

# Current Management Trends for Minimum/Mild Hearing Loss in Children

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# Background

- Good consensus on the benefits of amplification for children with moderate or worse bilateral hearing loss
- Protocols are less well-established for other groups of children
  - Auditory Neuropathy Spectrum Disorder
  - Minimal/mild bilateral
  - Unilateral
- This presentation will focus on minimal/mild bilateral (MBHL)

# Management of UHL in Children

- Cincinnati Children's Hospital
  - Best Evidence Statement
  - August 2009
- School-age children with any degree of unilateral SNHL
  - Excludes children with conductive loss
- Provides technology decision support based on degree of hearing loss

<http://www.cincinnatichildrens.org/assets/o/78/1067/2709/2777/2793/9198/d385a2a5-e6d6-4181-a9df-f84ebd338c31.pdf>

# FM System Recommendations

- AAA Clinical Practice Guidelines for Remote Microphone Assistance Technologies for Children and Youth from Birth to 21 years, 2008
- FM Technology Presentations
  - Imran Mulla
  - Jace Wolfe

# Current Definitions of Minimal/Mild Hearing Loss

Bess et al., 1998 → National Workshop Proceedings, 2005

Type of Hearing Loss	Definition
Permanent Mild Bilateral	Pure tone average (0.5, 1, 2 kHz) between 20 & 40 dB HL
Permanent High Frequency	Pure tone thresholds > 25 dB HL at 2 or more frequencies above 2 kHz
Permanent Unilateral	Pure tone average (0.5, 1, 2 kHz) $\geq$ 20 dB HL or Thresholds > 25 dB HL at two or more frequencies above 2 kHz in the affected ear


# Prevalence

- ~ 1/1000 in the newborn period (Prieve et al., 2000)
- ~3/100 in the school-age population (Bess et al., 1998)
- There are ~2.7 million children in the U.S. age 6-16 with unilateral or slight/mild bilateral hearing loss
  - Ross, 2005

# Consequences of UHL/MBHL

- A significant portion of children with permanent UHL/MBHL have been found to demonstrate difficulties observed
  - In academic settings
  - Under laboratory conditions
  - By parents and teachers
  - By the children themselves

Bess & Tharpe, 1986; Oyler & Matkin, 1987; Jensen, 1988; Bovo et al, 1988; Bess et al., 1998; Most, 2004; Lieu 2004; Wake et al., 2004; Yoshinaga-Itano et al, 2008; Briggs et al, 2011



*“...a growing body of scientific-based research exists to support the premise that UHL/MBHL can indeed compromise social and emotional behaviours, success in school, and ultimately, life learning.”*

*Porter & Bess, 2010*

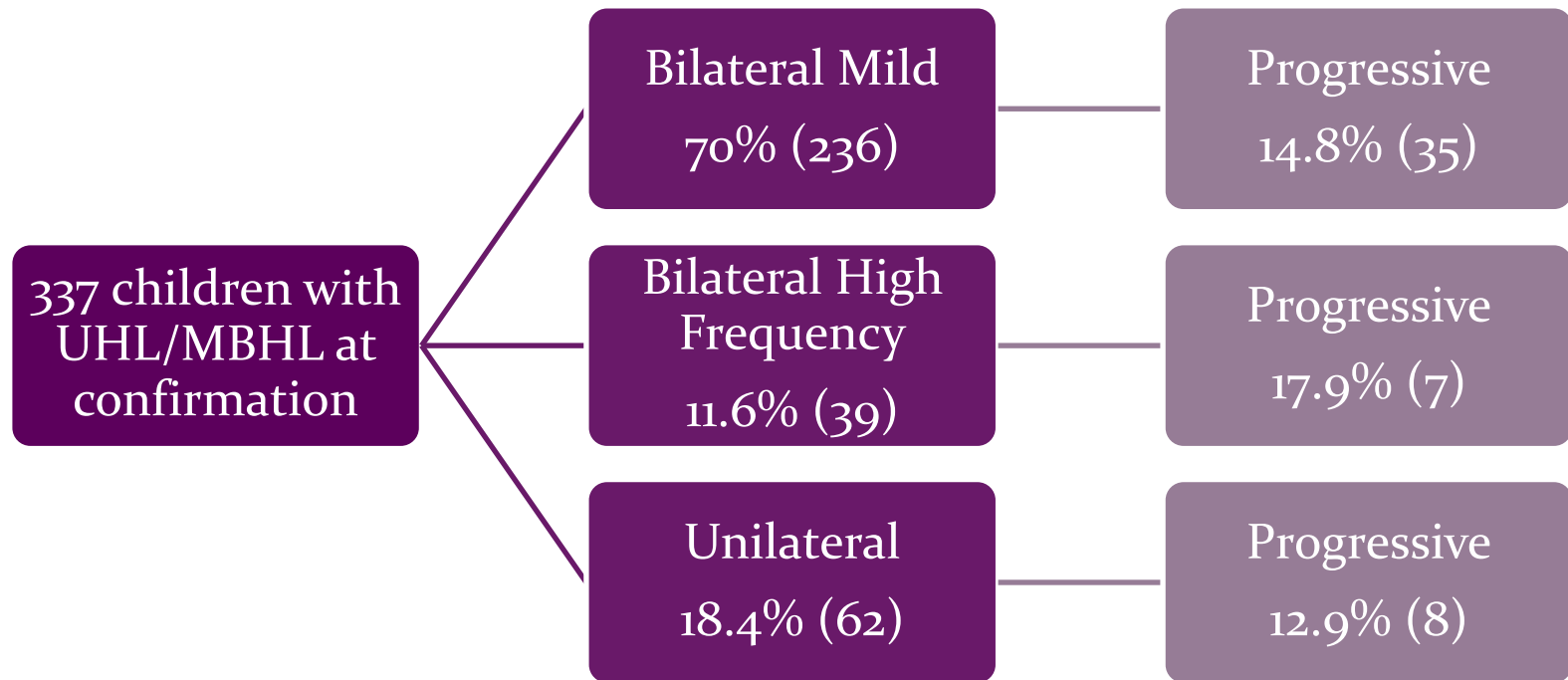


# Early Intervention

- Research suggests that in some cases, children with UHL/MBHL may have poorer outcomes than children with more severe hearing losses
  - Children with more severe losses were identified earlier and received more services (Most, 2006)
- Consensus for children with UHL/MBHL to receive early intervention services
  - National Workshop on Mild and Unilateral Hearing Loss, 2005
  - Joint Committee on Infant Hearing, 2007, 2013
- Goals are to monitor audiometric thresholds and developmental progress
  - Children with MHL are at risk for developing greater degrees of loss

# Percentage of Progressive Hearing Loss

Fitzpatrick, Whittingham & Durieux-Smith, 2013



# Candidacy for Amplification

- Children with MBHL should be considered candidates for some form of amplification
  - Hearing aids
  - Personal FM system
  - Sound field FM system
  - Cochlear implant
- Consider on a case-by-case basis
  - AAA, 2013; OIHP, 2010
- Counseling and continued follow-up are critical

# Factors to Consider

- Audiological
  - Developmental
  - Communication
  - Educational
  - Parental preference
  - Child preference
- 
- More specific recommendations do not exist because there is no evidence to support amplification for *all* children with MBHL

