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NATIONWIDE CHILDREN'S®
When your child needs a hospital, everything matters.

Pediatric Grand Rounds: Beyond the Basics to Maximize Outcomes, presented in partnership with Nationwide Children's Hospital

Gina M. Hounam, PhD
Holly T. Gerth, AuD
Lauren Durinka, AuD
Christine Schafer, AuD
Alecia Jayne, AuD, CCC-A
Ursula M. Findlen, PhD
Caitlin Cummings, PhD, CCC-SLP
Lauren Y. Yoshihiro, MS, CCC-SLP

Gina M. Hounam, PhD

Gina M. Hounam, PhD is an audiologist and program manager of Audiology at Nationwide Children's Hospital. Gina has practiced audiology in a variety of settings for over 23 years. Her areas of interest focused on relationship-centered care, counseling and early hearing detection and intervention. She also has years of experience grant writing for non-profits and believes in supporting community education and awareness. Her goal both as a clinician and manager has always been to help patients and families overcome obstacles associated with hearing loss and achieve their maximum potential. In her current management role, Gina now focuses on assisting staff in achieving their full potential and expanding the services and programs offered at Nationwide Children's Hospital.

Holly T. Gerth, AuD

Holly Gerth, AuD, PASC is a pediatric audiologist and clinical leader, having practiced audiology for more than 13 years. At Nationwide Children's Hospital, Dr. Gerth is an inpatient audiologist, responsible for answering all inpatient consults, performing diagnostic hearing evaluations in a variety of settings (Operating Room, Procedure Center, bedside testing) and managing inpatients with hearing loss. She is an active member of several multidisciplinary research projects. She has an interest in audiologic electrophysiology, universal newborn hearing screening and congenital CMV.

Lauren Durinka, AuD

Lauren Durinka, AuD, is a pediatric audiologist and Evidence Based Practice Coordinator at Nationwide Children's Hospital. She received a Bachelor of Arts degree in Speech and Hearing Science with a minor in Disability Studies from The Ohio State University. Dr. Durinka went on to complete her Doctorate in Audiology at The Ohio State University and has been practicing audiology for the last 8 years at large pediatric facilities. Dr. Durinka is passionate about providing excellent family-centered care to all patients. Her clinical interests include diagnostic evaluations, bone conduction implants, and hearing aids.

Christine Schafer, AuD

Christine Schafer, AuD, is a pediatric audiologist at Nationwide Children's Hospital. Dr Schafer received her Masters degree in Audiology from the University of Akron in 2002 and Doctor of Audiology from Arizona School of Health Sciences in 2010. She has certification in Advanced Cochlear Implant Programming from the Institute for Cochlear Implant Training (ICIT) and is a Certificate Holder- Audiology Preceptor (CH-AP) from the American Academy of Audiology. Before joining the Audiology team at Nationwide Children's Hospital, Dr Schafer practiced at Memorial Hermann Children's Hospital and The Center for Hearing and Speech, both in Houston, Texas. Her primary interests are implantable hearing devices, hearing aids and precepting audiology externs. She is one of the primary preceptors for the 4th year audiology extern; providing training and mentoring on cochlear implant programming.

Alecia Jayne, AuD, CCC-A

Christine Schafer, AuD, is a pediatric audiologist at Nationwide Children's Hospital. Dr Schafer received her Masters degree in Audiology from the University of Akron in 2002 and Doctor of Audiology from Arizona School of Health Sciences in 2010. She has certification in Advanced Cochlear Implant Programming from the Institute for Cochlear Implant Training (ICIT) and is a Certificate Holder- Audiology Preceptor (CH-AP) from the American Academy of Audiology. Before joining the Audiology team at Nationwide Children's Hospital, Dr Schafer practiced at Memorial Hermann Children's Hospital and The Center for Hearing and Speech, both in Houston, Texas. Her primary interests are implantable hearing devices, hearing aids and precepting audiology externs. She is one of the primary preceptors for the 4th year audiology extern; providing training and mentoring on cochlear implant programming.

Ursula M. Findlen, PhD

Ursula M. Findlen, PhD is Director of Audiology Research in the Division of Clinical Therapies- Audiology Department at Nationwide Children's Hospital and Associate Professor-Clinical at The Ohio State University College of Medicine, Department of Otolaryngology- Head & Neck Surgery. Dr. Findlen engages in clinical practice and research endeavors related to pediatric (re)habilitative audiology. Her research interests include infant diagnostics and improving outcomes of children with hearing loss through systematic quality improvement and population health endeavors.

Caitlin Cummings PhD CCC-SLP

Caitlin Cummings, PhD, CCC-SLP is a bilingual (English/Spanish) speech pathologist and clinical researcher at Nationwide Children's Hospital. She works primarily as a member of the Cleft Lip and Palate, Craniofacial, Velopharyngeal Dysfunction, and Bilingual SLP teams to provide speech, language, and resonance evaluations and intervention services for children with communication disorders. Her research interests include speech sound disorders and early intervention in young children with cleft/craniofacial anomalies, 22q11.2 deletion syndrome, as well as bilingual speech sound development. Caitlin completed her Ph.D. in Speech-Language Science in May, 2024 and hopes to continue clinical practice and academic research focused on improving the communication outcomes of mono- and multi-lingual children with complex speech disorders.

Lauren Y. Yoshihiro MS CCC-SLP

Lauren Yoshihiro, MS, CCC-SLP is a pediatric speech-language pathologist with the Hearing Program at Nationwide Children's Hospital. Lauren provides specialized intervention and aural (re)habilitation for patients who are Deaf/Hard of Hearing and Deaf+ who require a Total Communication approach to communicate. This includes spoken language, sign language, and/or augmentative or alternative communication (AAC) methods to establish functional communication skills due to their language needs/deprivation, medical history and/or co-morbidities, or hearing and vision status. Lauren received her Master's of Science in Speech, Language, and Learning from Northwestern University in 2018 and has been with Nationwide Children's Hospital for 5 years. She is specialized to work with children from birth-23 years.

Disclosures

- **Presenter Disclosure**: Financial: Gina M. Hounam is employed by Nationwide Children's Hospital. Non-financial: Gina M. Hounam is the chair of the Ohio Speech and Hearing Governmental Affairs Coalition and is an Ohio Academy of Audiology Board MemberFinancial: Holly T. Gerth is employed by Nationwide Children's Hospital. Non-financial: Holly T. Gerth has no relevant non-financial relationships to disclose. Financial: Lauren Durinka is employed by Nationwide Children's Hospital. Non-financial: Lauren Durinka has no relevant non-financial relationships to disclose. Financial: Christine Schafer is employed by Nationwide Children's Hospital. Non-financial: Christine Schafer has no relevant non-financial relationships to disclose. Financial: Alecia Jayne is employed by Nationwide Children's Hospital. Non-financial: Alecia Jayne has no relevant non-financial relationships to disclose. Financial: Ursula M. Findlen is employed by Nationwide Children's Hospital and The Ohio State Wexner Medical Center, College of Medicine; Grant funding from Advanced Bionics, Inc., NIH (R01DC017846), PCORI (EACB-2413), and Decibel/Regeneron (DB-100-001;NCT06019481). Non-Financial: Board Member, American Academy of Audiology. Non-financial: Ursula M. Findlen has no relevant non-financial relationships to disclose. Financial: Caitlin Cummings is employed by Nationwide Children's Hospital. Non-financial: Caitlin Cummings has no relevant non-financial relationships to disclose. Financial: Lauren Y. Yoshihiro is employed by Nationwide Children's Hospital. Non-financial: Lauren Y. Yoshihiro has no relevant non-financial relationships to disclose. In lieu of accepting an honorarium, a donation has been made to Nationwide Children's Hospital.
- **Content Disclosure**: This learning event does not focus exclusively on any specific product or service.
- **Sponsor Disclosure**: This course is presented in partnership with Nationwide Children's Hospital.

Learning Outcomes

After this course, participants will be able to:

- Examine clinical status indicators in patients with Bronchopulmonary dysplasia that may better predict hearing test outcomes and trajectories.
- Examine medical and audiologic indications for ABI. Discuss auditory outcomes in congenitally deaf children who receive ABI.
- Describe the impact that language and/or cognitive level can have on diagnostic assessment of children with autism spectrum disorder.
- Examine audiologic indications for Active Transcutaneous Bone Conduction Implants. Discuss auditory outcomes in children with Down syndrome who receive a bone conduction implant.
- Describe elements regarding appropriate evaluation and management of speech and language disorders in children from multilingual backgrounds who are deaf/heard of hearing.

Audiologic Trends in Children with Severe Bronchopulmonary Dysplasia: Improvements in Health and Hearing

Holly Gerth, AuD, PASC, CCC-A

Case Study: L.A.

- 26 weeks gestation
- Intrauterine growth restriction (IUGR)
- Congenital heart defect
- Severe bronchopulmonary dysplasia

She spent a total of 302 days in Nationwide Children's NICU.

Image: Nationwide Children's Hospital

L.A.’s Audiologic Journey

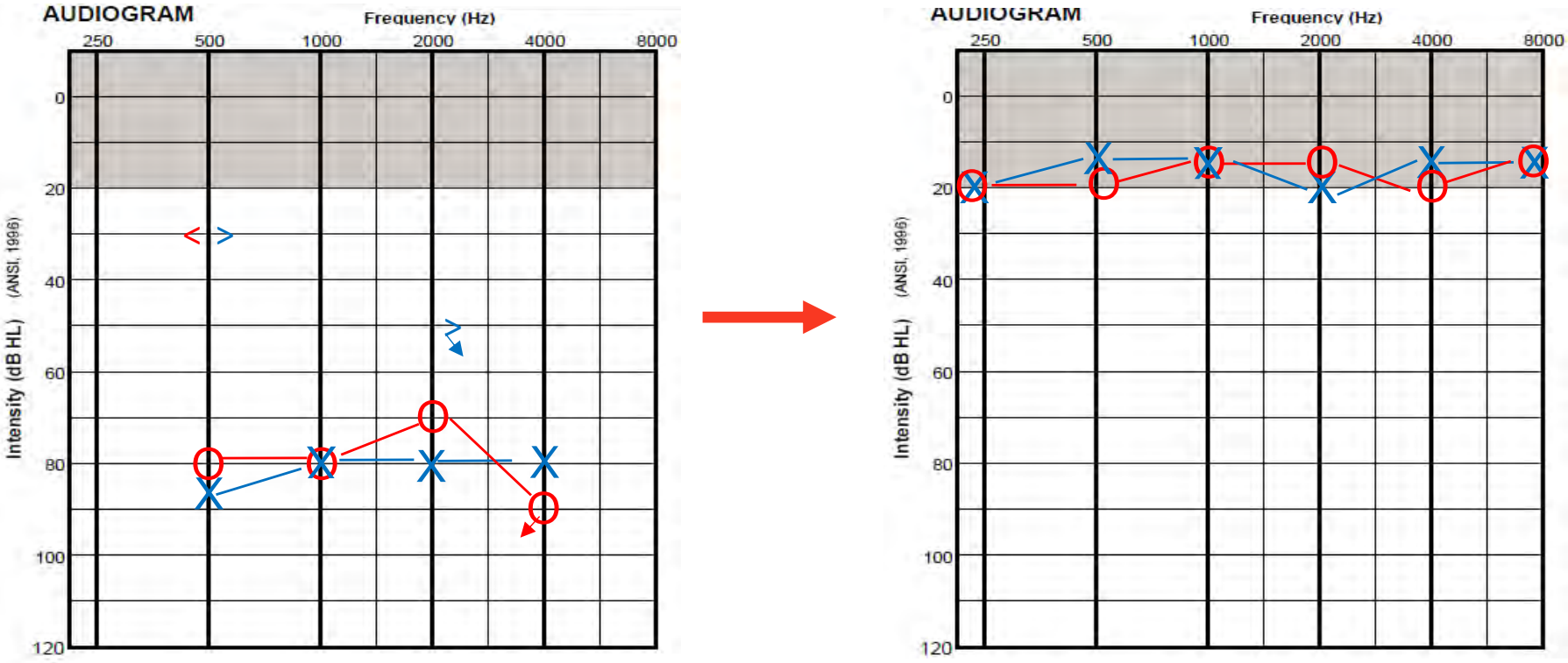


Image: Nationwide Children’s Hospital

Bronchopulmonary Dysplasia

Mild	Moderate	Severe
• O_2 support for at least 28 days • Weaned to **room air** by 36 weeks PMA	• O_2 support for at least 28 days • Still receiving **oxygen support** (<30% O_2) at 36 weeks PMA	O_2 support for at least 28 days Still receiving **oxygen support** (>30% O_2) and/or need for **positive pressure** at 36 weeks PMA

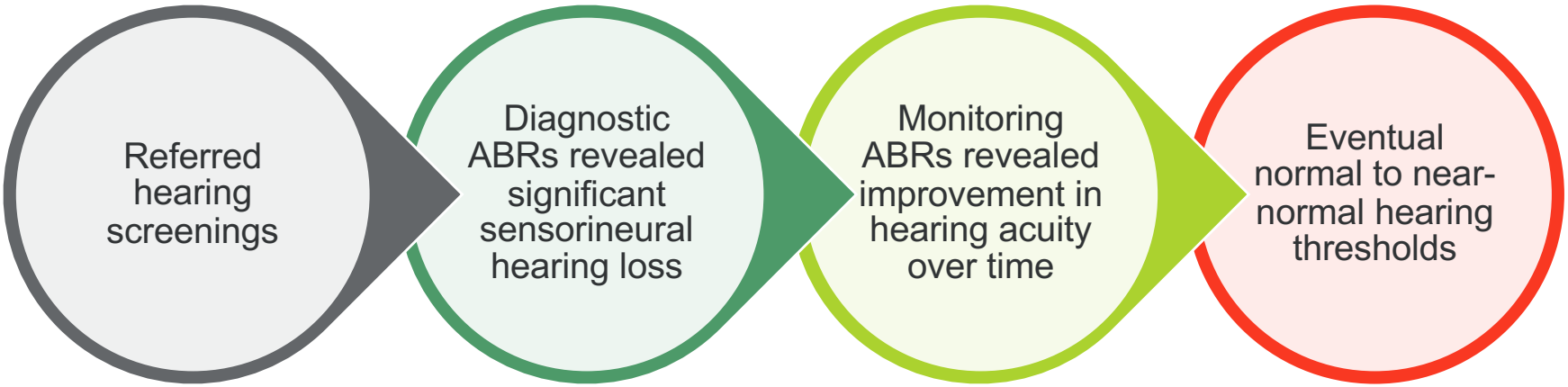
Comprehensive Center for BPD

- NICU dedicated entirely to BPD
- Comprehensive and highly specialized staff
- Consultations provided to facilities nationwide
  - Patients transferred for care

Image: Nationwide Children's Hospital

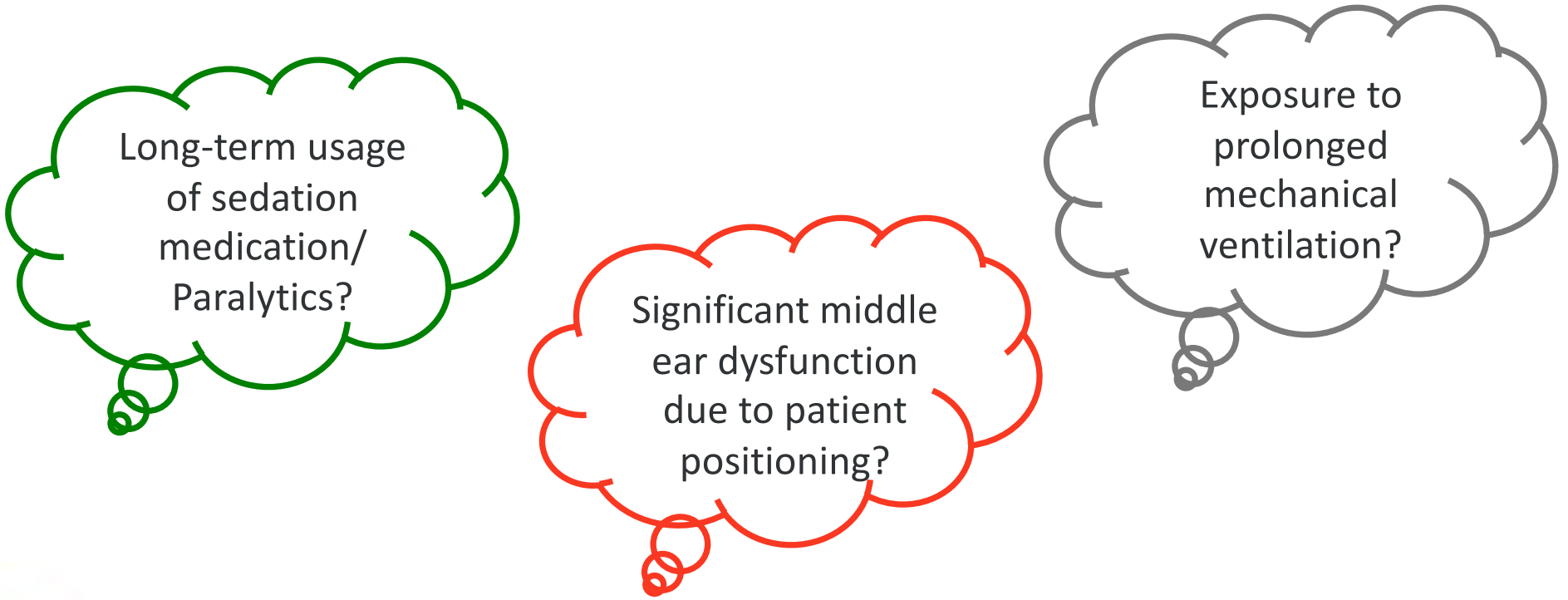
Audiology and the BPD NICU

- A trend began to emerge as we were seeing babies in the NICU with severe BPD

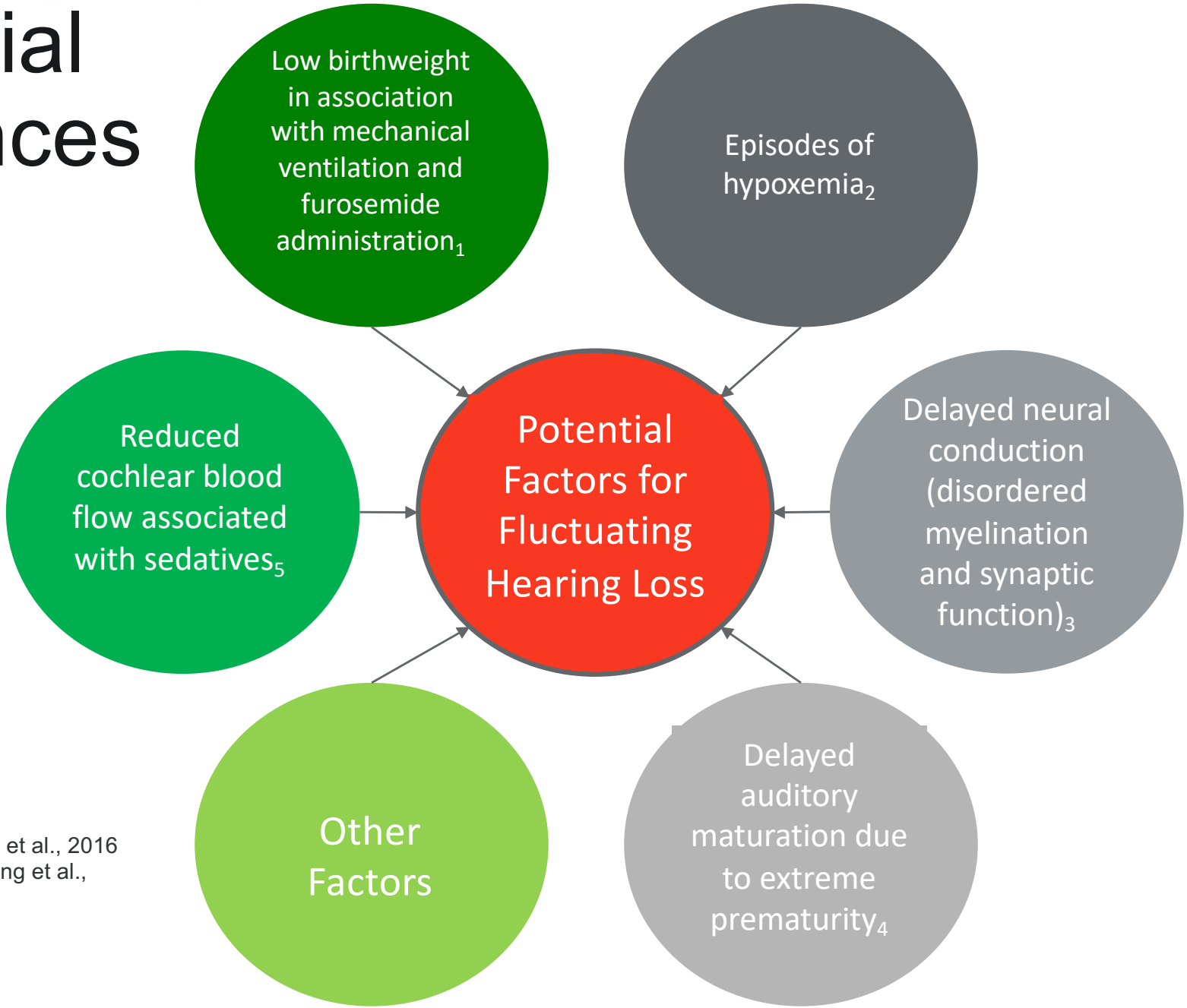


Hearing Loss in Babies with BPD

- Trend of higher rates of (seemingly sensorineural) hearing loss in babies with BPD than hearing loss noted in the general NICU



Potential Influences



References:
1. Martinez-Crus et al., 2012
2. Jiang et al., 2006
3. Wilkinson et al., 2007; Jiang et al., 2016
4. Koenighofer et al., 2014; Jiang et al., 2006; Sipdonk et al., 2016
5. Buyukkocak et al., 2009

Multidisciplinary Collaboration

- Meeting with Audiology & BPD NICU team
- BPD NICU team developed a system to classify phases of BPD

Could the BPD phase correlate to improvement in hearing loss?

