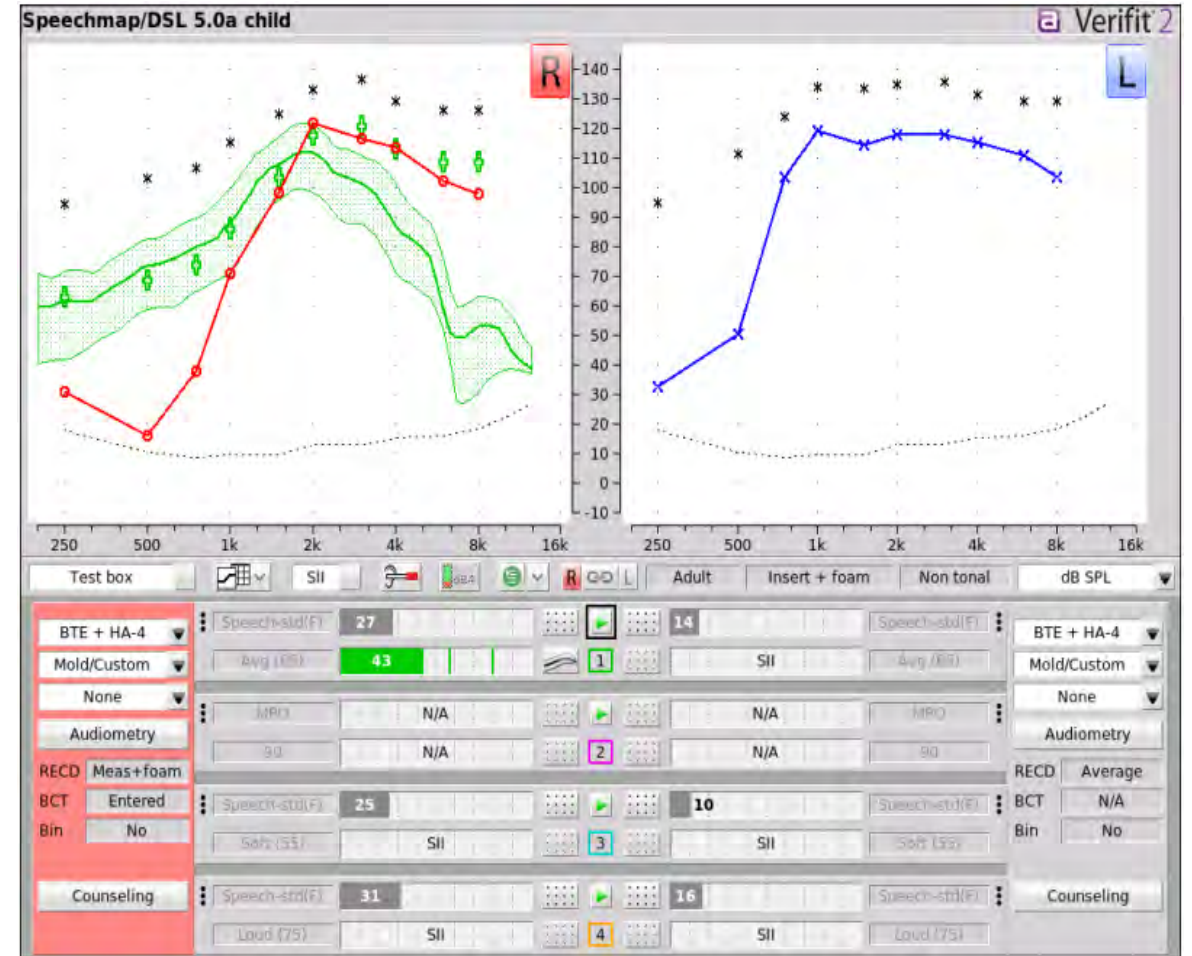
Incoming Hearing Aid Settings

- Over targets in the low frequencies
- Under targets in the mid- and high- frequencies
- SII: 34



HA Adjustments

- Patient would not allow for RECD
- Adjust hearing aid to meet targets out to 1500Hz
- Unable to meet targets beyond this due to the degree of hearing loss
- Enabled Sound Recover
- SII still only 43
- Would not tolerate the change
- Took earmold impressions and scheduled for follow-up appt.



Follow-up Appt

- Fit new earmold with a vent and reprogrammed the hearing aid. This helped with tolerance issues.
- Checked cochlear implant mapping.
- N7 processor.
- Tip broken where acoustic component connects.
- Out of warranty, obsolete, can not be repaired.
 - Opportunity to discuss options.

CI Complaints



Size and not being able to “hide”

Referral to psychology



Sound quality

Dome made her voice echo, felt she “couldn’t hear” with it in, didn’t fit right, hurt her ear
Sounded robotic



Retention

Plays sports will not stay on her ear
floppy

CI Options

Replace	Replace	Replace
Replace with N8 processor: Electric only	Replace with N8 processor: Acoustic and Electric	Replace with a Kanso 3

Discussed each option in relation to visibility, clarity of the signal, comfort, retention, connectivity (particularly to the Roger system).

Patient Choice: Kanso 3

Invisibility factor

Will use CI
Retention
Solutions when
playing sports

Acoustic earhook
won't plug her
natural hearing

Discussion with Mother

- Mother inquired about 2nd CI
 - Patient is a candidate but would need further testing
 - Consider waiting until she is established with the first device

Cochlear Implant Candidacy Guidelines

CI Referral Candidacy Criteria

1) Audiometric Thresholds $>70\text{dB HL}$



2) Word recognition and/or SII $<50\%$



3) Poor functional performance, limited progress,
poor quality of life

Take Home



Importance of managing patient emotions

Don't push, make it a pleasant experience, know when to have them come back



Thinking outside the box

Utilization of natural hearing



Counseling on importance of device use



Counseling on need for ongoing speech therapy once device use improves

Thank you!

Deborah Flynn, AuD



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Thank You!

Questions?

Allie Sayer, AuD, Audiologist II

Laura Marchman, AuD, Audiologist I

Lynn Eyde, AuD, Audiology Manager

Paige Petersen, AuD, Audiologist II

Deborah Flynn, AuD, Lead Audiologist

Wendy Steuerwald, AuD, Director of Audiology



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**If you have any questions or comments
about this presentation, please reach out to:**

Wendy Steuerwald
Audiology Director

Wsteuerwald@phoenixchildrens.com



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