# Amplification Recommendation

Fitzpatrick, Whittingham & Durieux-Smith, 2013

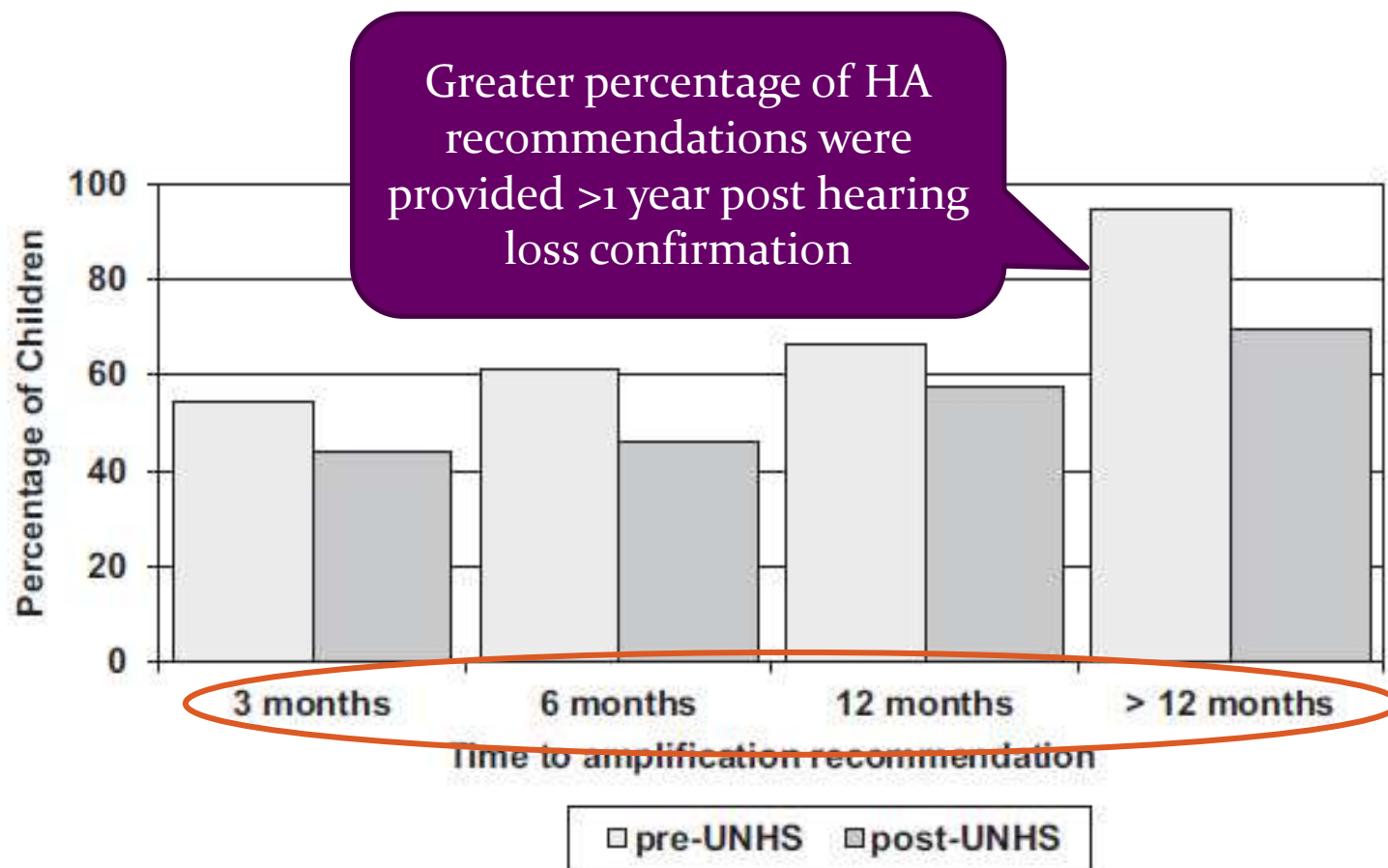


Fig. 6. Cumulative percentage of pre- and post-UNHS children with amplification recommended within 3 to >12 months after identification. UNHS indicates universal newborn hearing screening program.

# Uptake of Amplification

- Of the ~90% of children with HA or FM amplification, 65 - 70% used it consistently or at school only
  - No variation in uptake between hearing loss groups
- Davis et al, 2001 study:
  - <50% of children with mild bilateral or unilateral loss

- Fitzpatrick, Durieux-Smith, Whittingham, 2010

- Fitzpatrick, Whittingham, Durieux-Smith, 2013

# Understanding Clinical Decisions

- Continued uncertainty despite early identification
- More comfortable amplifying when the child is older
- Would like more information about the impact of the hearing loss on the child's overall functioning at school age
- Uncertainty about whether to aid very young infants
- Difficult to achieve open fittings on small ear canal size and noise floor potentially masking speech sounds

# Reason for Delay in Recommendation

- There is considerable uncertainty related to clinical recommendations for amplification for children with mild bilateral and unilateral hearing loss
- Impact of parental indecision unknown, however provider uncertainty may have affected parents' understanding of potential benefits of amplification

- Fitzpatrick, Durieux-Smith, Whittingham, 2010  
- Fitzpatrick, Whittingham, Durieux-Smith, 2013



# Role of Child & Family

- Children may reject amplification
- Family unable to support consistent hearing aid use
- Family not convinced of benefit of hearing aid(s)

~ JCIH, 2013; McKay et al., 2008;  
Moeller, Hoover, Peterson, Stelmachowicz, 2009

# Further Research & Education

- Need more information about the impact of amplification in the early years
- Continuing education for clinicians on how to make decisions about the management of children with MBHL