How Patients are Scored

(Logan et al., 2018)

Oxygen (O_2) support levels

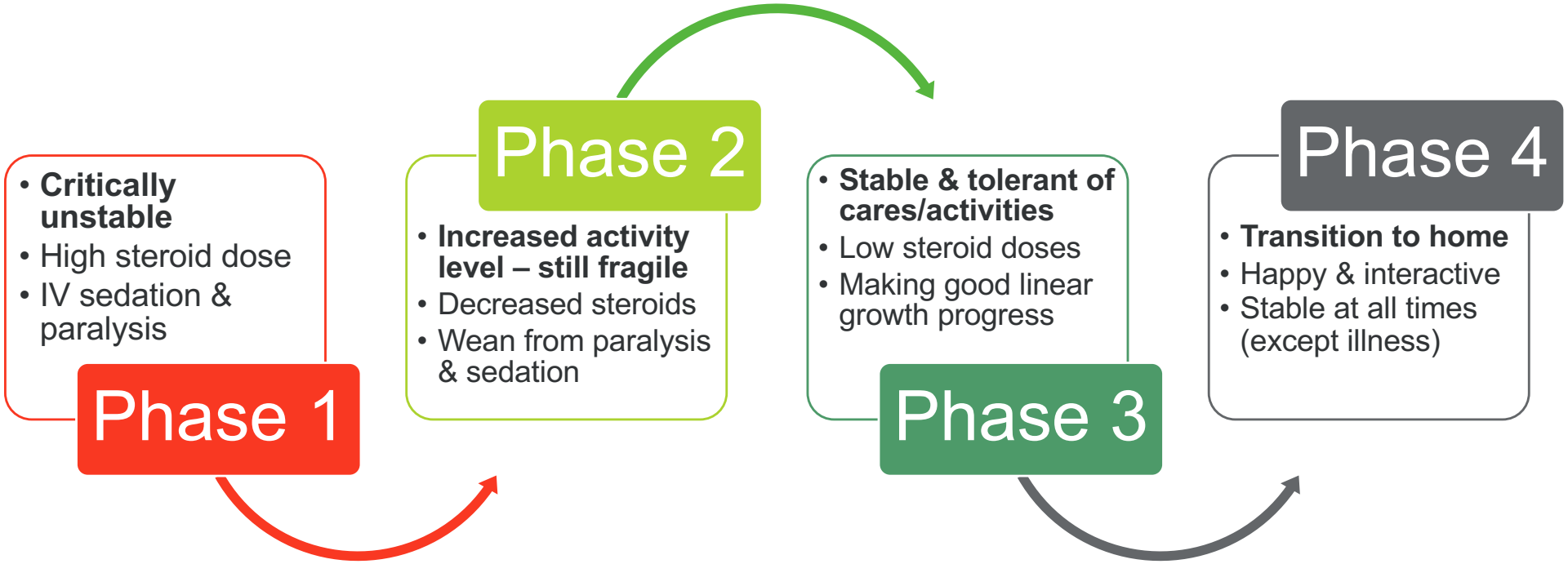
Linear Growth

Steroid Dosages

Clinical Appearance

Four Phases of BPD Management

(Logan et al., 2018)



Case Discussions

Image: Nationwide Children's Hospital

Baby Girl L.A.

Image: Nationwide Children's Hospital

L.A.

- Test 1 (ABR)
- Corrected Age: 10 weeks
- **Early Phase 2**
  - Weaning sedation
  - Decreasing steroids

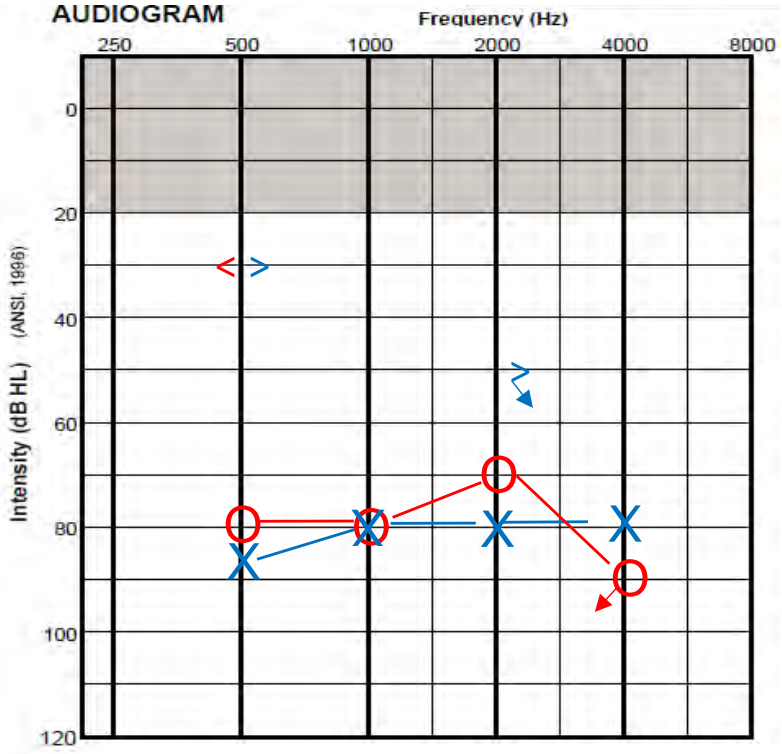


Image: Nationwide Children's Hospital

L.A.

- Test 2 (ABR)
- Corrected Age: 4 months
- **Phase 3**
  - Stable on nasal cannula
  - Good linear growth

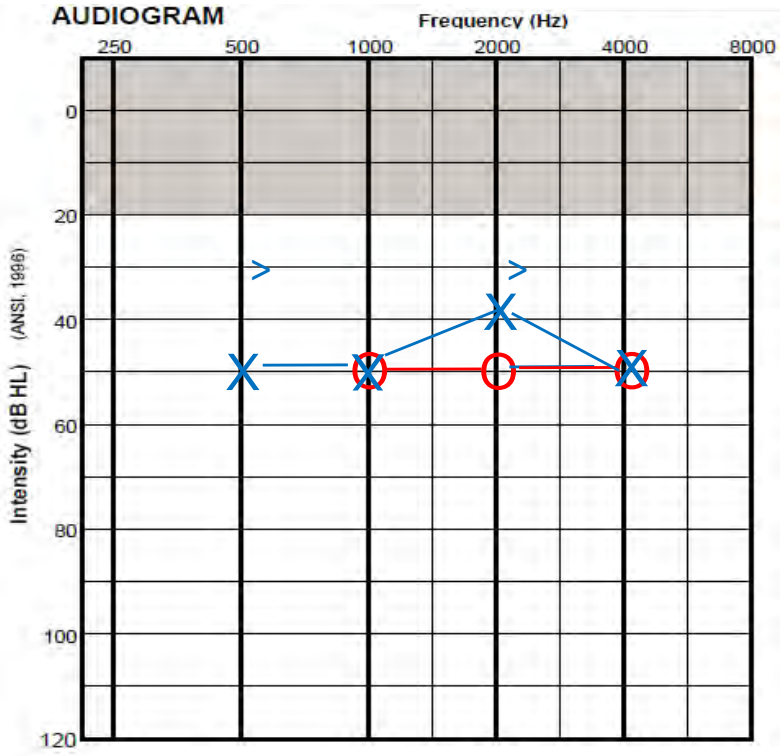


Image: Nationwide Children's Hospital

L.A.

- Test 3 (VRA)
- Age: 1 year 10 months
- **Phase 4**

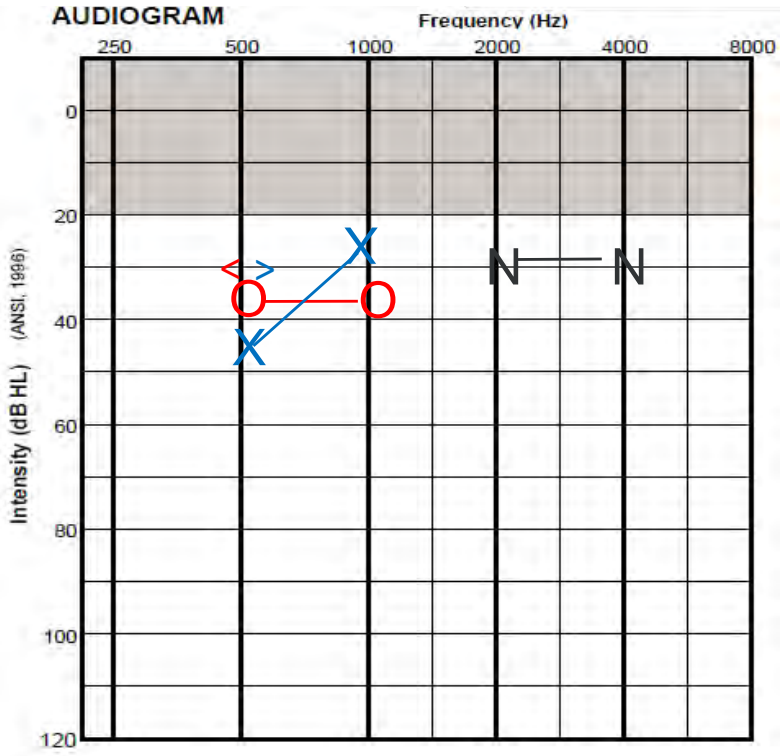


Image: Nationwide Children's Hospital

L.A.

- Test 4 (VRA)
- Age: 1 year 11 months
- **Phase 4**

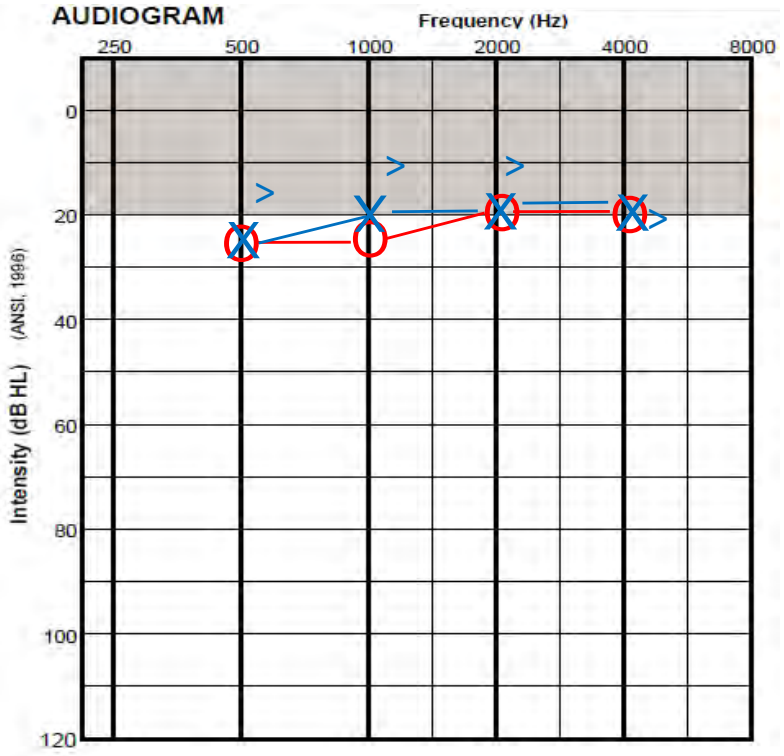


Image: Nationwide Children's Hospital

L.A.

- Test 5 (ABR)
- Age: 3 years
- **Phase 4**

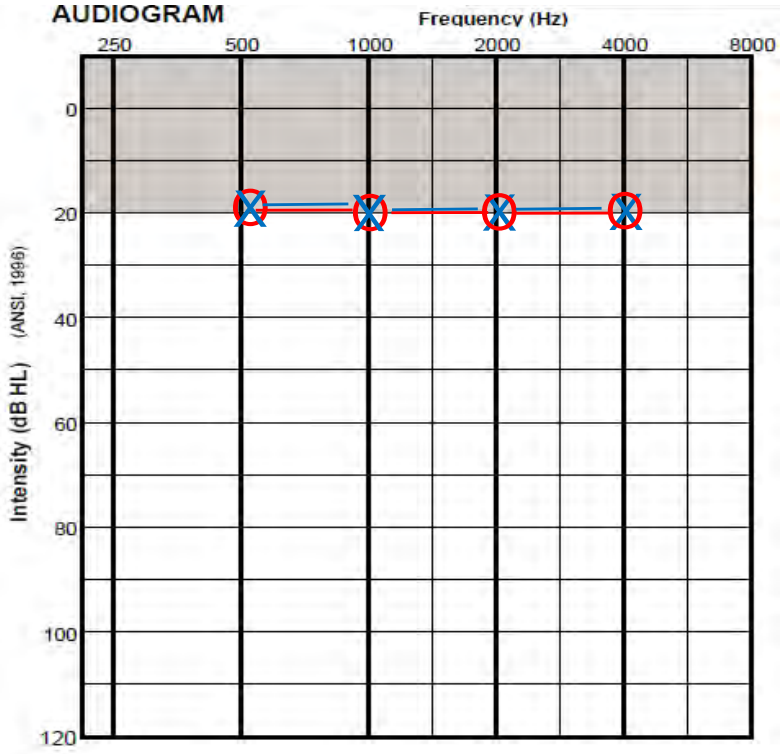
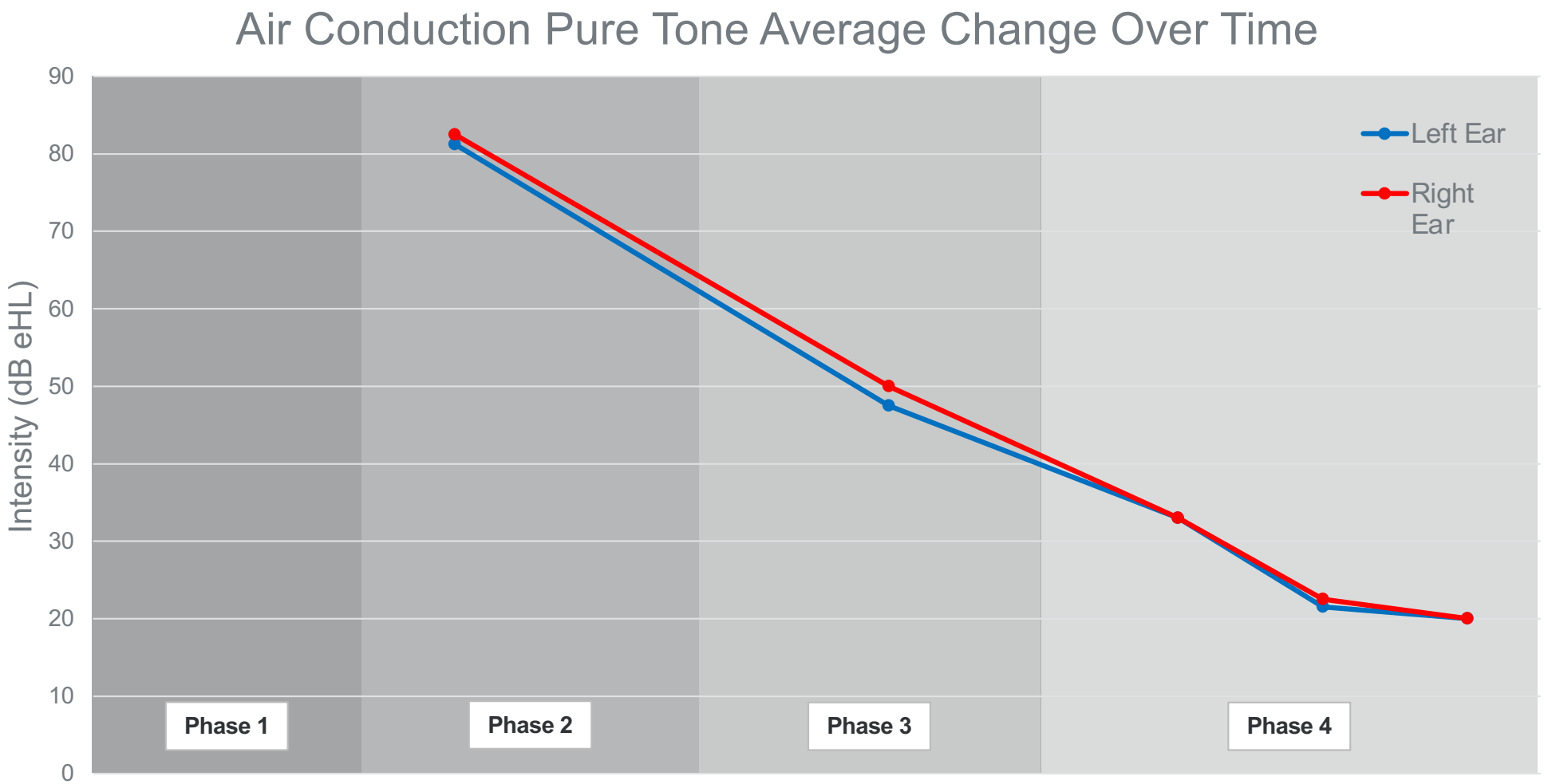


Image: Nationwide Children's Hospital


Air Conduction Pure Tone Average Change Over Time
Intensity (dB eHL)
90
80
70
60
50
40
30
20
10
0
Left Ear
Right Ear
Phase 1
Phase 2
Phase 3
Phase 4

L.A.

- Most recent test (CPA)
- Age: 9 years

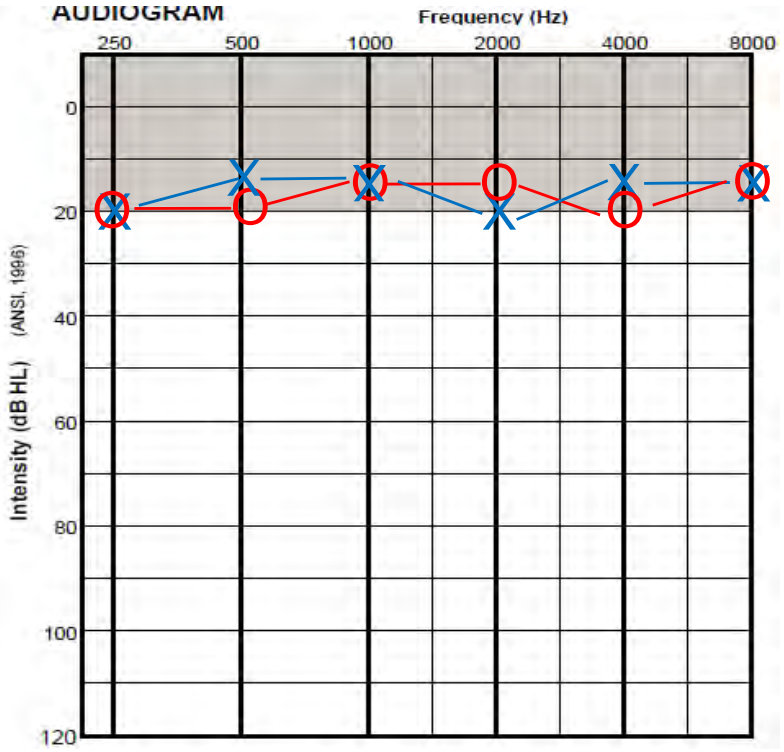


Image: Nationwide Children's Hospital

Meet A.K.!

Image: Nationwide Children's Hospital

A.K.