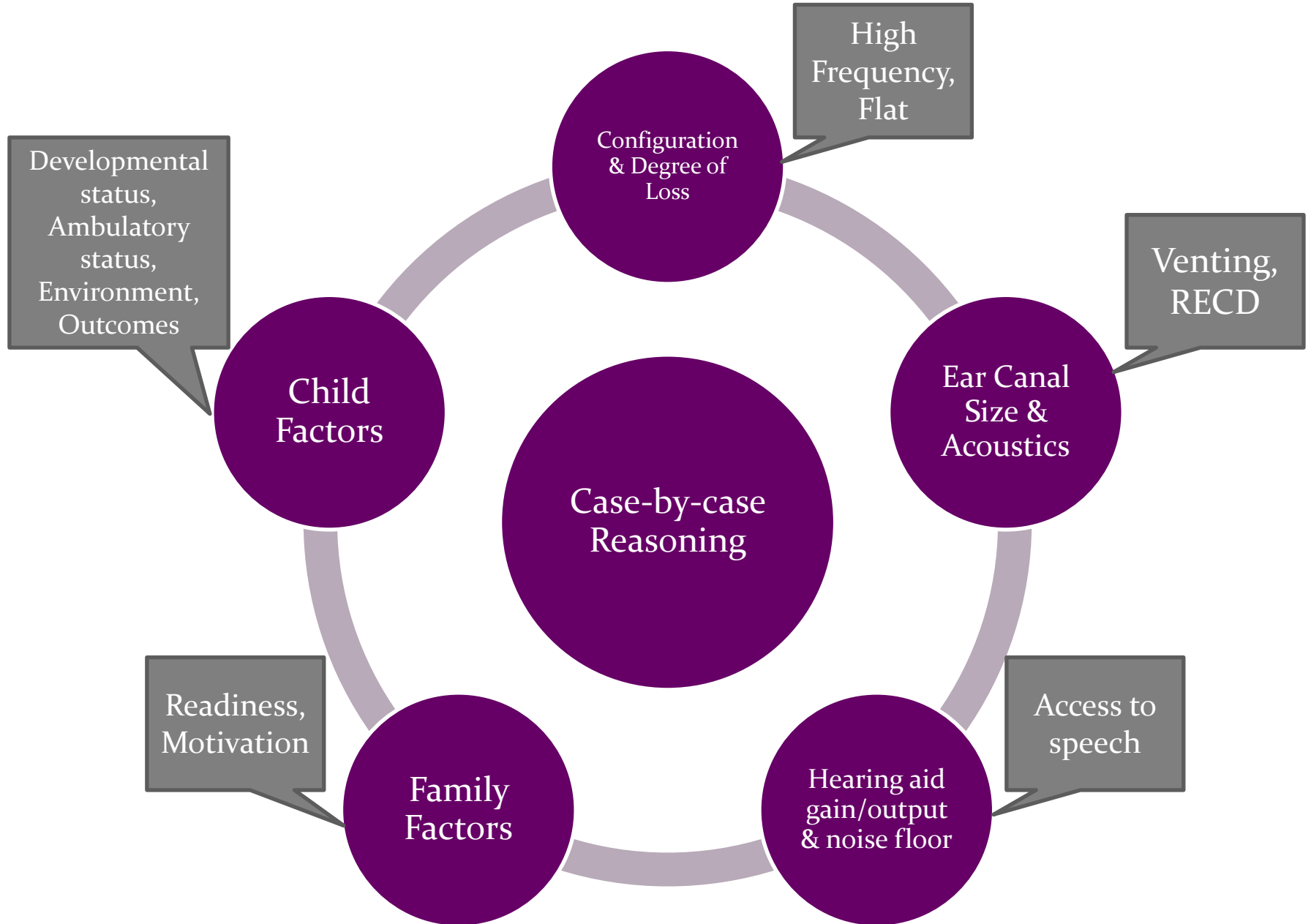


# **Proposed Hearing Technology Guide for Infants and Children with Minimal/Mild Bilateral Hearing Loss**

# Rationale

- Decision aid in the form of flow charts which describe a process to help clinicians decide which infant or child with MBHL would potentially benefit from amplification
- Intended to facilitate appropriate case-by-case reasoning when selecting amplification for this population
  - Highlights factors to consider
- Work in progress that has been vetted by pediatric audiologists
  - Will continue to evolve as more input is gathered

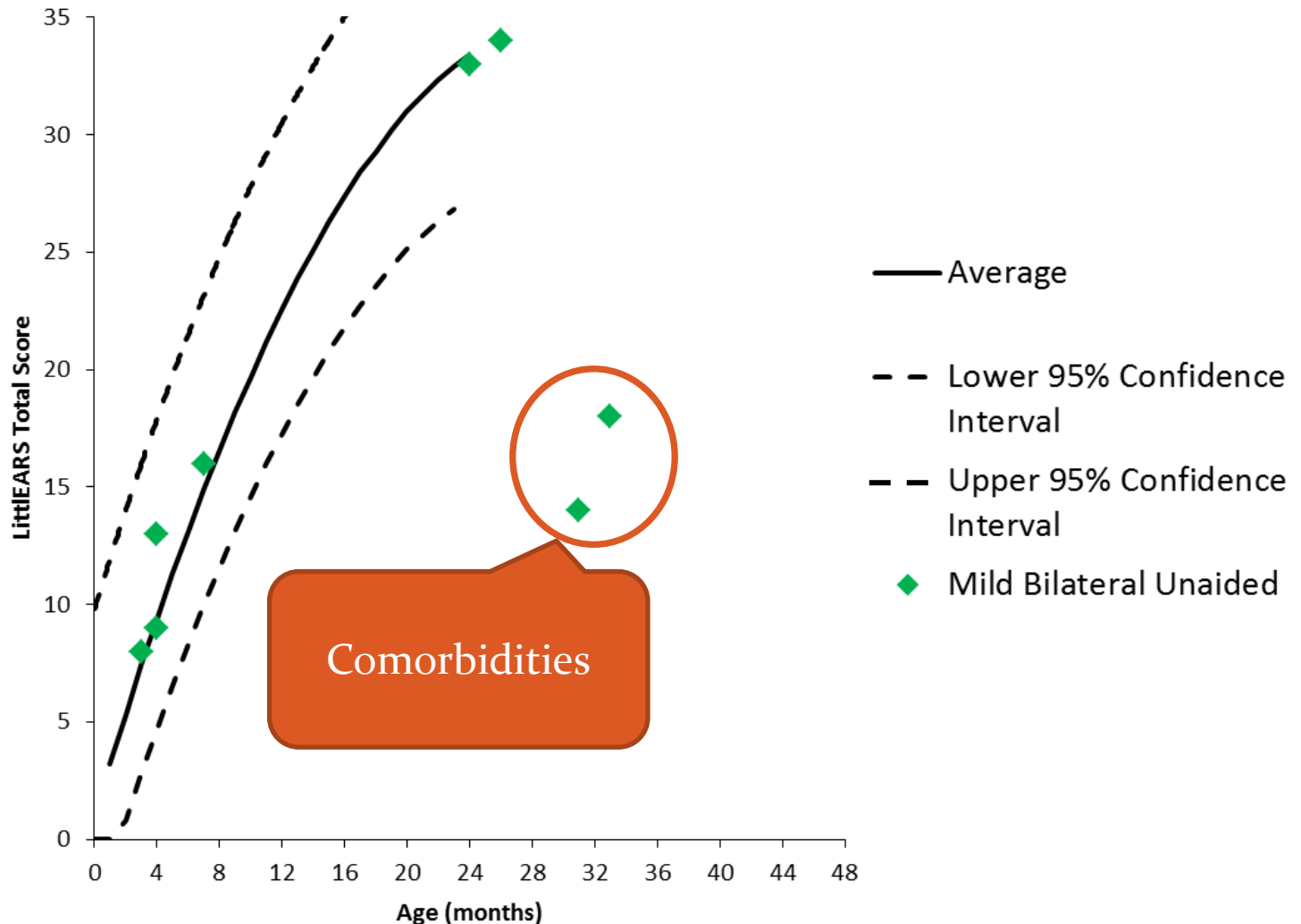
# Factors Considered



# Auditory Development Outcomes

Child  
Factors

Family  
Factors

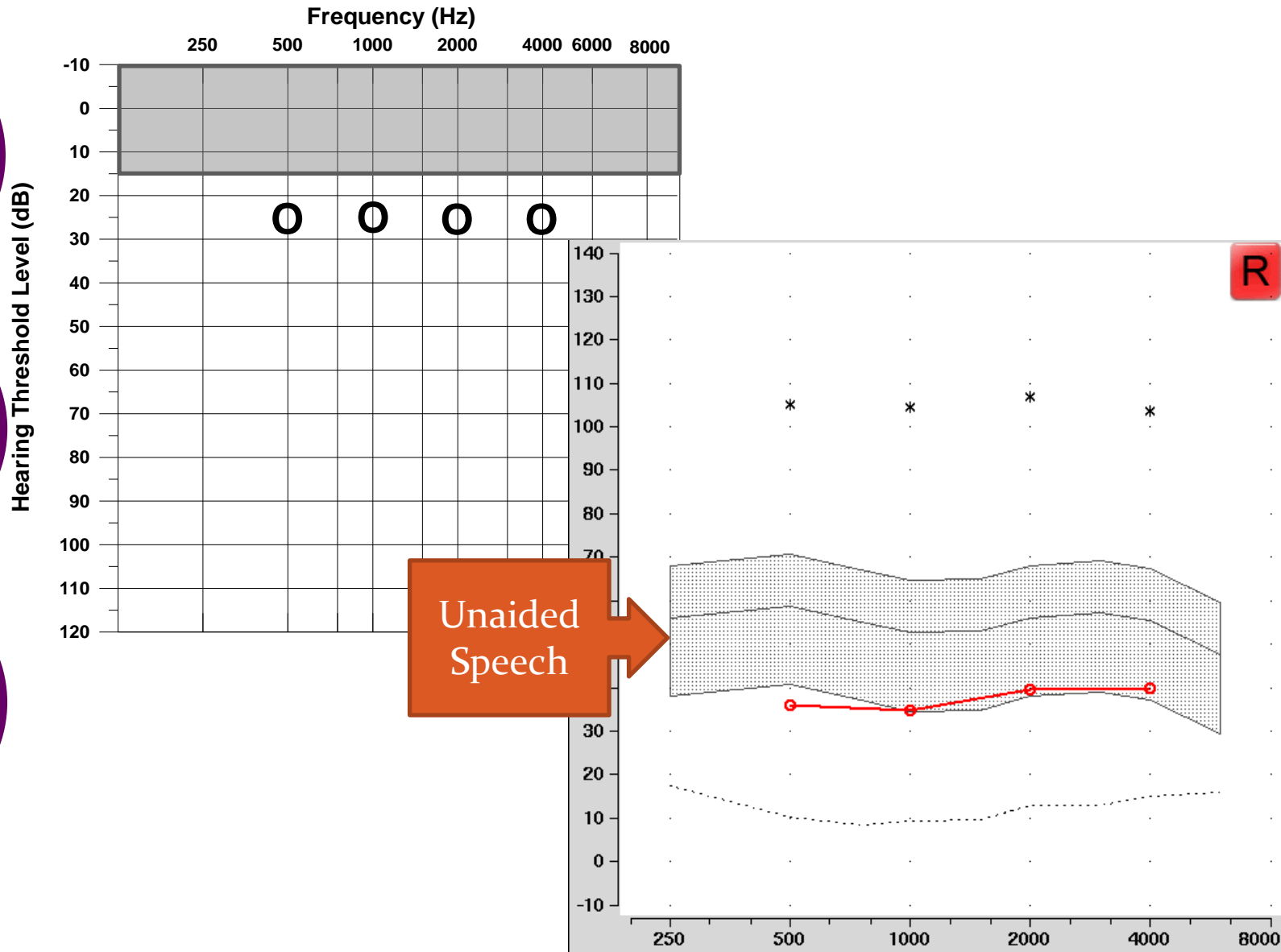


# Flat 25 dB HL

Configuration  
& Degree of  
Loss

Ear Canal  
Size &  
Acoustics

Hearing aid  
gain/output  
& noise floor

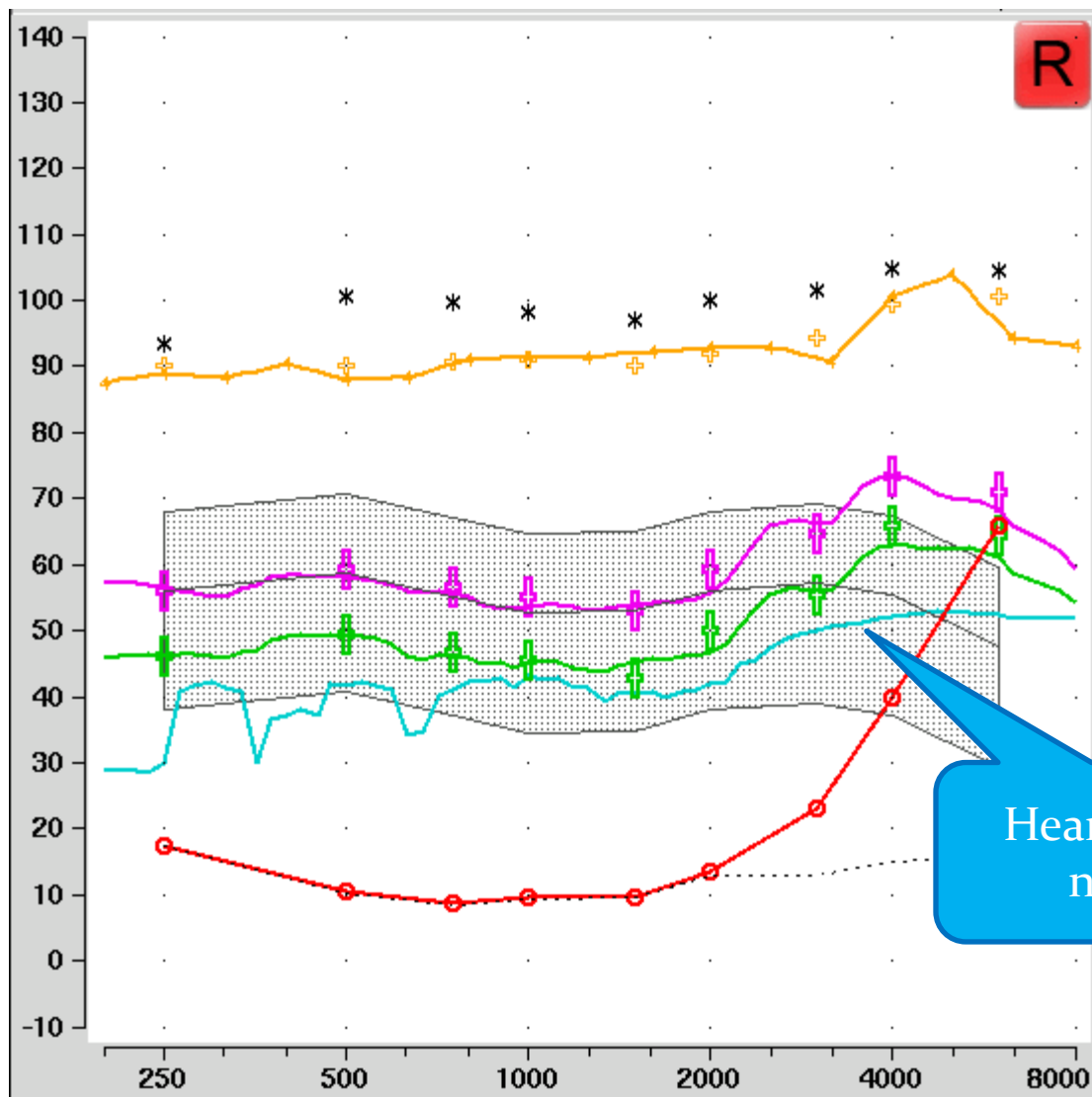


# High Frequency Hearing Loss

Configuration  
& Degree of  
Loss

Ear Canal  
Size &  
Acoustics

Hearing aid  
gain/output  
& noise floor

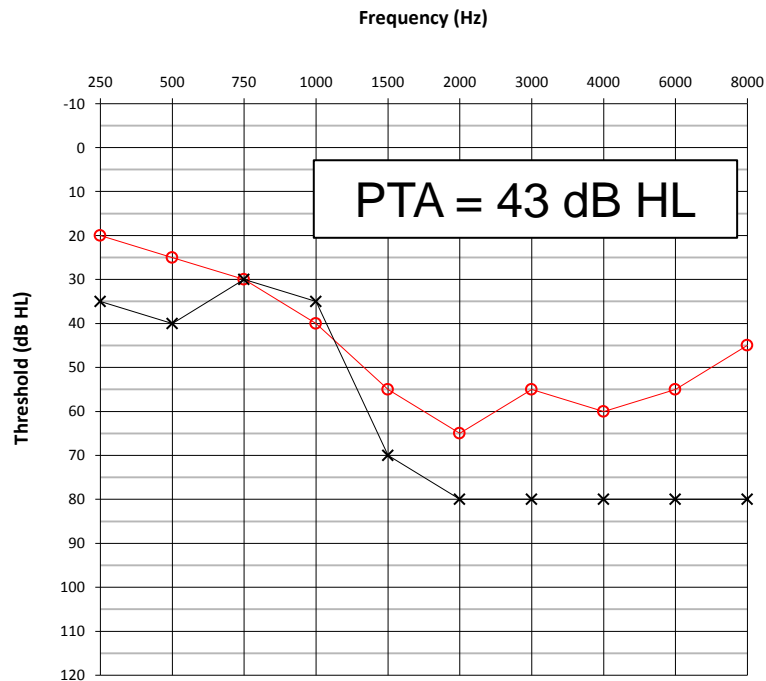


SII Unaided  
= 89%  
SII Aided  
= 94%

Hearing aid  
noise