- Test 1 (ABR)
- Corrected Age: 5 months
- **Late Phase 1**
  - IV sedatives
  - High dose steroids
  - Medically fragile and unstable

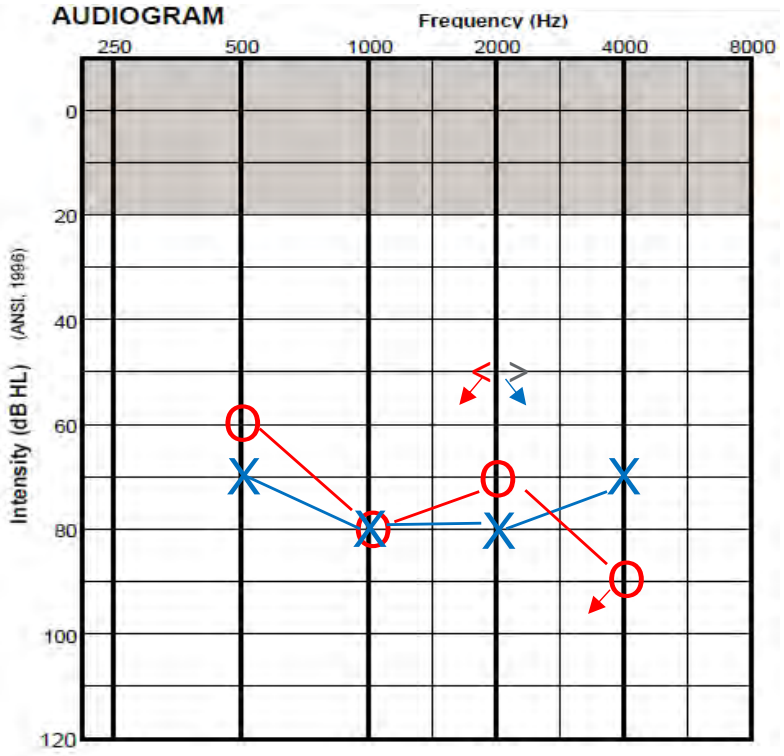


Image: Nationwide Children's Hospital

A.K.

- Test 2 (ABR)
- Corrected Age: 7 months
- **Early Phase 2**
  - Reduction in sedation medications
  - Medically fragile

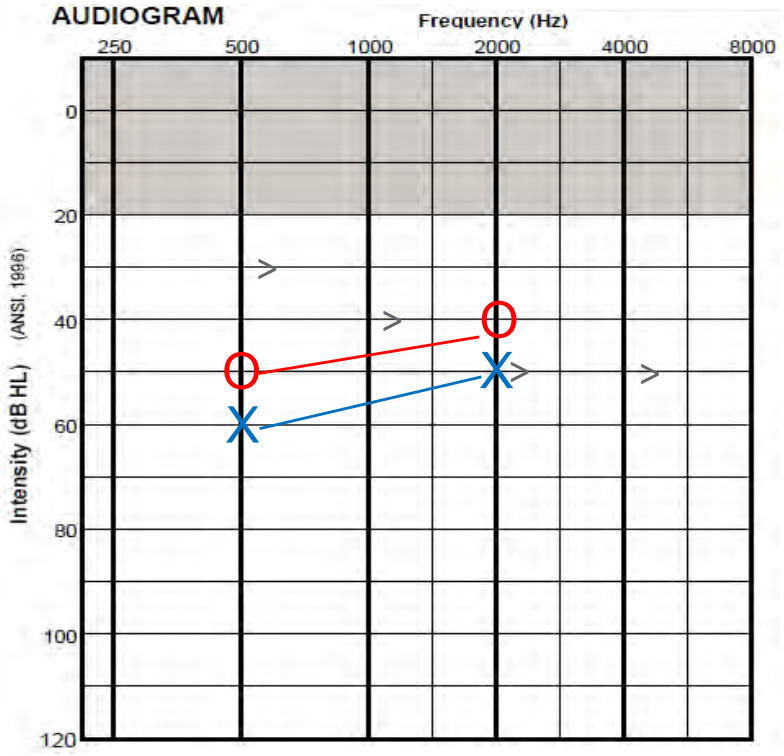


Image: Nationwide Children's Hospital

A.K.

- Test 3 (ABR)
- Corrected Age: 9 months
- **Mid-Phase 2**

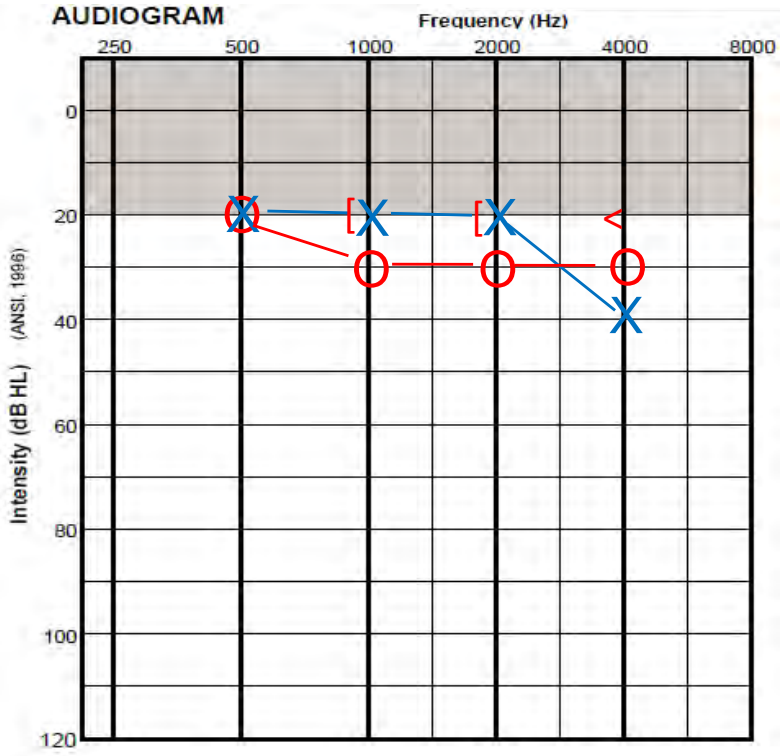


Image: Nationwide Children's Hospital

A.K.

- Test 4 (ABR)
- Corrected Age: 12 months
- **Early Phase 3**
  - Stable
  - Tolerant of cares and activities
  - Good linear growth

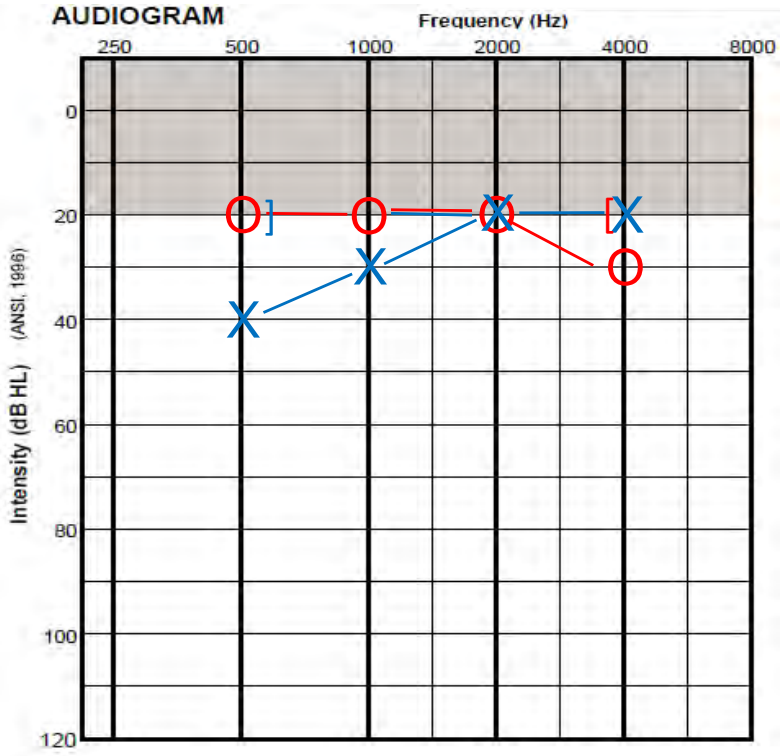


Image: Nationwide Children's Hospital

A.K.

- Test 5 (ABR)
- Age: 1 year 11 months
- **Late Phase 3**

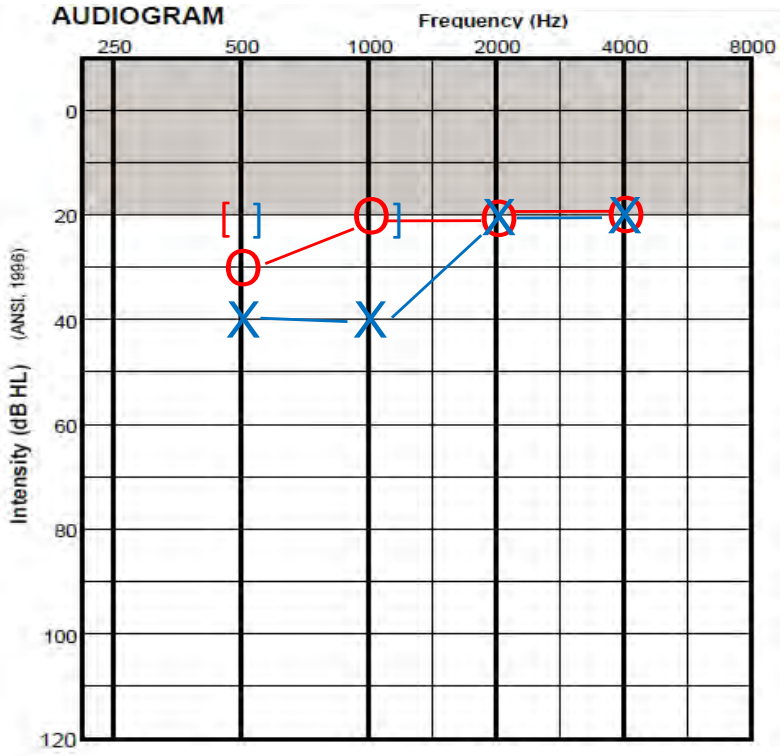
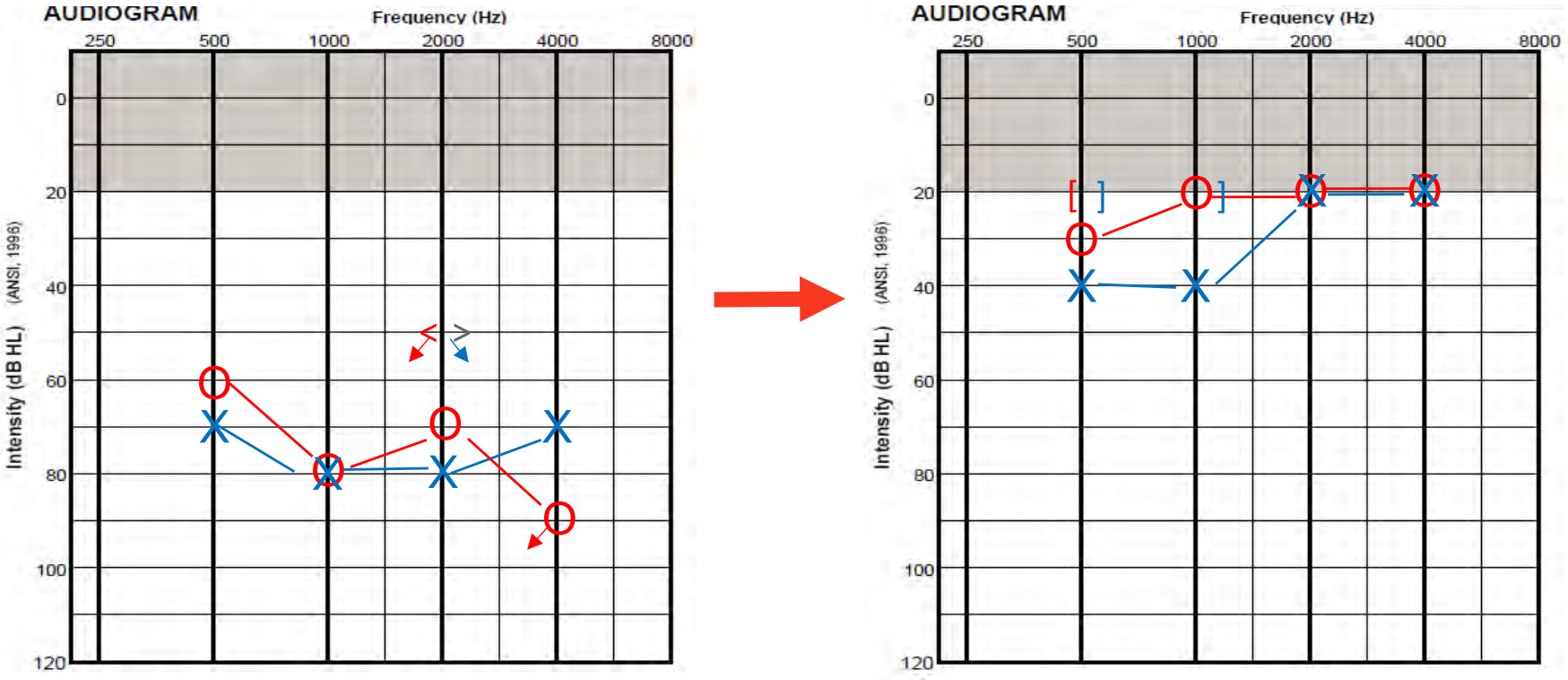


Image: Nationwide Children's Hospital

A.K.



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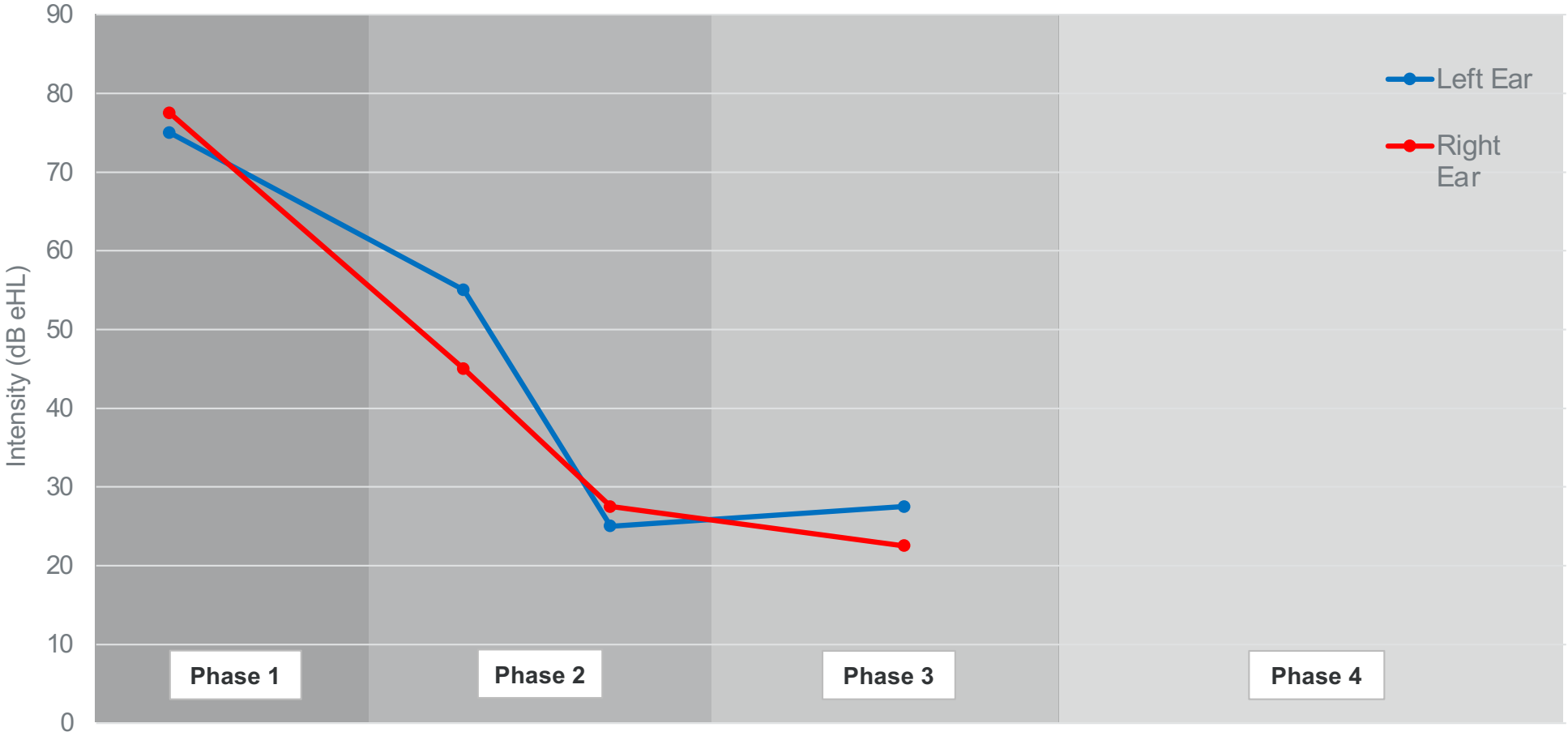
Air Conduction Pure Tone Average Change Over Time



A.K.

- Most recent test (ABR)
- Age: 9 years

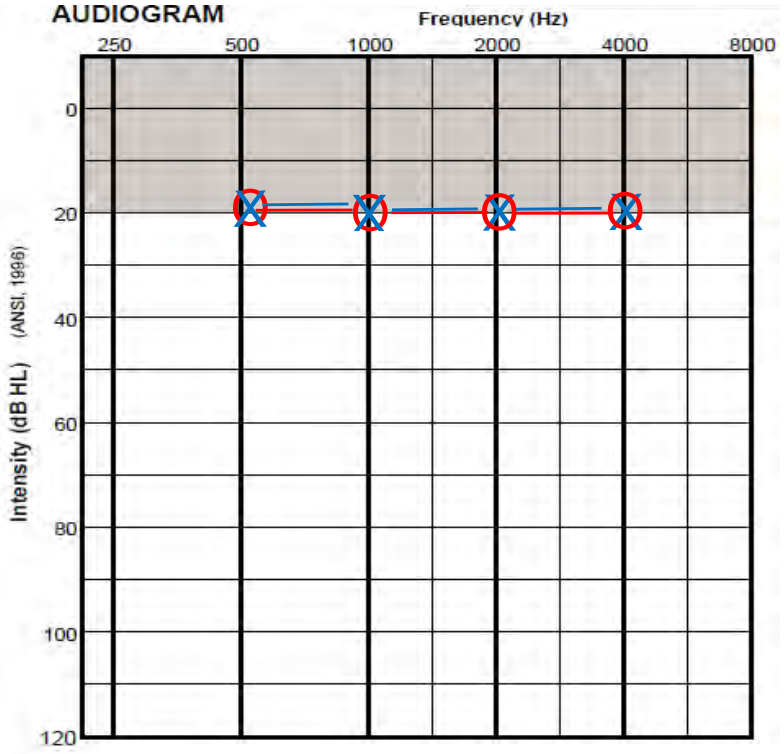
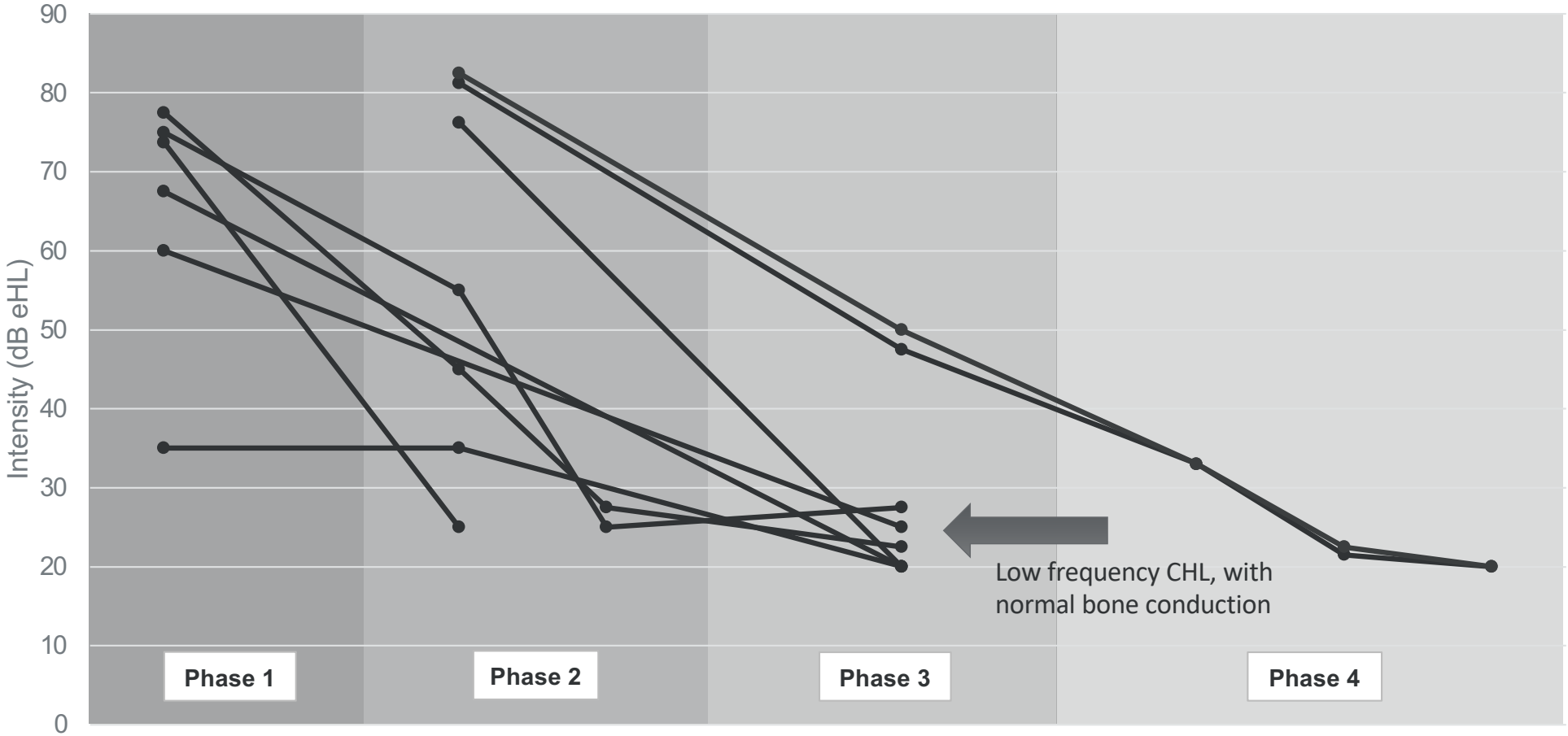


Image: Nationwide Children's Hospital

Air Conduction Pure Tone Average Change Over Time



NCH NICU BPD protocol

- For patients with severe BPD:
  - Diagnostic ABR (waiting until Phase II)
  - Repeat ABR in 2-3 months
    - No fitting of amplification until 2 stable evaluations
    - Monitoring if hearing is fluctuating/improving
- Requires:
  - Great working relationship with medical team
  - Flexibility of audiologists
  - Divergent thinking

Thank you!