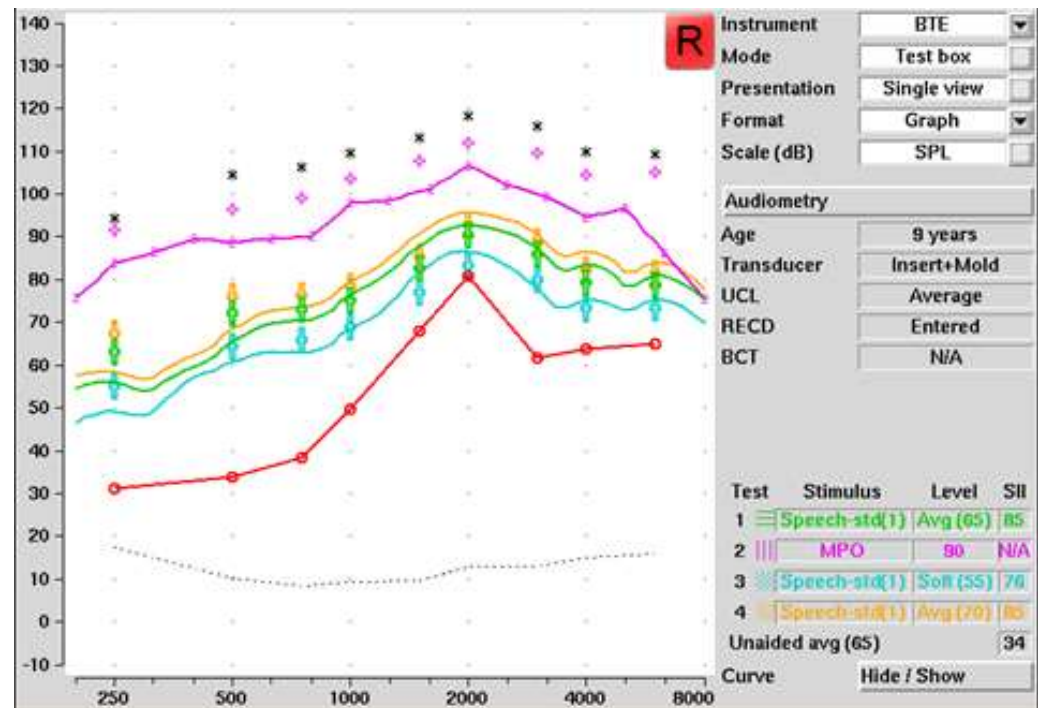


# Case Example

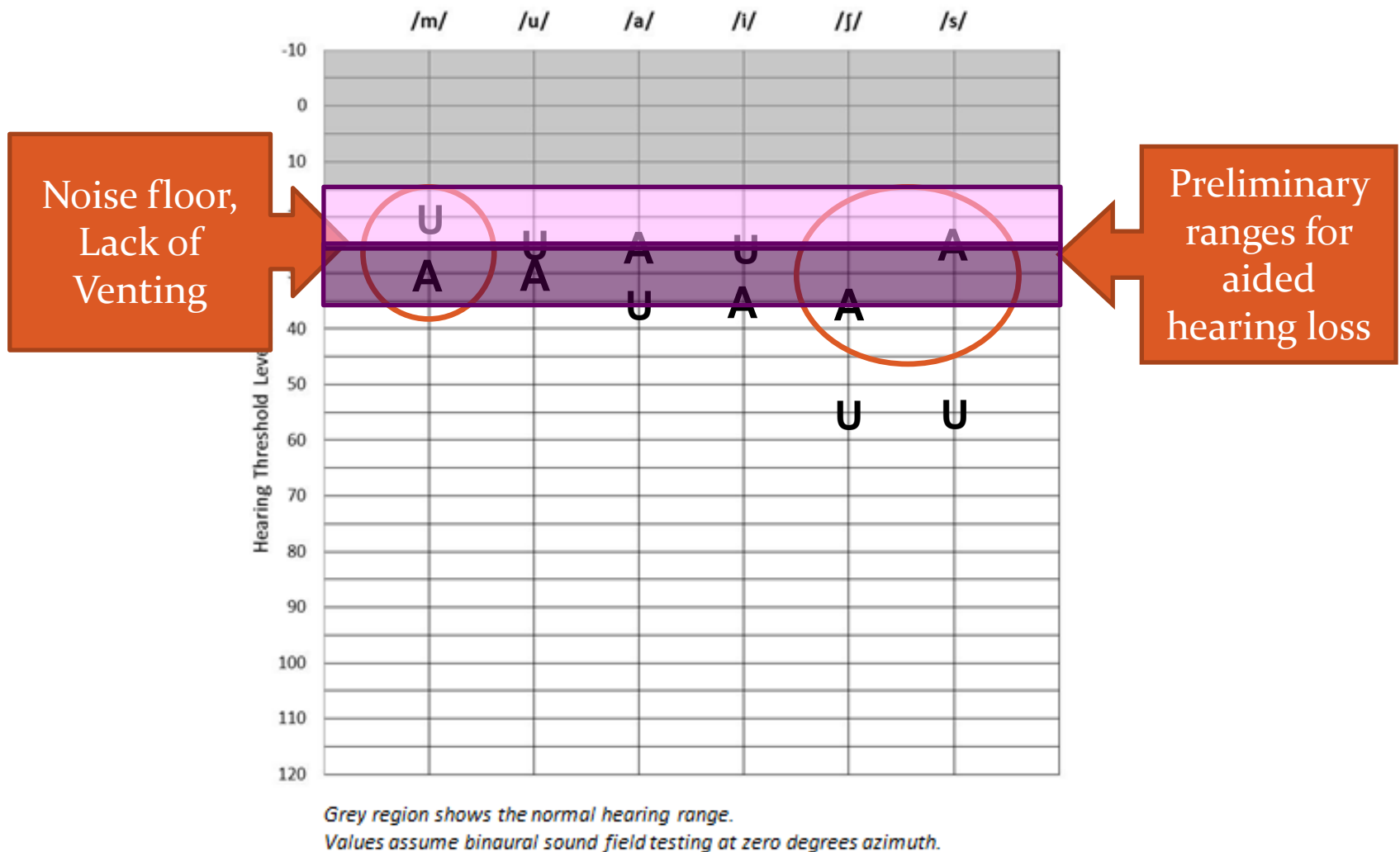


9 years old;  
Earmolds cannot  
accommodate venting

*Acknowledgement:*  
Frances Richert, Western University



# Ling 6 (HL)



# Case Example Summary

Configuration  
& Degree of  
Loss

Ear Canal  
Size &  
Acoustics

Hearing aid  
gain/output  
& noise floor

- Noise floor from hearing aid may be causing better unaided versus aided score for /m/ detection
  - With venting, may see improved performance
- Detriment in low frequencies smaller than aided benefit in the high frequencies