Holly Gerth, AuD, PASC, CCC-A

Auditory Brainstem Implants (ABI)

Alecia Jayne, AuD, CCC/A

Christine Schafer, AuD

What is an Auditory Brainstem Implant (ABI)?

- An ABI can provide sound sensation to a patient with an absent cochlear nerve

- An ABI can provide:
  - Sound awareness
  - In some cases, sound recognition
  - Improved lip reading skills

How Does an ABI Work?

- The electrodes on the paddle activate neurons in your brainstem, creating sound sensations

- Unlike a cochlear implant where electrodes stimulate the auditory nerve, an ABI bypasses your auditory nerve to stimulate the cochlear nucleus complex in the brainstem

Approved Indications (USA)

- 12 years of age or older

- Diagnosed with Neurofibromatosis Type 2 (NF2)
  - Implantation may occur during 1st or 2nd side tumor removal or in patients with previously removed acoustic tumors bilaterally

Additional Considerations

- Cochlear nerve hypoplasia
- Inner ear malformation
- Ossification of both cochlea's post meningitis
- Temporal bone fracture with cochlear nerve avulsion
- Otosclerosis with cochlear destruction
- Unmanageable facial nerve stimulation with cochlear implant

NCH Considerations

- Age
  - Pre-lingual: 18-24 months to 3 years for optimal auditory skill development
  - Peri- and post-lingual: No upper age limit
- No medical contraindications
- No diagnosed cognitive or developmental delays
- Strong family support
- Reasonable expectations

Performance Expectations

- ABI recipients should experience:
  - Detection of medium to loud environmental sounds at comfortable listening levels
  - Detection of **conversational speech** at comfortable listening levels
- ABI recipients may also experience:
  - Improved perception of the rhythm and volume of speech resulting in limited improvement in speech recognition and communication ability with lip reading
  - Limited improvement in the recognition of environmental sounds
- A small number of ABI recipients will experience:
  - Improved speech recognition without lip reading

Surgical Team

- Neurosurgeon
- Neurotologist
- Intraoperative monitoring specialist
  - Cranial nerve monitoring of V, VII, VIII, XI, X
  - Completes eABR
- Audiologist
  - Assists with eABR

Purpose of eABR

- To confirm that the placement of the ABI is capable of stimulating the CNC
- To ensure optimal placement in order to stimulate as much of the CNC as possible
- To ensure placement does not cause excessive side effects and can maximize outcomes

Follow Up Schedule

Recommended/Typical Follow-up Timelines: (Timelines are approximates and will be based on the discretion of the audiologist and surgeon) [2]	
Sedated EABR	4-6 weeks after surgery
Initial Activation in Outpatient Clinic	Within one week of sedated EABR
2nd Follow-up	1-week post initial activation
3rd Follow-up	1-month post initial activation
4th Follow-up	3-months post initial activation
5th Follow-up	6-months post initial activation
6th Follow-up	9-months post initial activation (recommended at the discretion of the audiologist)
7th Follow-up	1-year post initial activation
Addition appointments	Bi- annually or annually based on the discretion of the audiologist

Case 1

- July 2018
  - 3 y.o. female adopted from China in 06/2018
  - Parents aware that she had a HL, however no testing had been completed in China and therefore degree and etiology were unknown
  - ABR completed in 07/2018
    - No response ABR 500-4000 Hz, bilaterally
  - CT and MRI completed at time of ABR in 07/2018
    - Common cavity with absence of normal cochlea, vestibule, and SSC bilaterally
    - Atresia of IAC and VII and VIII cranial nerves, bilaterally
  - ABI surgery completed on 05/06/2019

Case 1

- **Initial stimulation**
  - 14 active electrodes
  - Cochlear ABI 541 with CP1000 external
  - SPEAK, MP1+2, Rate 250, PW150, Max 8
  - C levels set at eABR thresholds

- **6 months post activation**
  - 10 active electrodes based on behavioral responses
  - Measured C levels using a faces chart
  - Datalogging 11 hours per day
  - Detection levels between 40-65 dB HL
  - Able to detect all 6 Ling sounds

Case 1

- **1 year post activation**
  - 10 active electrodes
  - Datalogging 9.3 hours per day
  - Ling detection between 20-40 dB HL
  - Able to point to all Ling sounds (auditory cues only) using a picture board
  - Mother reports she recently pointed out a lawn mower, the microwave bell, and thunder. She can spontaneously say "I love you."
- **2.5 years post activation**
  - 10 active electrodes
  - Datalogging 7.0 hours per day
  - Mainstreamed school with ASL interpreter and DM system (Phonak Roger)
  - Patient able to behaviorally measure all T and C levels via CPA
  - Pure tone and Ling detection between 20-30 dB HL

Case 1

- **4 years post activation (Today)**
  - 10 active electrodes
  - Datalogging 11.4 hours per day
  - Mainstreamed school with ASL interpreter and HAT (Mini Mic 2+)
  - Able to behaviorally measure all T and C levels via CPA
  - Able to REPEAT all Ling sounds with auditory cues only with the exception of /o/ and /m/
  - Recognizes her name with auditory cues only
  - Unable to complete ESP testing
  - Family is working with the school district to incorporate cued speech into her curriculum

Case 2

- Patient referred NBHS and ABR indicated profound SNHL, bilaterally
- MRI indicated hypoplastic, potentially absent cochlear nerves
  - Due to the possibility of a nerve, a cochlear implant was placed
- Patient received no benefit from the cochlear implant, and approximately 1.5 years later, the patient received an ABI
- IT-MAIS 0/40
- Patient in a high-risk social situation and not receiving consistent speech therapy or access to ASL at this time

Case 2

- **Initial activation**
  - 13 active electrodes based on eABR
  - C levels measured up to +10 CU over eABR thresholds
  - Patient noted to smile and lean into mother in response to stimulation and was able to indicated to the audiologist when stimulation was uncomfortable
  - No non-auditory (NASE) observed

- **1 year post activation**
  - 13 active electrodes
  - Datalogging 3.1 hours per day
  - Ling testing 30-45 dB HL
  - SAT 30 dB HL
  - IT-MAIS 10/40

Trouble brewing…

- Patient was seen for his two- and three-year post activation appointments without incidence with similar results to the one-year post activation appointment.
- At 4 years post ABI, parents report issues with the recently replaced processor. The patient was seen for a troubleshooting appointment, and it was noted that the processor would connect to the computer, however, could not find the internal.
- Cochlear was contacted for integrity testing and a device failure was confirmed.

Next steps

- Explant/Re-implantation was discussed, however there was hesitation among the team. Audiology had not seen much progress in regards to sound awareness, datalogging has been historically low, and school reports his behavior is better WITHOUT the processor than with the processor. The patient was learning ASL and utilizing an AAC device.

- Family chose to explant/re-implant…

Re-Activation

- **Initial (re)activation**
  - Patient arrived at appointment with significant swelling at the incision site and continually signs “hurt”
  - Impedance indicated 17 open electrodes
  - No maps were created at this appointment

- Following this appointment, the patient was admitted to the hospital where a shunt was placed
  - Impedance testing as an inpatient was completed following shunt placement and indicated 16 open electrodes
  - No maps were created at this appointment

Follow Up After Re-activation

- 1 month post shunt placement
  - 18 open electrodes were noted
  - No maps were created at this appointment, and it was recommended to discontinue ABI use
- Patient is currently enrolled at the Ohio School for the Deaf and utilizes ASL as his primary language.

Image: Pixabay

Clinical Take Aways

- Though the audiogram and imaging looked the same, outcomes were vastly different between cases.
- Why?
  - Family buy in
  - Realistic expectations
  - Consistent therapy
  - Consistent device use
  - Early access to language/ASL

Thank you!

Alecia Jayne, AuD, CCC/A

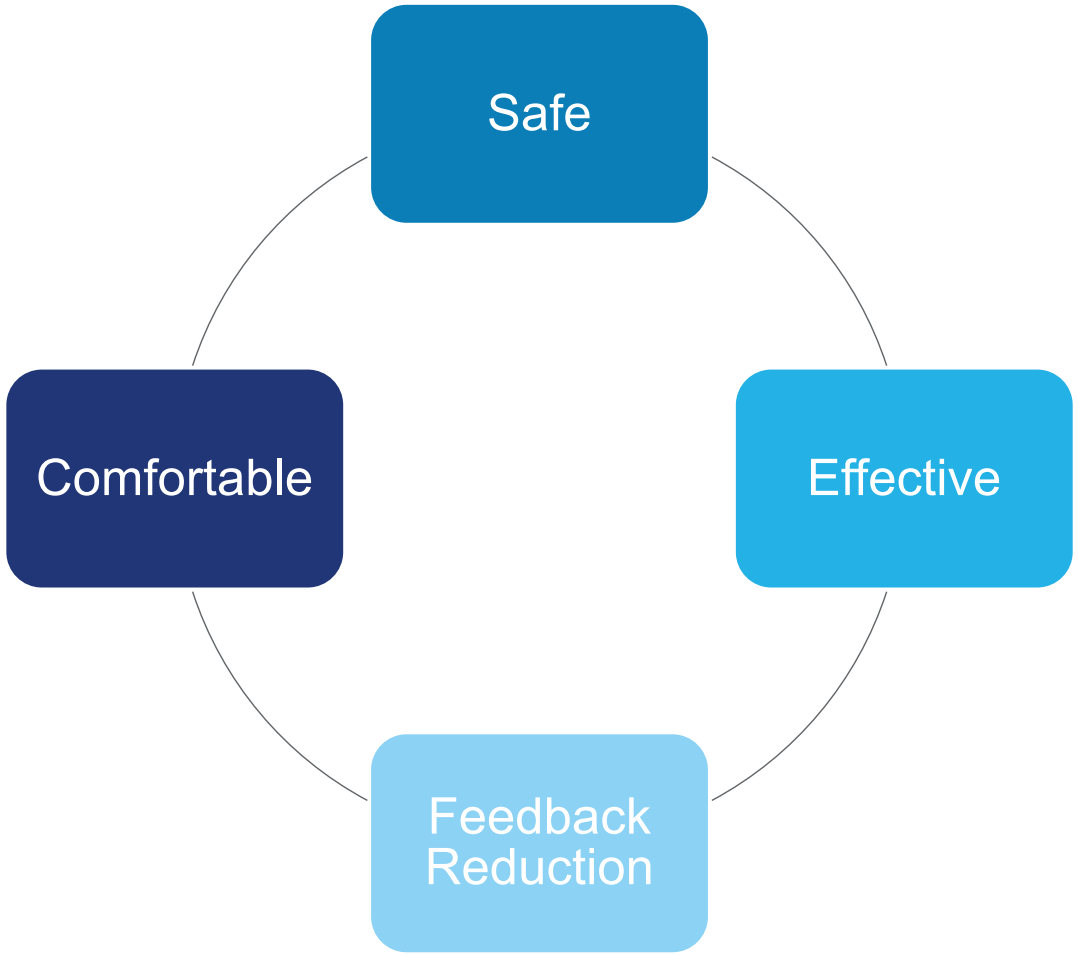
Christine Schafer, AuD

Gina M. Hounam, PhD - Moderator

Thinking Beyond Ear Tubes: Bone Conduction Implants for Children with Down Syndrome

Lauren Durinka, AuD, PASC

Active Transcutaneous Bone Conduction Implants: Why?



Active Transcutaneous Bone Conduction Implants

Med EL Bonebridge

- Floating-Mass Transducer
- Fitting range of up to 45 dBHL for BC

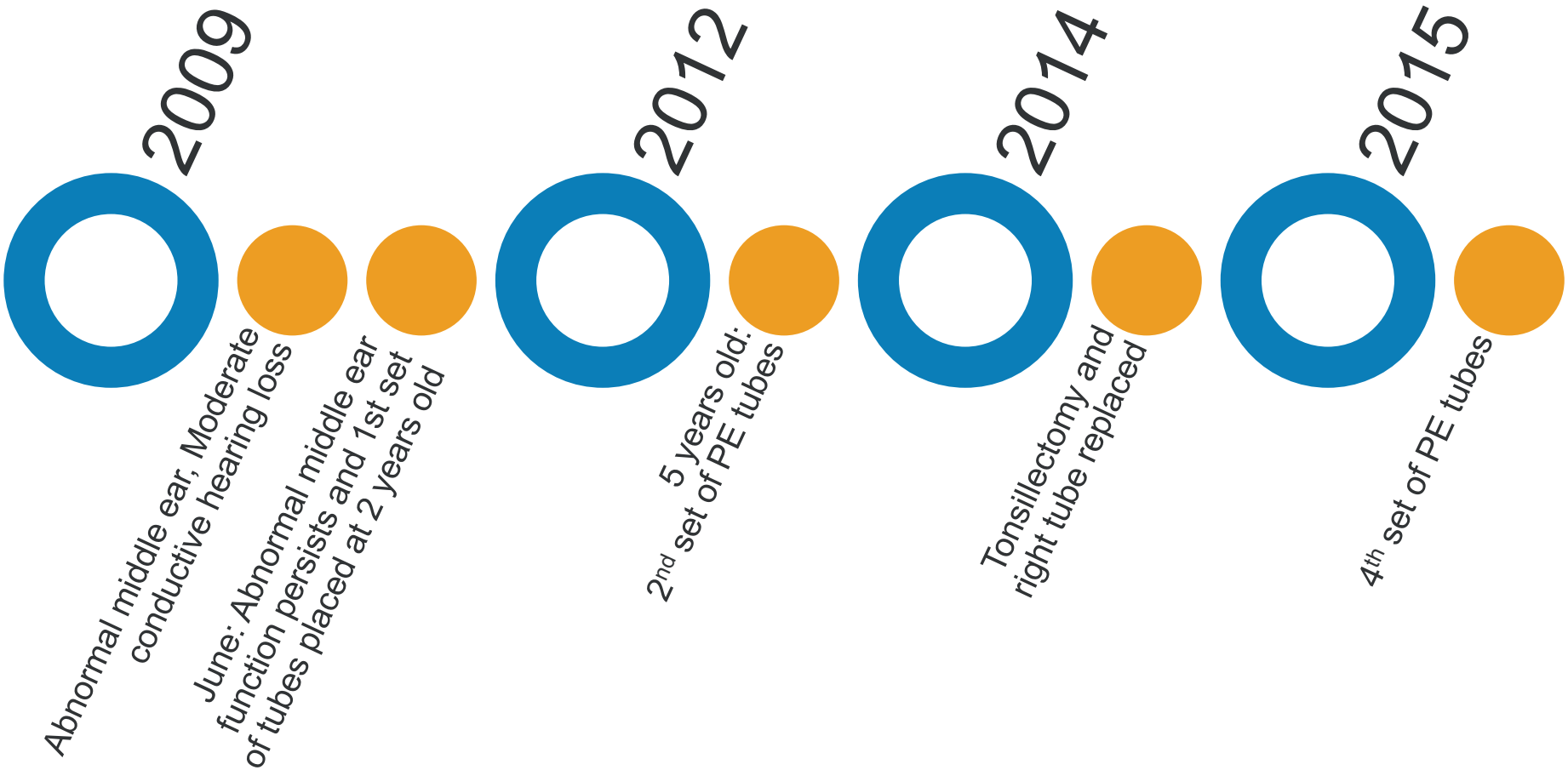
Cochlear Osia

- Piezoelectric Transduction
- Fitting range of up to 55 dBHL PTA for BC

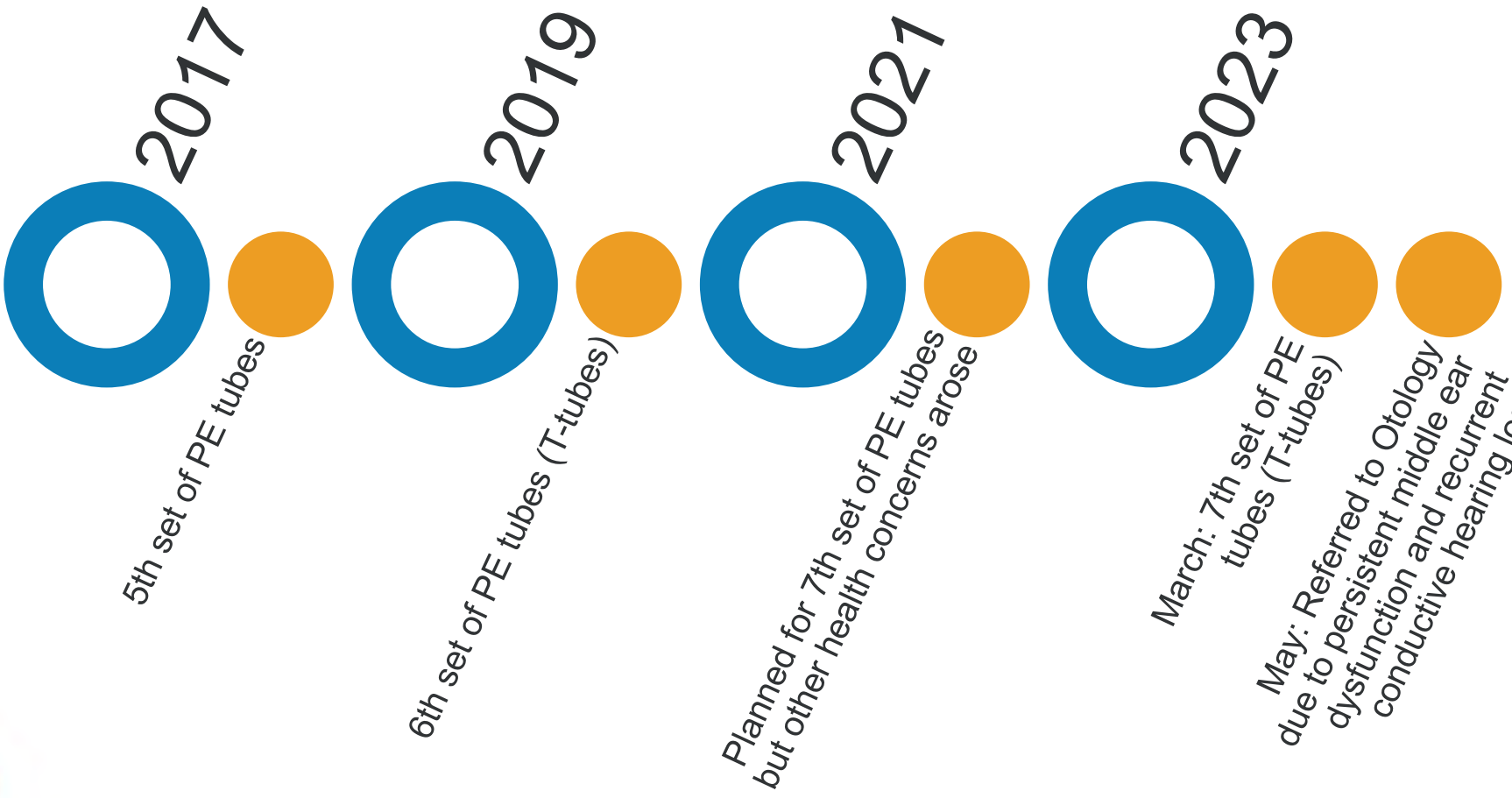
A.D. History


17 year old
Down Syndrome
Intellectual Disability
MoyaMoya Syndrome
Female

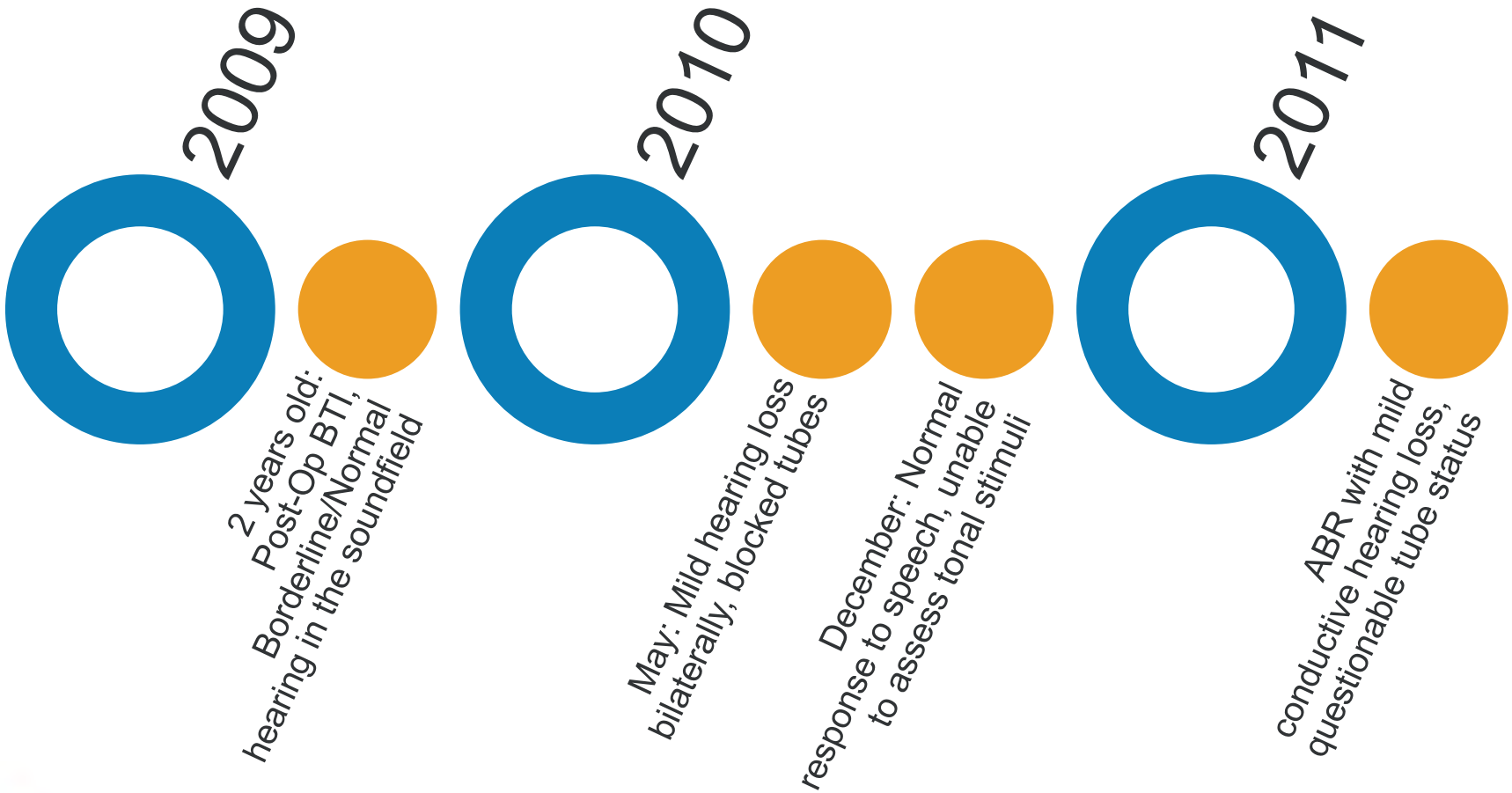
A.D. Otologic History



A.D. Otologic History Cont.

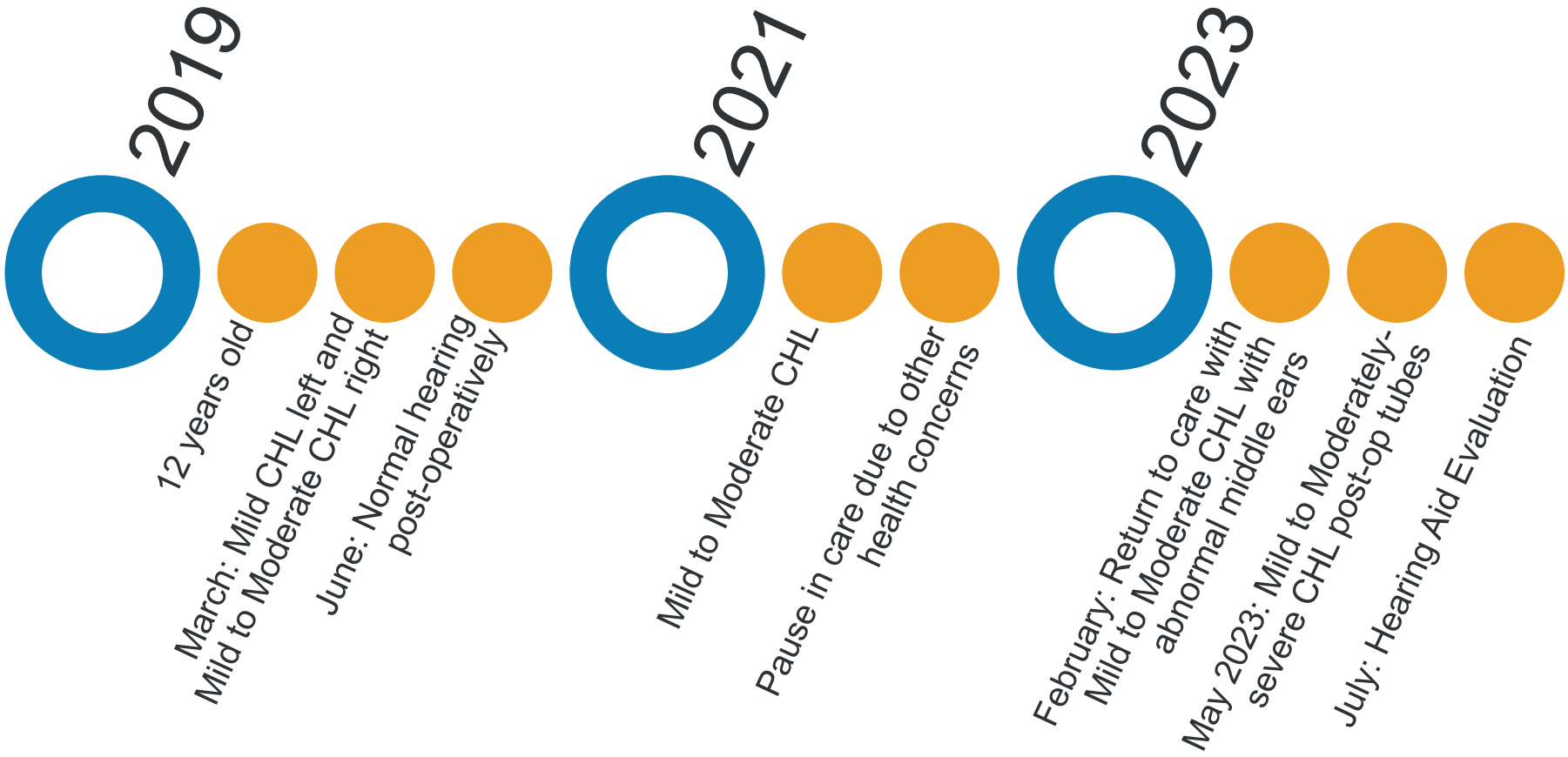


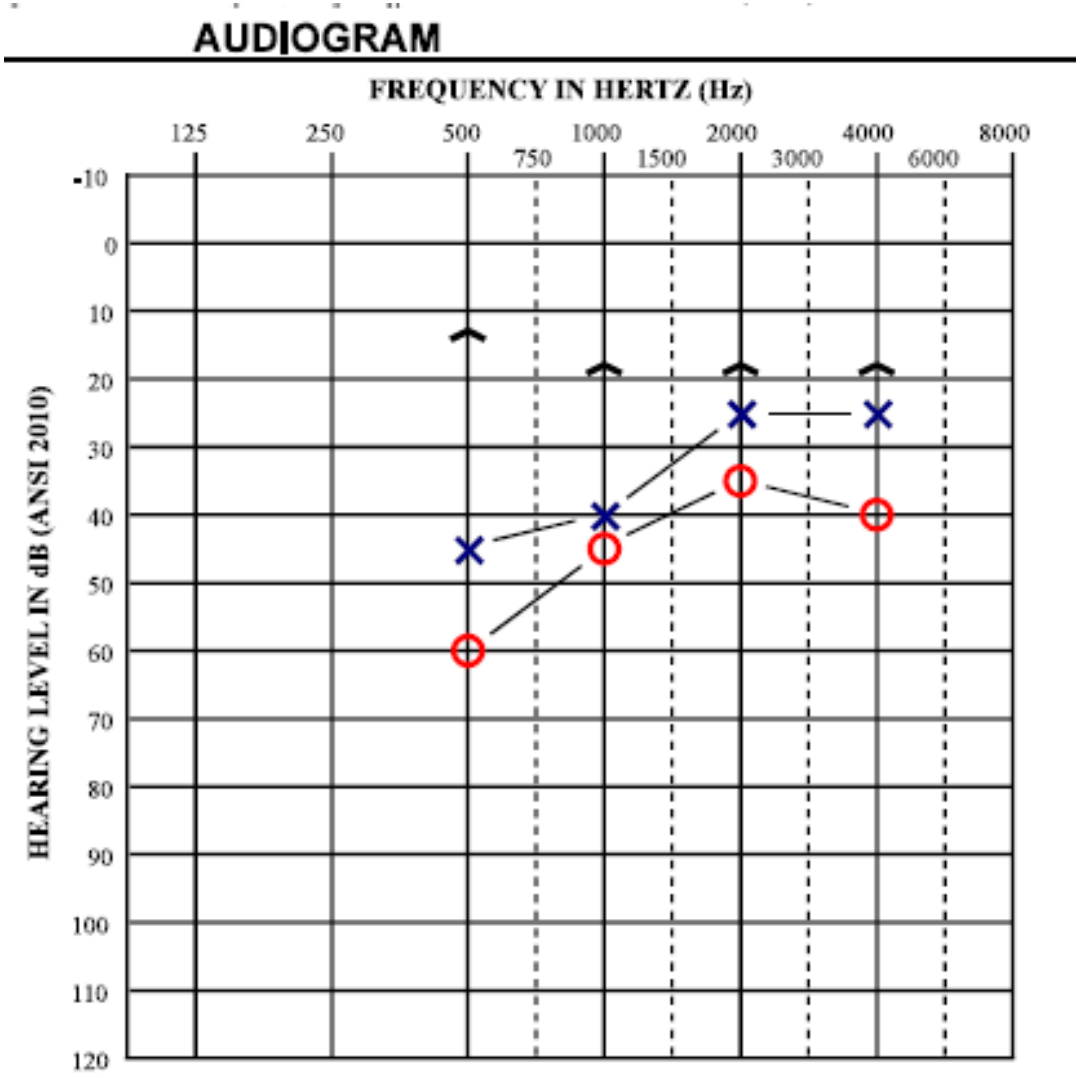
A.D. Audiologic History



A.D. Audiologic History Cont.

A.D. Audiologic History Cont.





May, 2023

Image: Nationwide Children's Hospital

A.D. One Month Post Activation

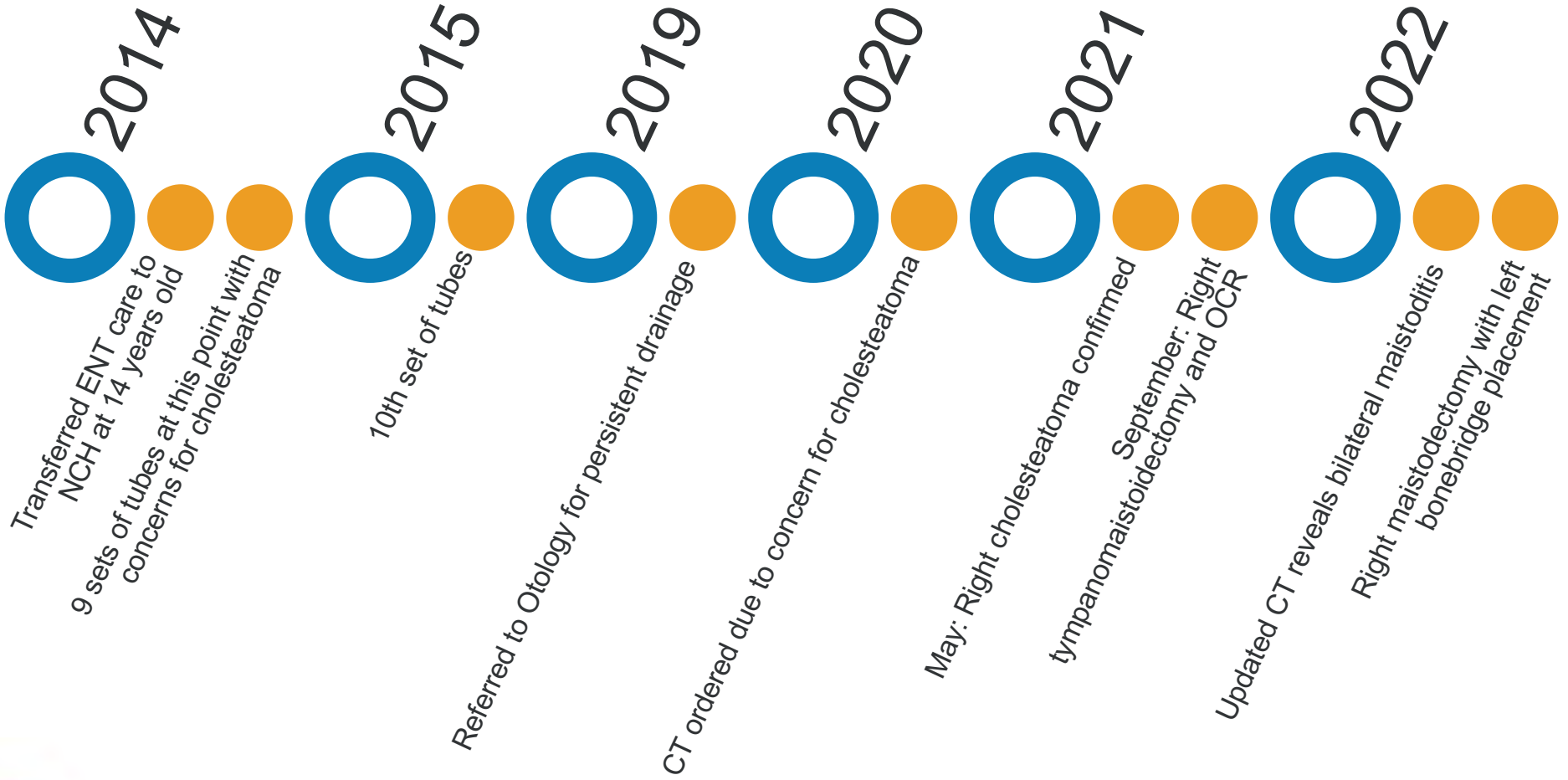
Aided LING Detection	/m/	/ah/	/ee/	/oo/	/sh/	/s/
Right Bonebridge	25 dBHL	10 dBHL	15 dBHL	20 dBHL	10 dBHL	30 dBHL

Speech Testing	SRT
Right Bonebridge	15 dBHL

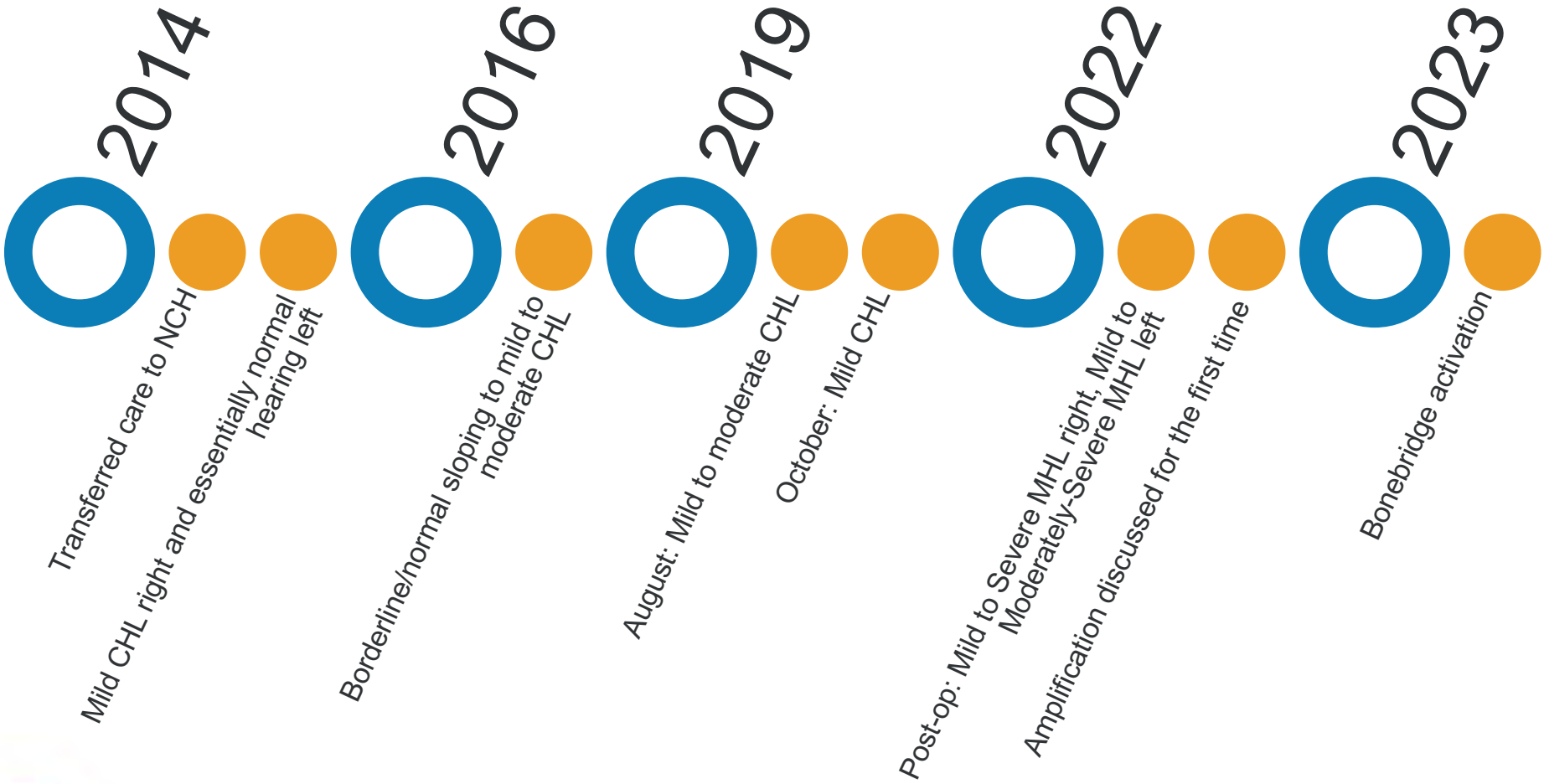
Materials Used:
Spondee picture card and Ling Sounds
Monitored Live Voice