- Important to use outcome measures to determine management decisions as well as illustrate aided benefit to parents

Child  
Factors

Family  
Factors

# Access to Speech

Hearing aid  
gain/output  
& noise floor

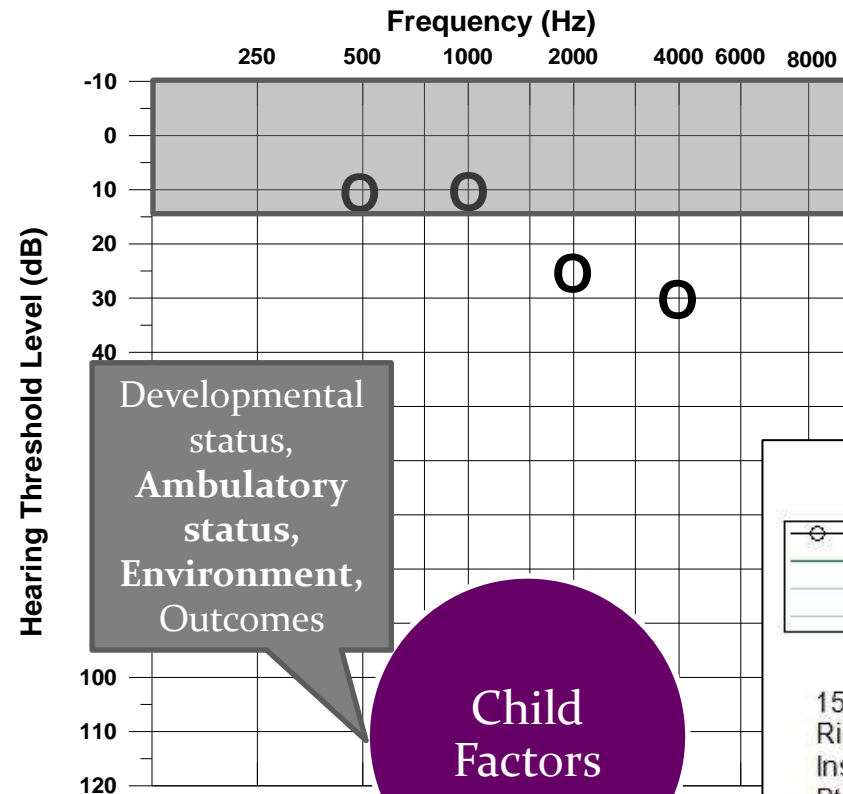
- Speech audibility may be improved for some children with MBHL without hearing aids by:
  - Increasing vocal effort of talker
  - Decreasing distance from speaker to listener
  - Reducing background noise

Child  
Factors

Developmental  
status,  
Ambulatory  
status,  
Environment,  
Outcomes

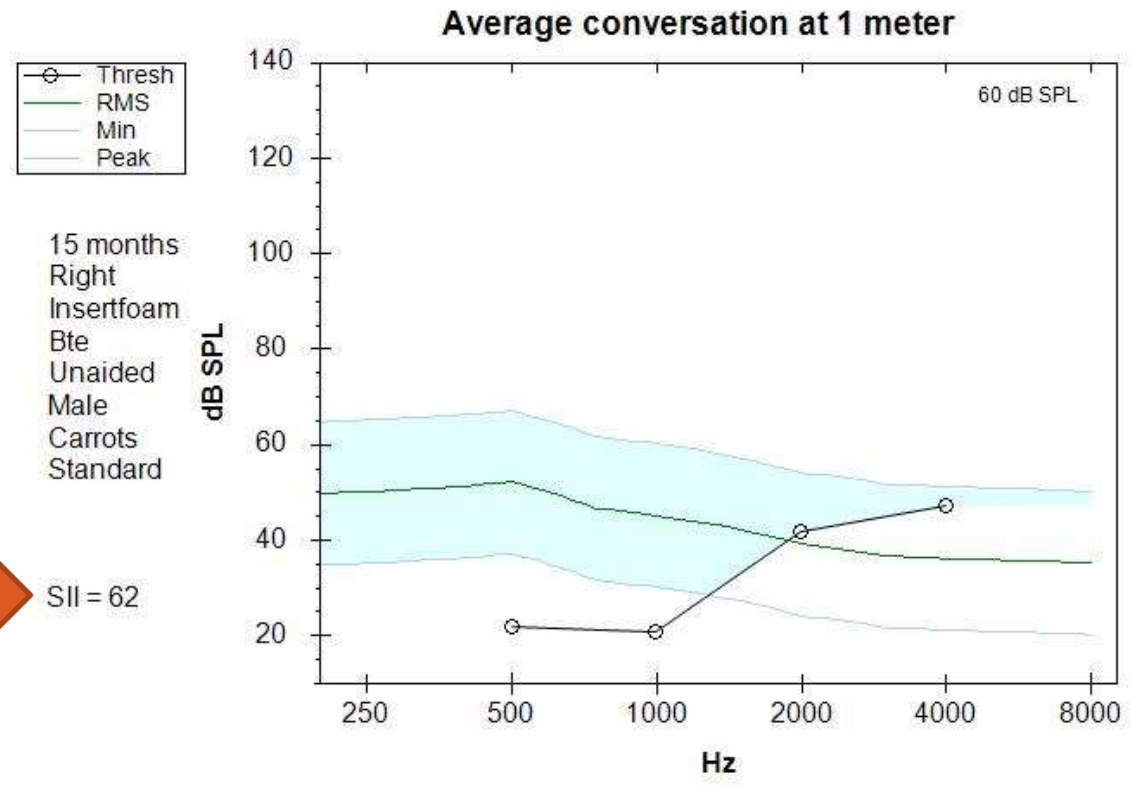
# Situational Hearing Aid Response Profile (SHARP)