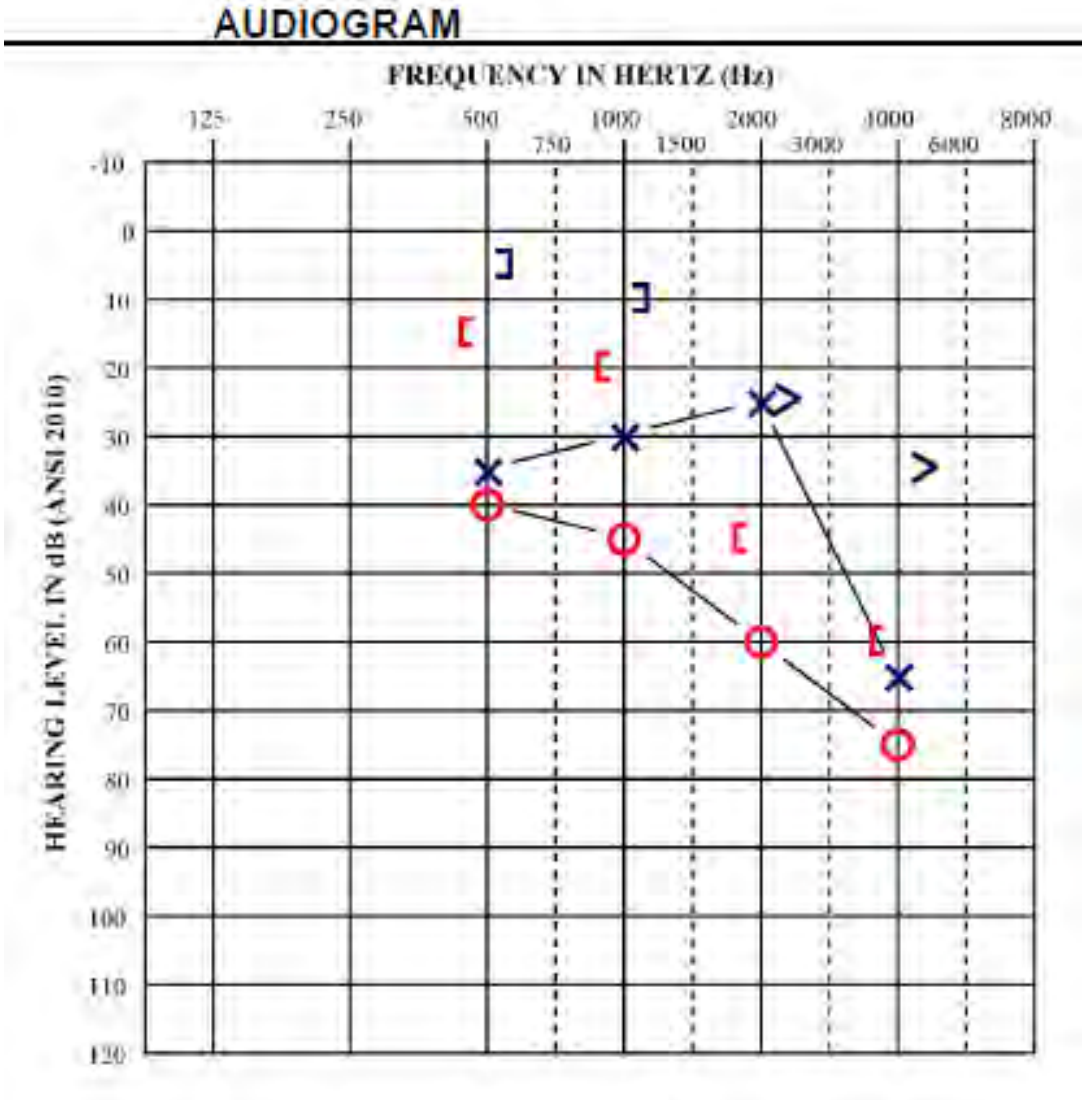
S.R. History

S.R. Otologic History



S.R. Audiologic History





June, 2022

Image: Nationwide Children's Hospital

S.R. One Month Post Activation

Aided LING Detection	/m/	/ah/	/ee/	/oo/	/sh/	/s/
Left Bonebridge	20 dBHL	15 dBHL	10 dBHL	15 dBHL	25 dBHL	30 dBHL

Speech Testing @ 60 dB SPL	SRT	Word Recognition (Quiet)
Left Bonebridge	20 dBHL	80%

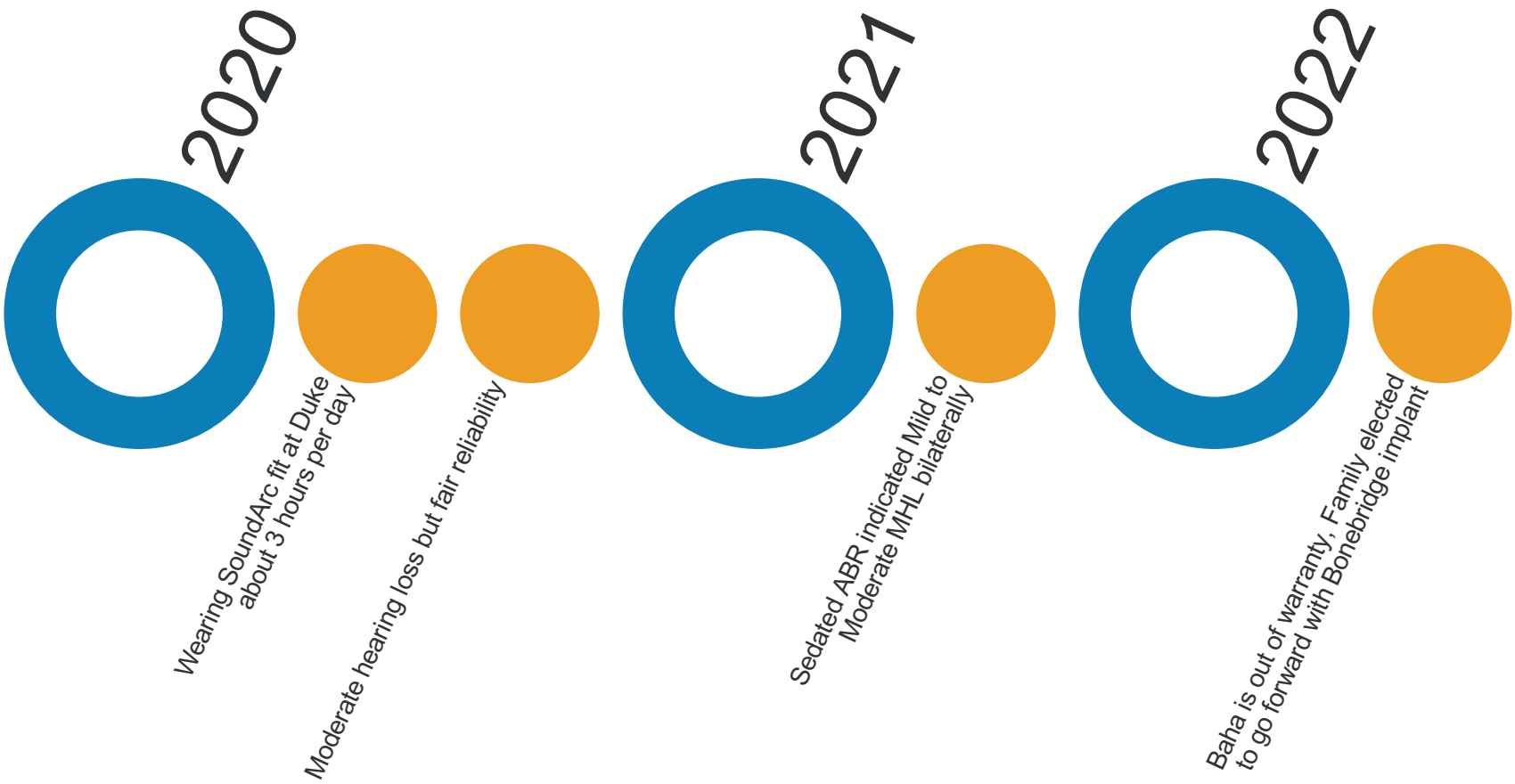
Materials Used:
Spondees, PBK, and Ling Sounds
Recorded and Monitored Live Voice

C.W. History


21 year old
Down Syndrome
Severe Intellectual Disability
Autism
Male

C.W. Otologic History

C.W. Audiologic History



Air Conduction				
	500 Hz	1000 Hz	2000 Hz	4000 Hz
Right Ear	40	30	50	40
Left Ear	50	30	40	30

Bone Conduction				
	500 Hz	1000 Hz	2000 Hz	4000 Hz
Right Ear	20	20	20	40
Left Ear	20	20	20	40

Sedated ABR results from February 2021

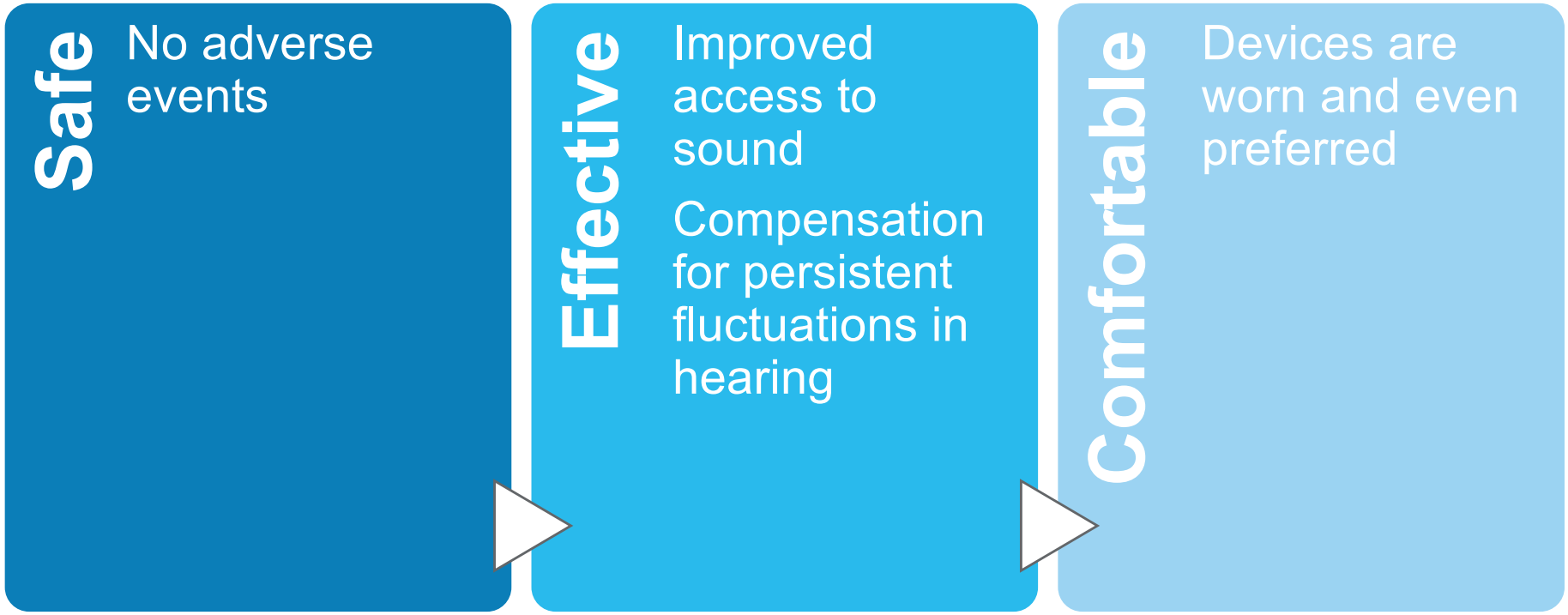
C.W. One Month Post Activation

Aided LING Detection	/m/	/ah/	/ee/	/oo/	/sh/	/s/
Right Bonebridge	40 dBHL	30 dBHL	40 dBHL	CNT	CNT	CNT

Speech Testing	SAT
Right Bonebridge	20 dBHL

Materials Used:
Lings and Speech stimuli via
Monitored Live Voice

Conclusions



Thank you!

Lauren Durinka, AuD, PASC

Facilitating Hearing Evaluation in Children on the Autism Spectrum

Ursula M. Findlen, PhD

Disclosures & Acknowledgements

- Employment - Nationwide Children's Hospital, The Ohio State University Wexner Medical Center
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Kelly Epperson, AuD

Lindsey (Kovacs) Bechtold, AuD

- Alecia Jayne, AuD
- Gina Guerra, AuD
- Ashley Dainton, AuD
- Holly Gerth, AuD
- Angie Zemba, AuD
- Chloe Vaughan, AuD

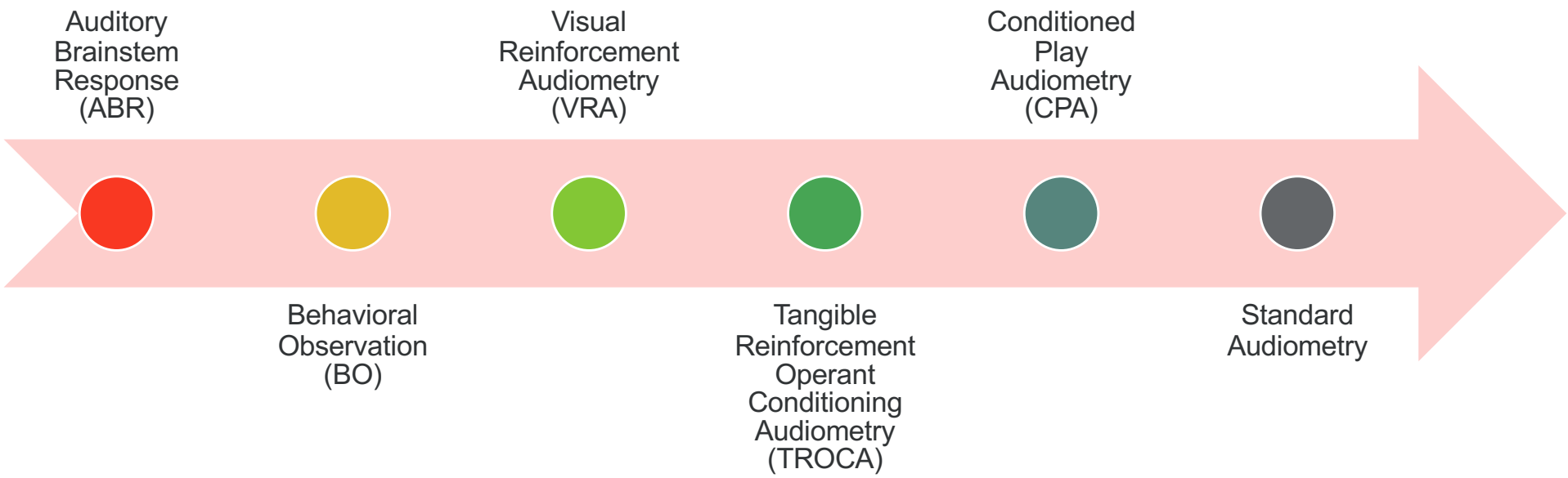
Determining Hearing Status

- Pediatric audiologists rely on various test measures to accurately determine hearing status in children.
  - Test Battery Approach
  - Electrophysiologic to behavioral measures
- All measures require some degree of participation and/or tolerance in awake children.

Image: Nationwide Children's Hospital

Developmental Considerations

- Hearing Thresholds & Continuum of Participation



Least Participation/ Lower Cognitive Load — **Most Participation/ Higher Cognitive Load**

Hearing Determination in Children with Autism

- It's Challenging!
  - Developmental considerations
  - Sensory considerations
  - Spectrum considerations

More unpredictable than typically-developing peers.

- It's really important!
  - Comorbidity of hearing loss and autism ~1.9-5.3%[1]
  - Overestimation of hearing level in ~40% of children with autism[2]
  - Test-retest reliability is poor complicating confirmation of hearing thresholds[2]

[1] Jure, Rapin, & Tuchman, 1991; Szymanski, Brice, Lam, & Hotto, 2012; [2] Tharpe, 2006

Resources Abound…

- 10 Tips for Testing Hearing in Children with Autism
  - Brueggeman (2012), The ASHA Leader
- Using Visual Supports to Facilitate Audiological Testing for Children with Autism Spectrum Disorder
  - McTee et al., 2019, The American Journal of Audiology
- Autism Spectrum Disorder: Considerations for Clinical Care in Pediatric Audiology
  - McCall et al. (2019), Marion Downs Lecture in Pediatric Audiology
- 20Q: Auditory Issues in Children with Autism Spectrum Disorder – Audiologists Wanted,
  - Audiology Online, Presented by Erin Schafer, PhD

We couldn’t help but wonder…

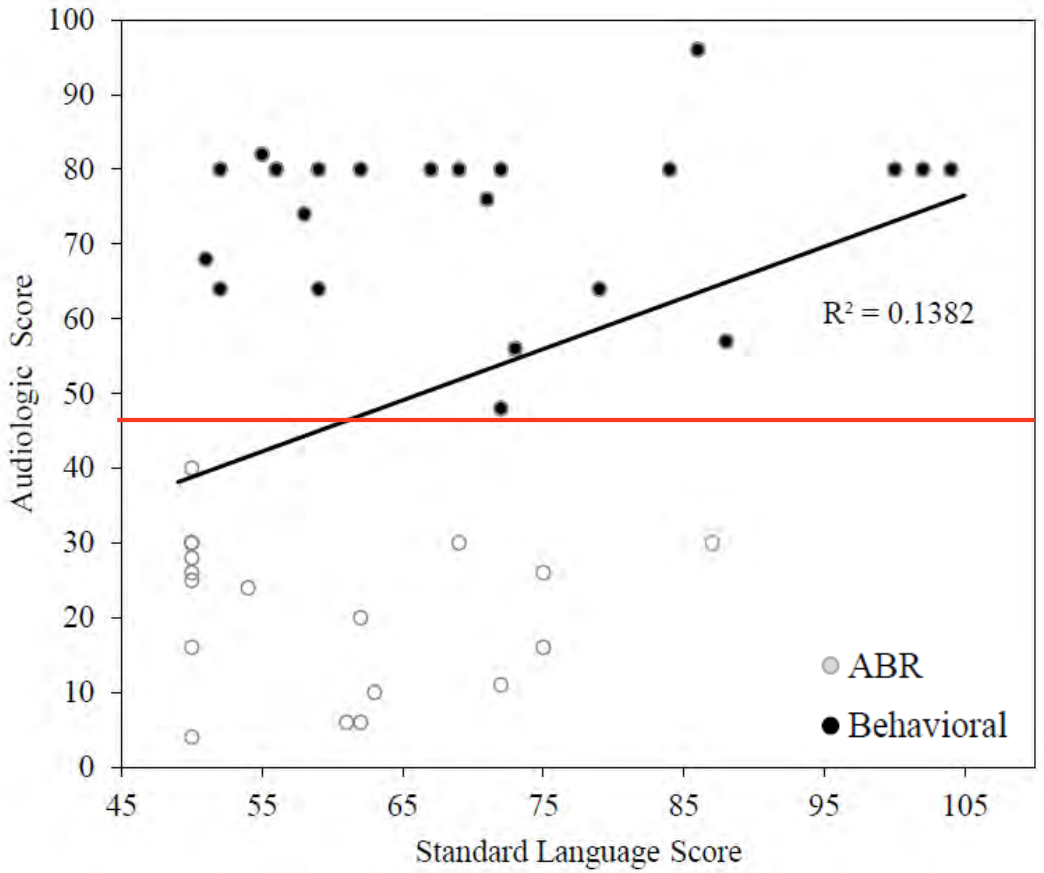
What else do we have access to in our EMR that can potentially help us when testing children on the Autism spectrum?

Research Questions

- Can language scores help us predict whether we can determine hearing status in children with autism behaviorally?
- Can cognitive scores help us predict whether we can determine hearing status in children with autism behaviorally?
- Is there a relationship between language or cognitive scores and the amount of information we can obtain in a single behavioral evaluation?

2019 Capstone

- Language and cognitive standard scores
- Audiologic Continuum Score - amount of audiometric data obtained on behavioral testing
- Ultimate testing method



Relationship Between Audio Score and Standard Language Score.

*Results revealed a significant, moderate positive relation between language standard score and audiologic continuum score (r = 0.372, p = 0.017).