Brennan, Lewis, McCreery,  
Creutz & Stelmachowicz, 2013  
[audres.org/rc/sharp](http://audres.org/rc/sharp)



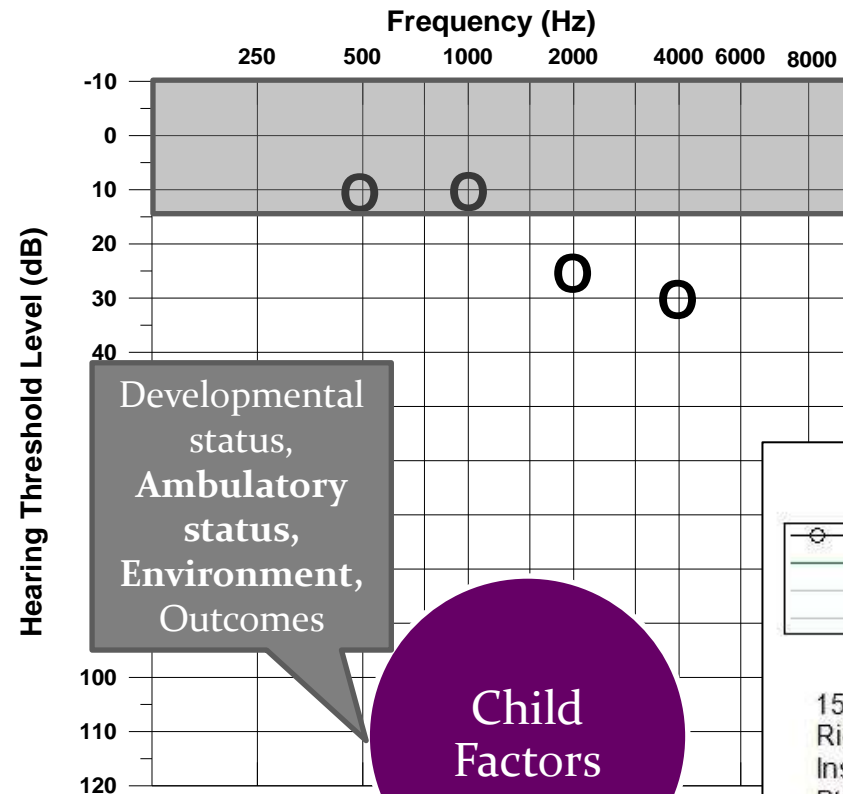
SII = 62

SII = 62



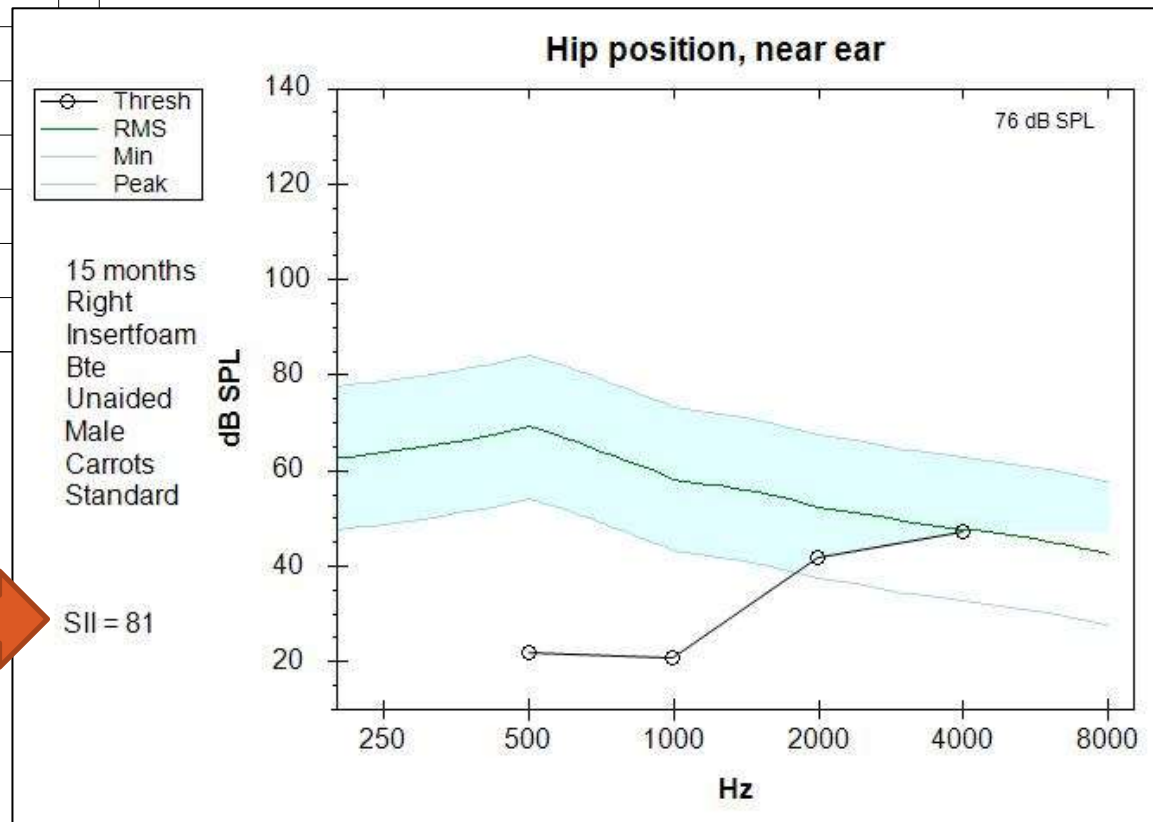
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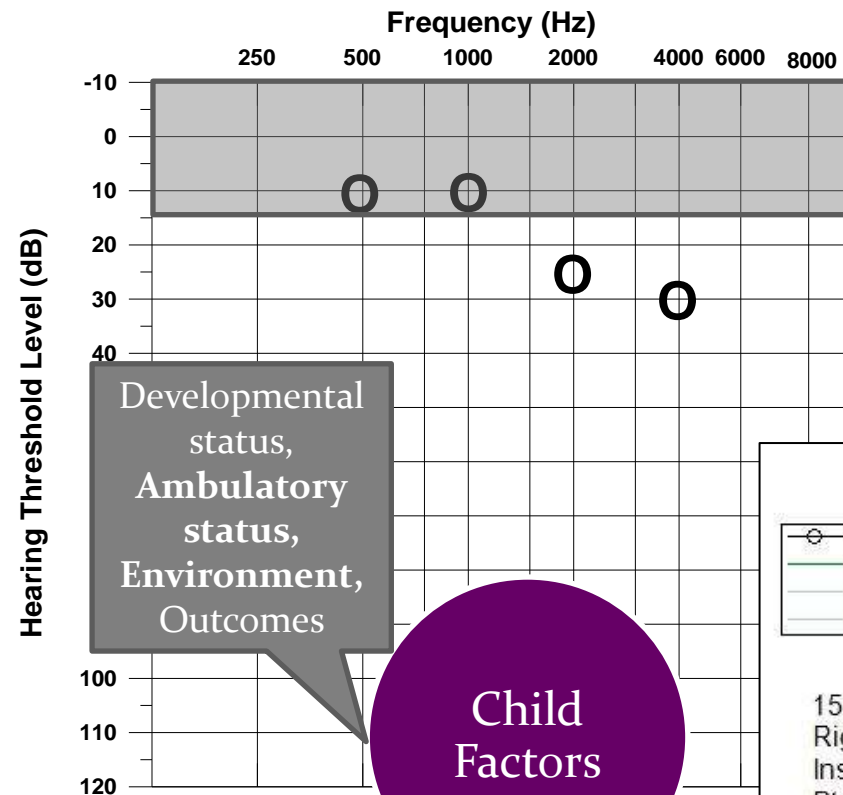
Child  
Factors