Epperson, 2019

2019 Capstone Conclusions

- The higher the language standard score, the more audiologic testing the child could complete.
- If children have already had language testing completed prior to audiologic testing, that can guide:
  - Choice of test method
  - Choice to repeat testing for more complete results vs. moving to sedated ABR

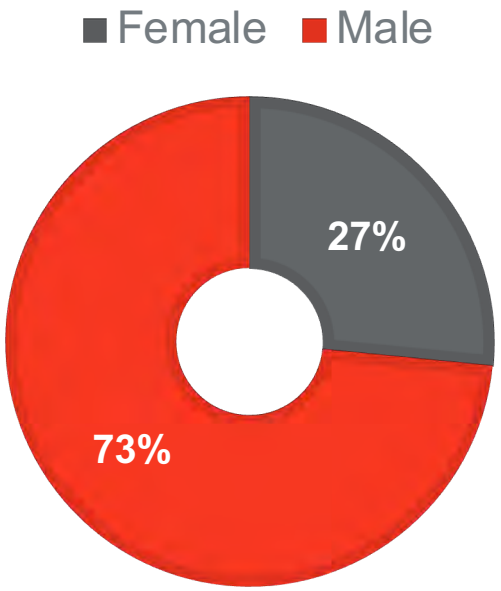
2023-2024 Reboot

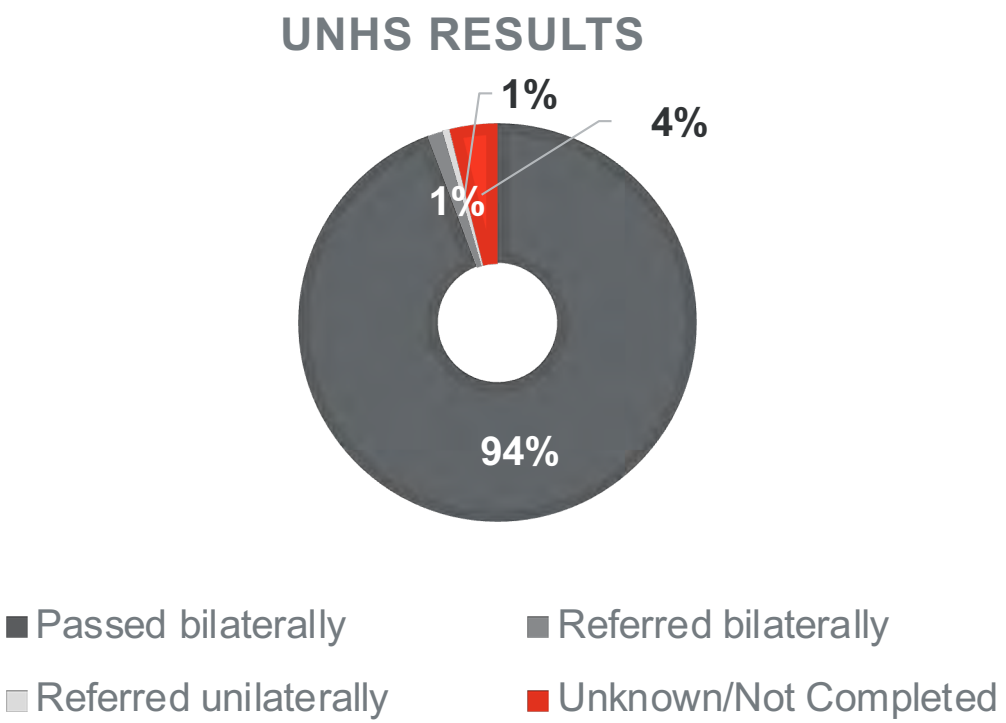
- Presented at ASHA 2023
- Data collection ongoing! (n = 570, age varies)

*Preliminary Data

Demographics

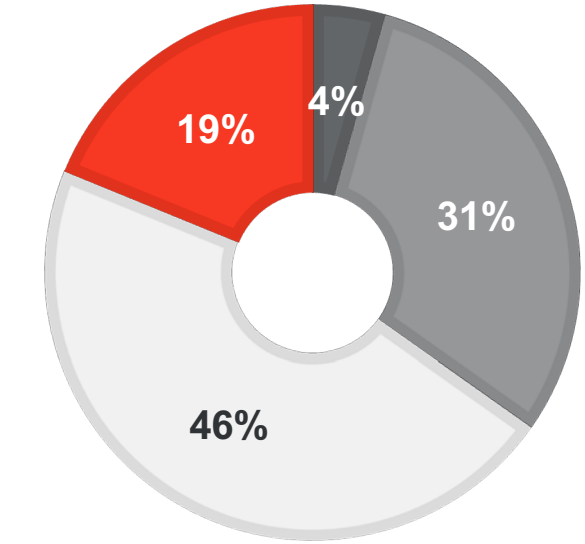
- 388 (68%) children had language or cognitive testing within 6 months of their first audiogram





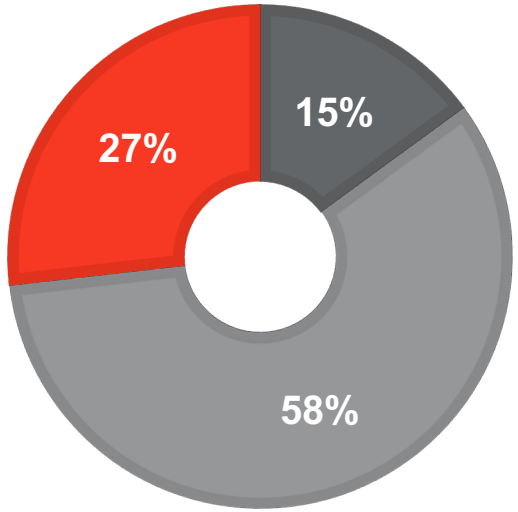
Demographics

LEVEL OF SUPPORT



- 1 (requiring support)
- 2 (requiring substantial support)
- 3 (requiring very substantial support)
- N/A (not in problem list)

DIAGNOSTIC APPROACH



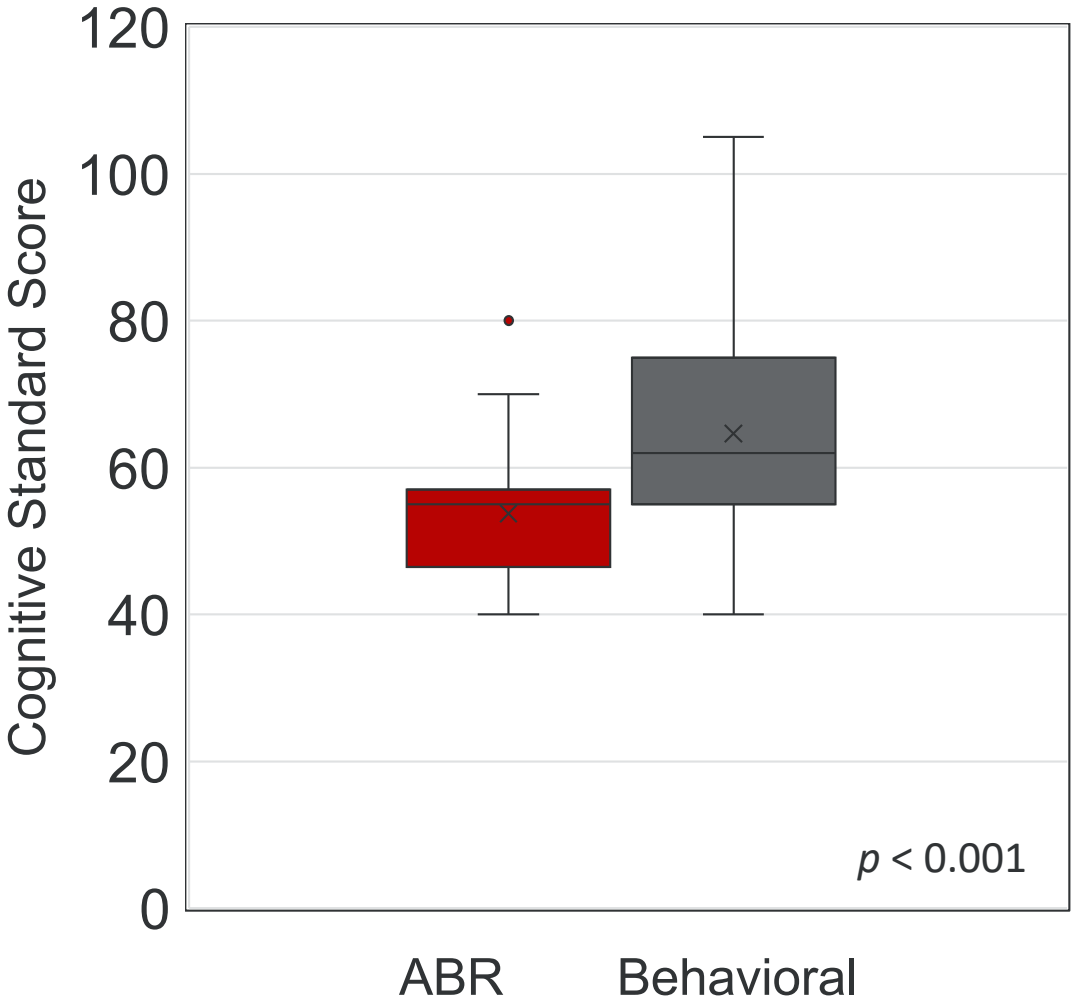
ABR Bx LTFU

Cognitive Testing

285 children with cognitive testing

- 122 (42.8%) BEFORE scheduled audiogram
- 138 with Bayley or DP-4 scores to analyze

- Children with lower cognitive standard scores may require sedated ABR to determine hearing status.



Clinical Application

- Adam - 2 years old
- Audiogram - SF VRA, three frequencies WNL + normal tymps and present DP OAEs bilaterally
- Cognitive evaluation only 6 months later
  - Bayley SS = 85
  - Age-appropriate functioning, + Autism
- Audio f/u recommended

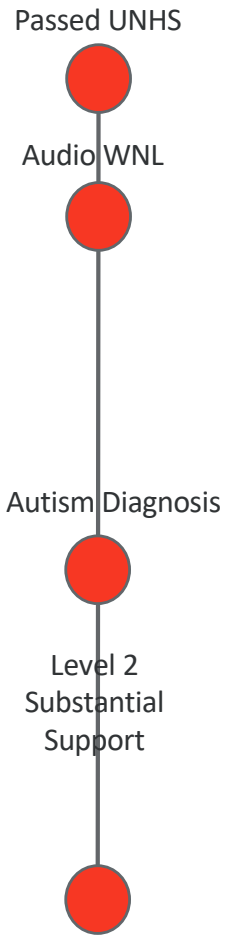


Image: Pixabay

Clinical Application

Passed UNHS

Autism Diagnosis

Level 3 - Very Substantial Support

Audio
2 Months later

1 Month later

1 Month later

- Max - 4 years old
- Full developmental evaluation 2 months prior to audiogram
  - DP-4 SS = 40
  - CNT Language - non-verbal
- Audiograms - 2 VRA team test attempts yielding no results
- ABR was WNL

Image: Pixabay

Clinical Take Aways

- Use all the information you have to support your efforts in this population.
    - If they have a language or cognitive score available in close proximity to your appointment it might help you plan for your testing approach and follow-up plan.
- If there is indication of low cognition and/or low language and you have tried to test hearing twice behaviorally without success, please don't hesitate to refer for sedated ABR!

Thank you!

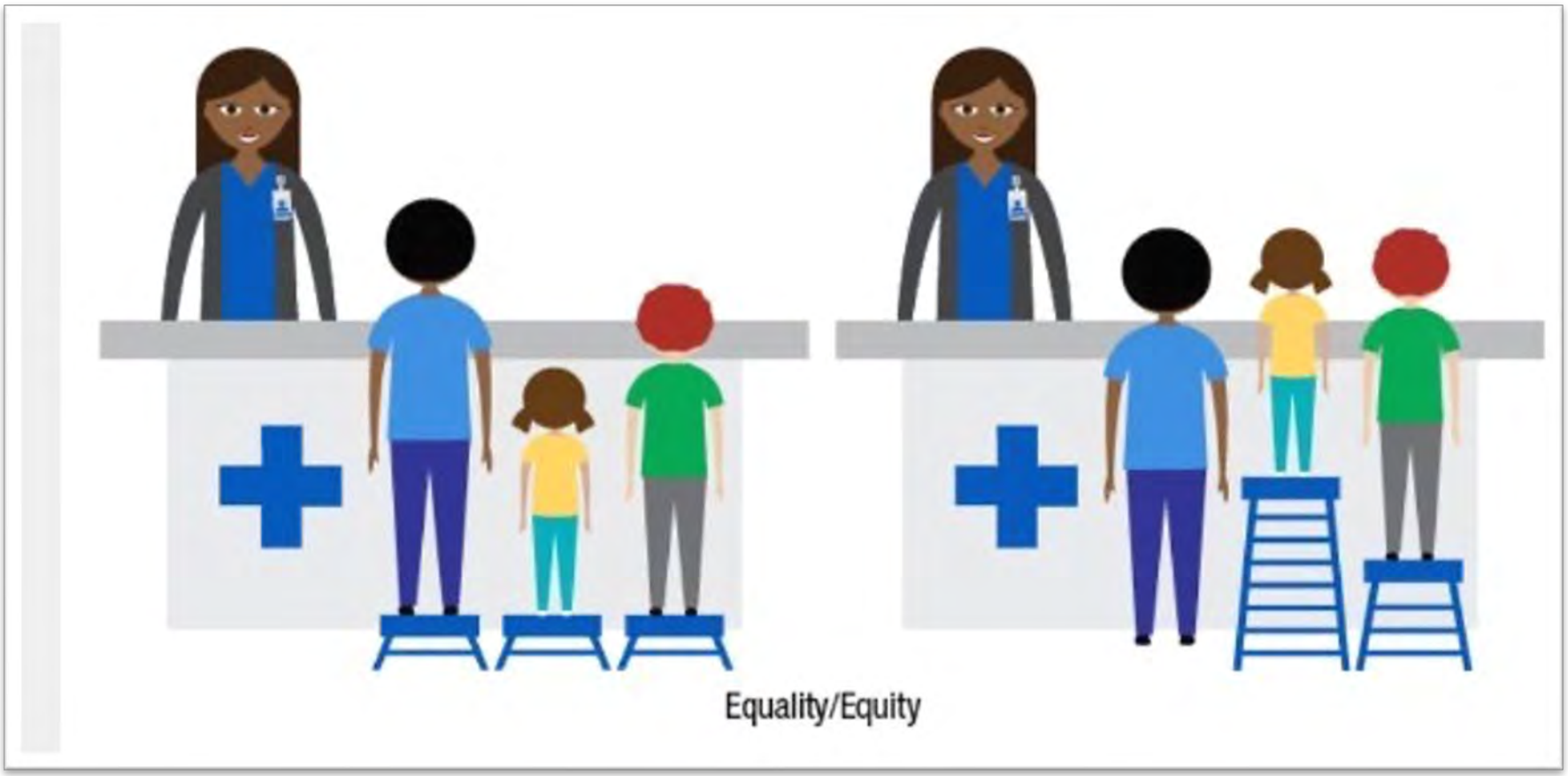
Ursula M. Findlen, PhD

Evaluating the Speech and Language of Bilingual Children who are Deaf/Hard of Hearing; Challenges, Approaches, and Recommendations

Caitlin Cummings, Ph.D., CCC-SLP

Lauren Yoshihiro M.S., CCC-SLP

Diversity, Equity, and Inclusion



Nationwide Children's Hospital. *What is health equity, and why is it so important?* (n.d.).
https://www.nationwidechildrens.org/about-us/collaboratory/addressing-inequities/what-is-health-equity

Hearing Loss + Language Deprivation

- Hearing loss + speech/language + cognitive development
- Poor auditory access = language deprivation
- Need for consistent and intensive intervention

(Arora et al., 2020; Çelik et al., 2021)

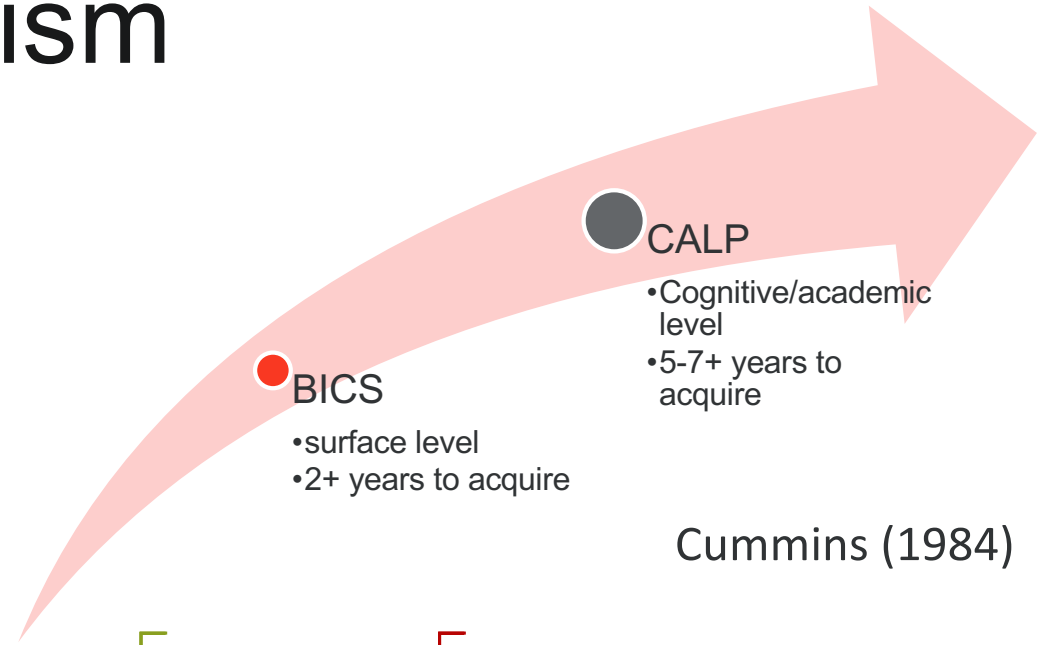
Image: Nationwide Children's Hospital

Bi-/Multi-Lingualism

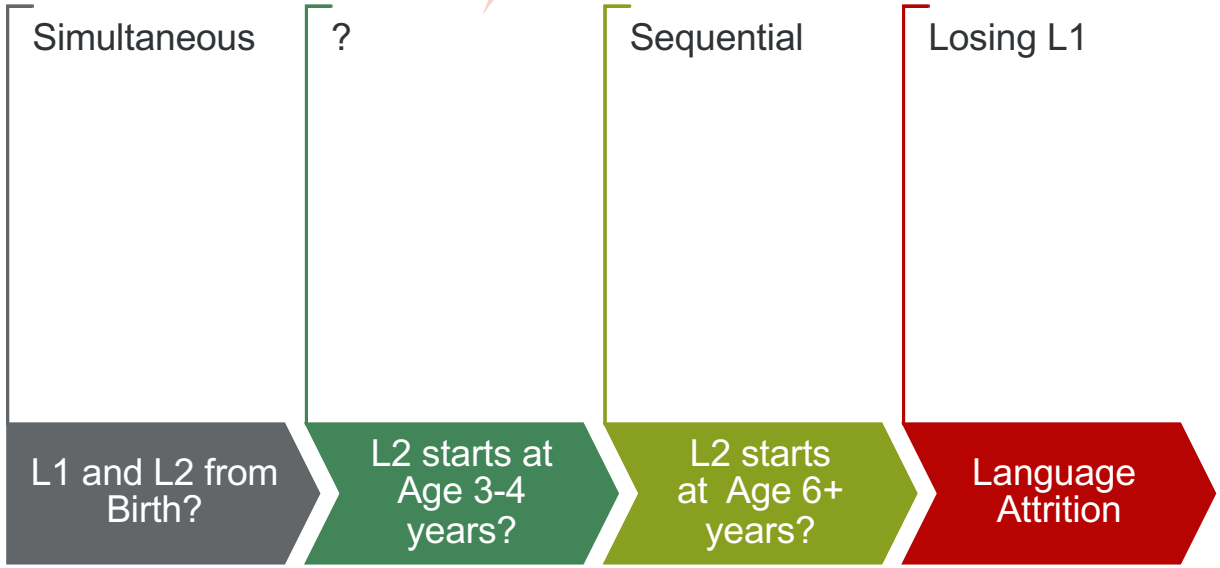
- As of 2021,**~21%** of school aged children in the US speak a language other than English in the home (Childstats.gov).
- By 2030, English learners are estimated to comprise **40%** of the US school-age population.
- More than half of the world's population speak more than one language (Grosjean, 2010; 2013).
- Bilingual children
  - Individuals who receive regular input in two or more languages during the most dynamic period of communication development: somewhere between birth and adolescence (Kohnert, 2010).

Bi-/Multi-Lingualism

Separate but interconnected sound and language systems (*Paradis, Genesee, & Crago, 2011*)



Cummins (1984)



Bilingualism

- Defining the term ***bilingual*** and pinpointing where a child is on the **spectrum of *bilingualism*** can be a complex task.
  - Simultaneous vs. Sequential vs. Second Language Acquisition
  - Who is speaking which languages to the child?
  - When? In what contexts?
  - What are the social and cultural attitudes/ideologies about the language(s)?

Research Findings

DML = d/Deaf and hard of hearing learners who are multilingual

~ 18.4-35% of K-12 learners are DMLs, for teachers of the deaf/Deaf and Hard of hearing (Gallaudet Research Institute, 2013).

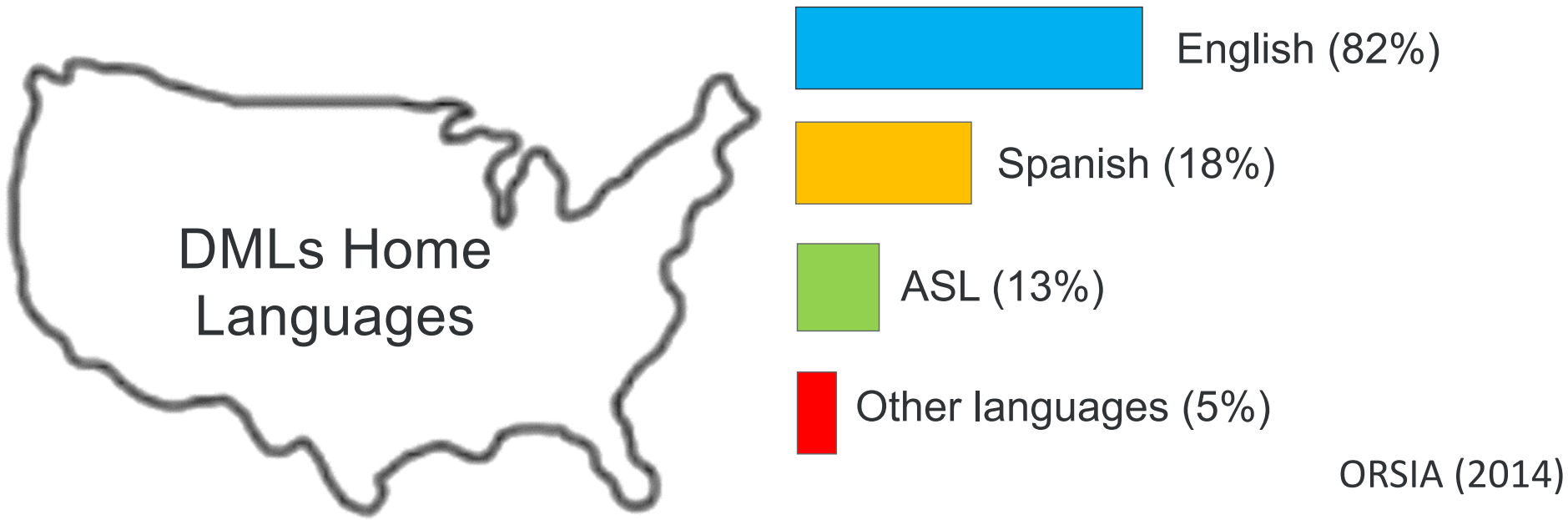
The majority of empirical evidence illustrates that **bilingualism is not detrimental**, in and of itself, to speech/language development – for children with and without true communication impairments (Fabiano-Smith & Goldstein, 2010; Kohnert, 2010), **including DMLs.**

Bunta et al. (2016) Crowe (2018) Sosa & Bunta (2019)

HETEROGENEITY

Research - DMLs

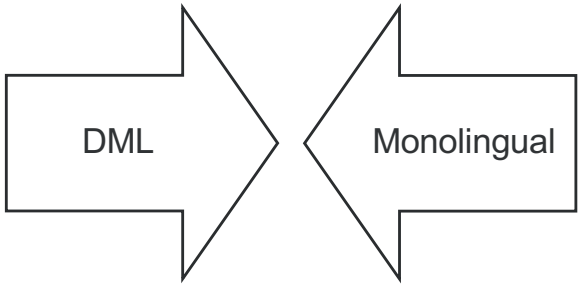
Best practice = Promoting use of the home language(s) and allowing caregivers to choose the language(s) that they want to use with their child (Benítez-Barrera et al., 2023).

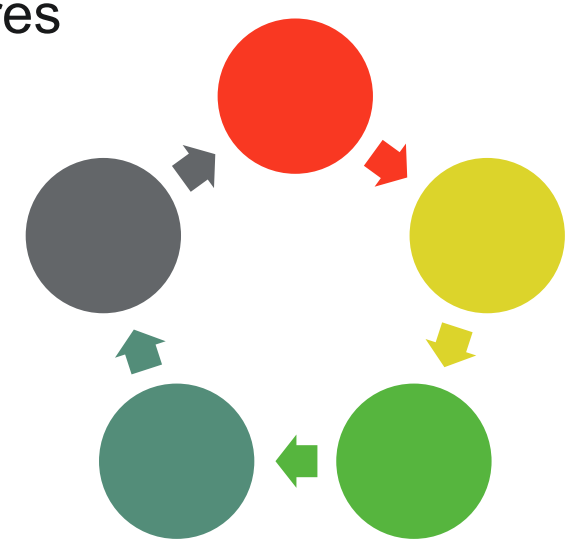


Evaluation Checklist

Being linguistically/culturally responsive = **A MINDSET**
(Cannon & Guardino, 2022; Crowe & Guiberson, 2022).

- Norm-referenced standardized measures
- Criterion-referenced measures
- Language processing measures
- Dynamic Assessment
- Sociocultural approaches





Evaluation Checklist

1. Complete a thorough language background interview

- Who, What, Where, When, Why, How
- Timeline of language(s) exposure and use
- **H**ow many languages - **O**nset – **L**ive/Like -**A**ssessment
- What are the family's multilingualism goals?

Evaluation Checklist

2. What is the DML's Language Profile?

Domain	Definition	L1	L2	ASL	...etc.
Phonology	Sounds	★	★		
Morphology	Word structure	★	★	★	
Syntax	Sentence structure	★	★		
Semantics	Vocabulary	★	★	★	
Pragmatics	Social use	★	★	★	

Evaluation Checklist

3. Use multiple assessments, sources, and approches
   - There are currently no standardized tests for DMLs.
   - ✘ Do not translate one language's test to another
   - ✓ Can select subtests to help structure observation
   - ✓ Language Sample/Play Analysis
   - ✓ Test-Teach-Retest Dynamic Assessment
   - ✓ Gather inventory of breadth and depth of skills

Evaluation Checklist

- Think Holistic Bilingual Abilities - Not "perfect bilingual"
- Think Dynamic - Not Static
- Need to develop and support skilled clinicians

Considerations

- Heterogeneity compounded
- Variables:
  - Degree of HL, age at Dx, amplification, communication mode, education setting, maternal education, maternal education
- For DMLs:
  - Age of exposure to language(s), cognitive skills, family cultural practices, classroom language exposure, quantity and quality of exposure in the home

Situation

- Starting around 2022-2023:
  - Influx of new patients within the United States AND arriving from Spanish-speaking countries
  - Presenting to Hearing Program
  - Undiagnosed/unamplified hearing losses

Demographics

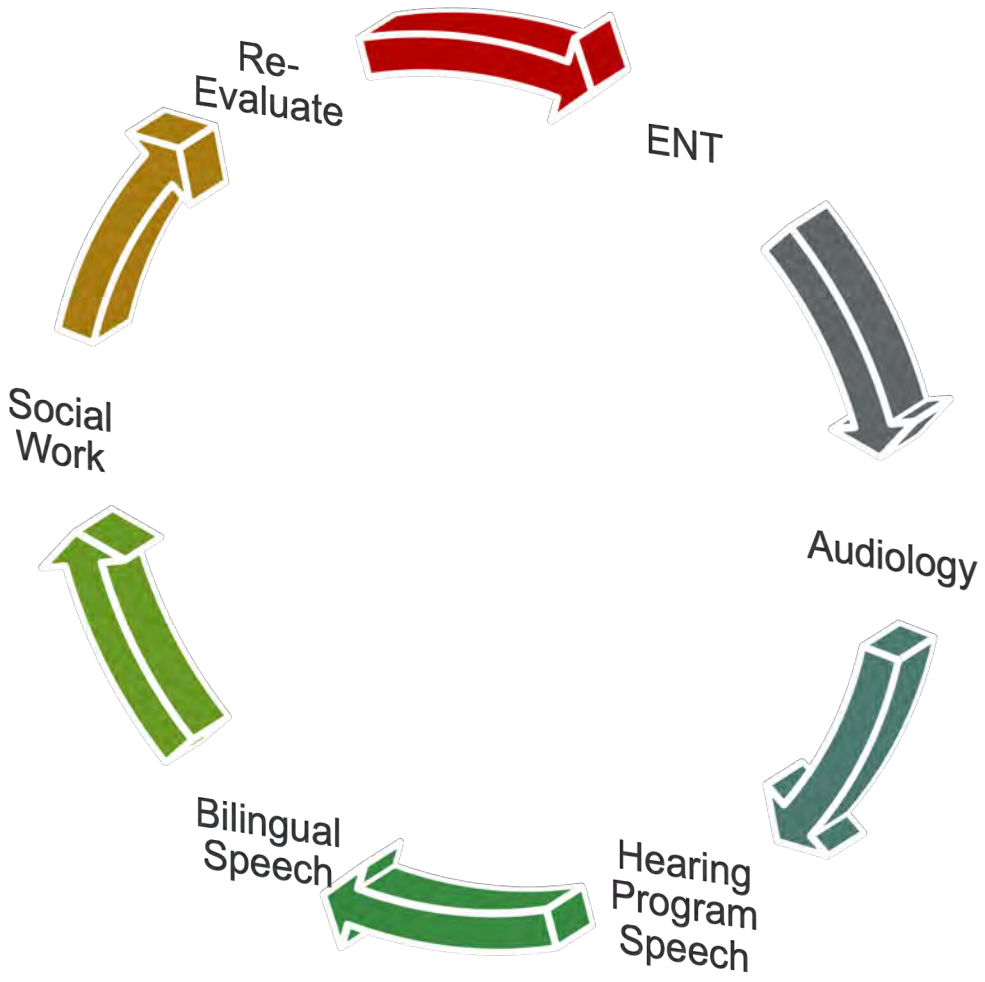
(N = 11)

Demographics

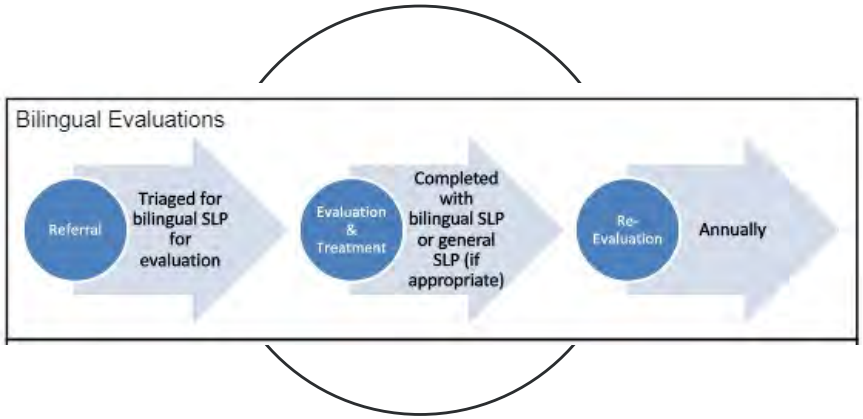
Age	• 2-7 years old • 12 & 23 year olds
Hearing Status	• 9 Sensorineural Hearing Loss (SNHL) • 2 Conductive Hearing Loss
Hearing Amplification	• 8 hearing aid users 1 bimodal patient after evaluation • 1 cochlear implant user (unilateral) • 2 bone anchored hearing aid users
Other Diagnoses	• 6 confirmed/suspected co-morbidities (syndromes, developmental delays, cognitive delays)
Time of Identification of Hearing Loss	• 2 identified at birth • 9 identified later in life/after moving to the United States
Exposure to English	• 8 after school enrollment/moving to the United States • 3 prior to age 2

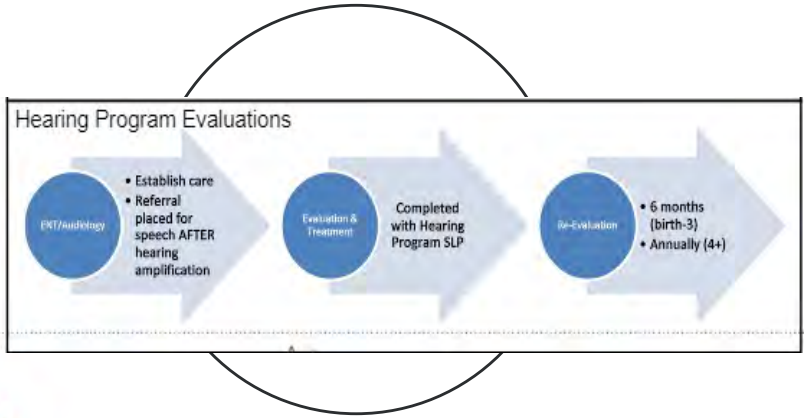
Situation

?


Re-
Evaluate
ENT
Audiology
Hearing
Program
Speech
Bilingual
Speech
Social
Work

New Process





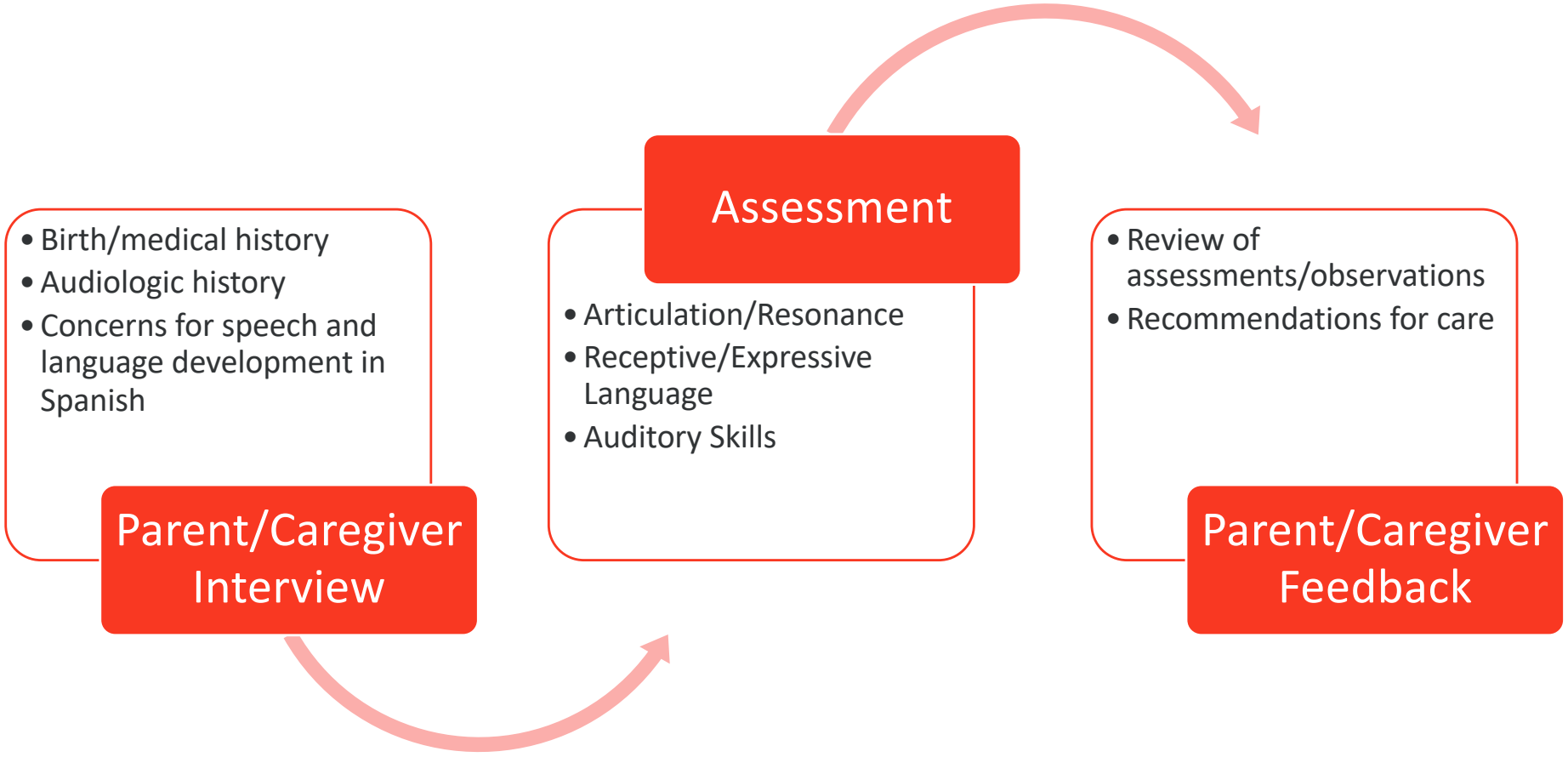
New Dual SLP Specialty Model

Assessment

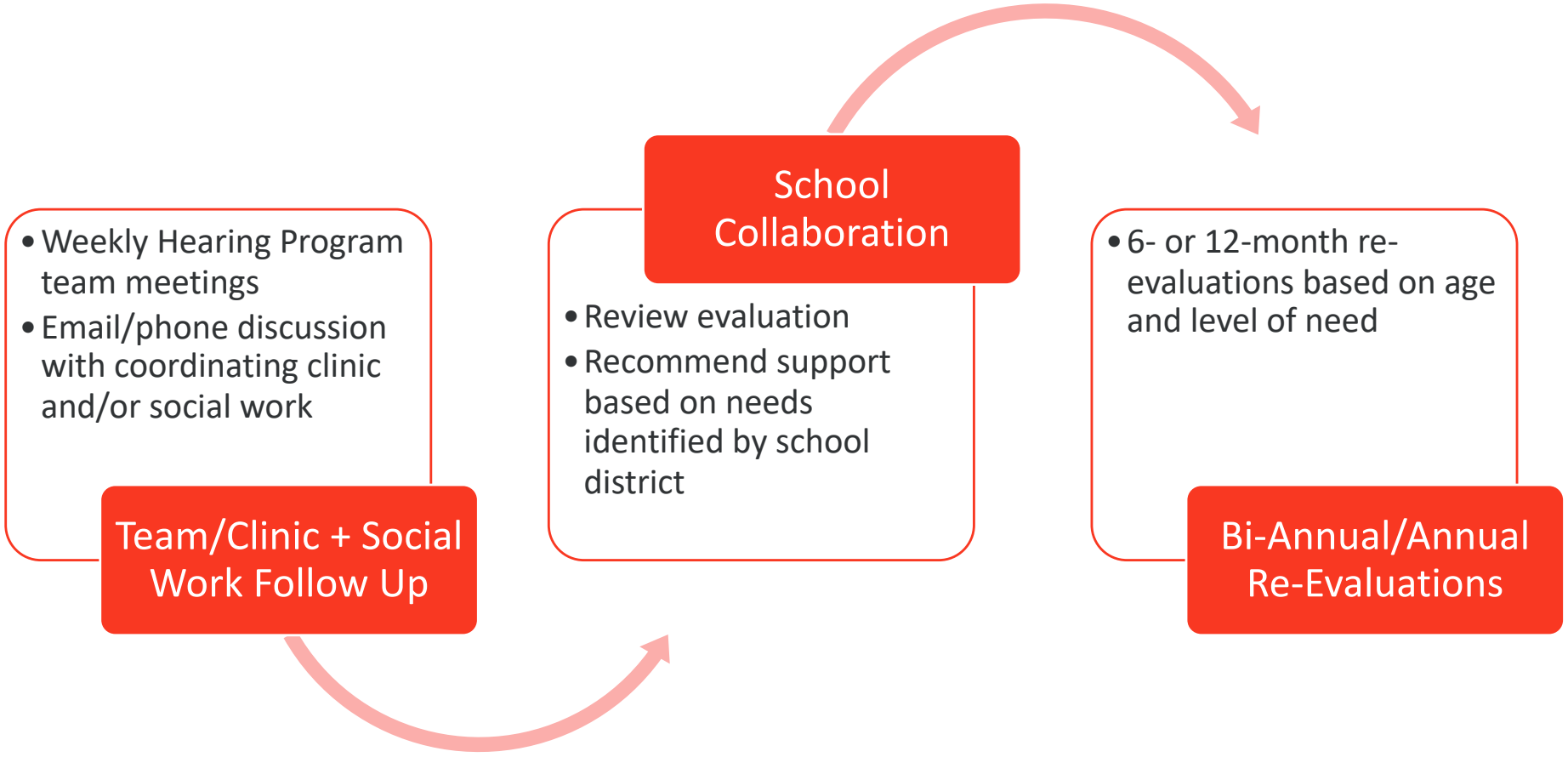
- Evidenced-Based Practice Protocols
  - Bilingual Evaluations + Hearing Program/Total Communication Evaluation

- Dual Evaluation Proposal
  - Bilingual SLP
  - Hearing Program SLP
  - Certified Spanish medical interpreter
  - Social work

Evaluation Process



Post-Evaluation Care



Summary - Disorder

Delay/Disorder/Pathological	Typical/Expected
Deficits present in all languages/modalities	Distributed skills across languages
Slow/limited response to increasing cueing/scaffolding levels	Code-mixing and code-switching
Significant parent concern	Heterogeneous profile
Limited growth when given access to supports/opportunities in all modalities	Poorer academic performance likely to be related to other individual/external factors rather than bilingual exposure itself
Overt disordered speech production, limited vocabulary, ability to communicate independently with a consistent system in their environment	Poorer performance on English standardized tests than would be expected (i.e., not valid)

In Conclusion

- Patients and families who may not have a solely English-monolingual background deserve equitable access.

- We hope to use this experience and initial outcomes to develop a more formalized protocol with data monitoring to provide more detailed and statistical updates, for future presentations and trainings.

(Muñoz, et al., 2023)

Brief - Interaction - Debrief (BID)

Common recommendations for the speech-language pathology field, and medical field in general:

Clinician meets with interpreter beforehand away from family.

Clinician introduces self, profession, role, and **goals of the session**.

Request that everything be interpreted during the session.

Clinician and interpreter work together as a team with family.

Make eye contact and address the family/child directly when talking to them.

Use first person language ("Do you have any questions?" NOT → "Ask Mrs. X if she has any questions")

Clinician should moderate the length of utterances and rate and speak in manageable phrases, pausing throughout to allow interpreter to interpret.

Clinician and interpreter touch base briefly away from family.

-How did that go?
-Was there any miscommunication that I was not aware of?

Langdon, 2002

Thank you!

Caitlin Cummings, Ph.D., CCC-SLP

Lauren Yoshihiro M.S., CCC-SLP

Thank you!
Nationwide Children's Hospital

Gina M. Hounam, PhD
Holly T. Gerth, AuD
Lauren Durinka, AuD
Christine Schafer, AuD
Alecia Jayne, AuD, CCC-A
Ursula M. Findlen, PhD
Caitlin Cummings, PhD, CCC-SLP
Lauren Y. Yoshihiro, MS, CCC-SLP

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