SII = 81



# Situational Hearing Aid Response Profile (SHARP)

Brennan, Lewis, McCreery,  
Creutz & Stelmachowicz, 2013  
[audres.org/rc/sharp](http://audres.org/rc/sharp)

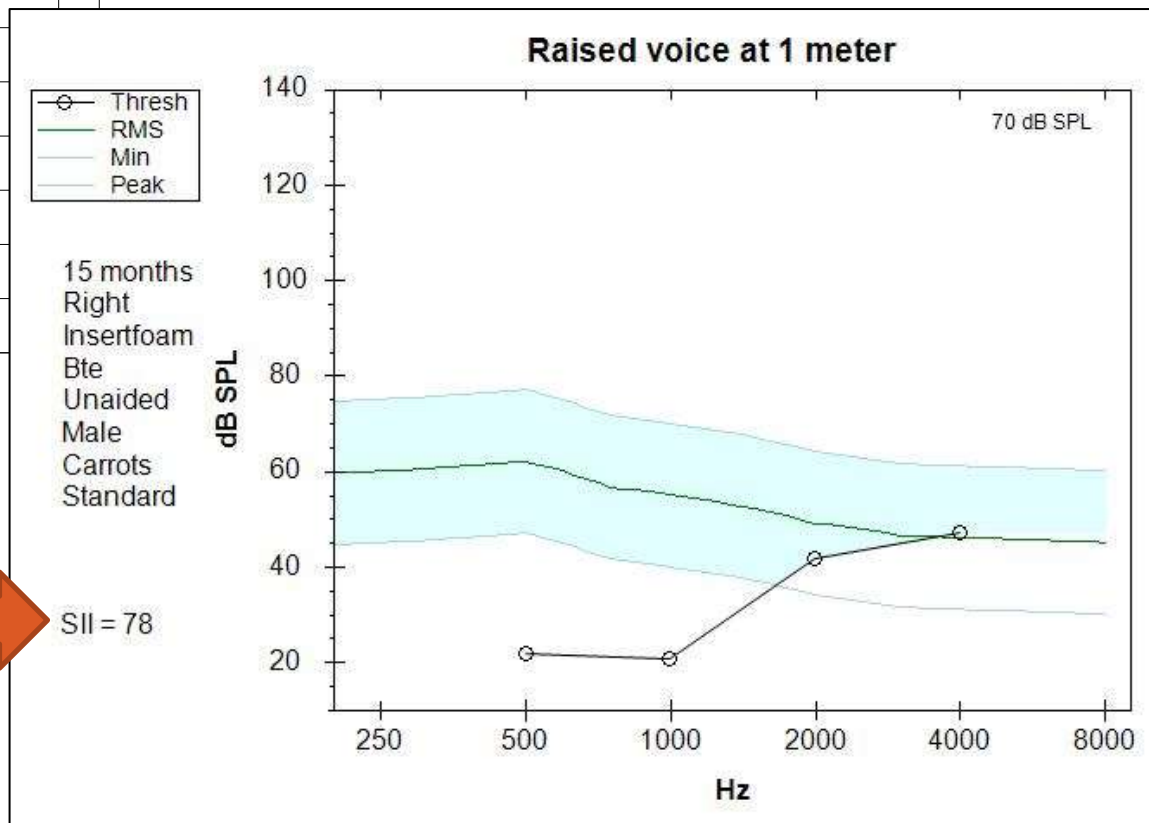


Developmental  
status,  
Ambulatory  
status,  
Environment,  
Outcomes

Child  
Factors

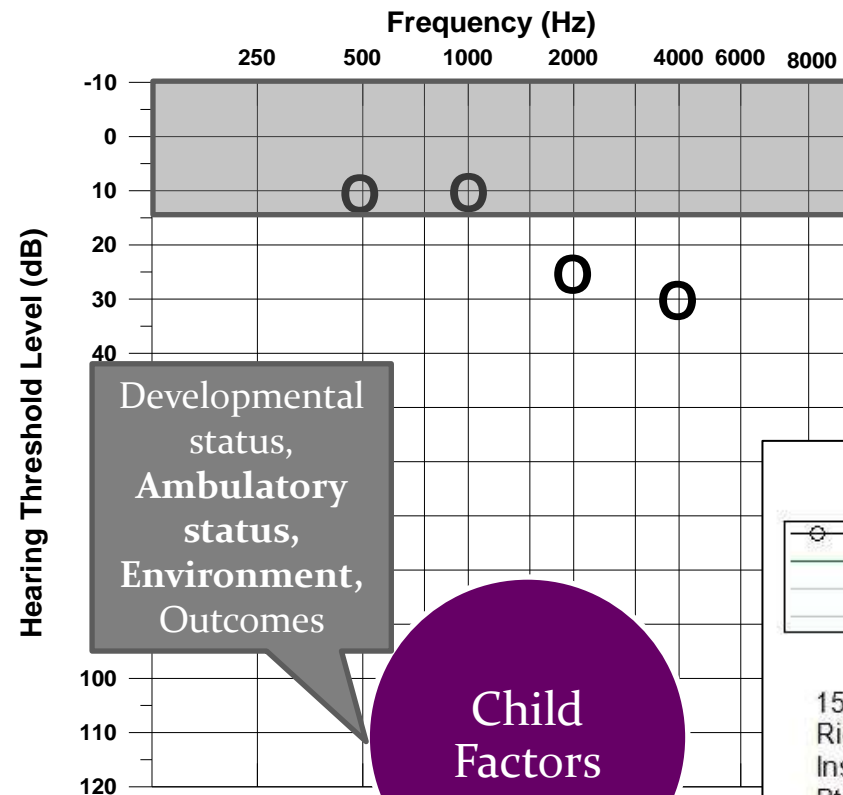
SII = 78

SII = 78



# Situational Hearing Aid Response Profile (SHARP)

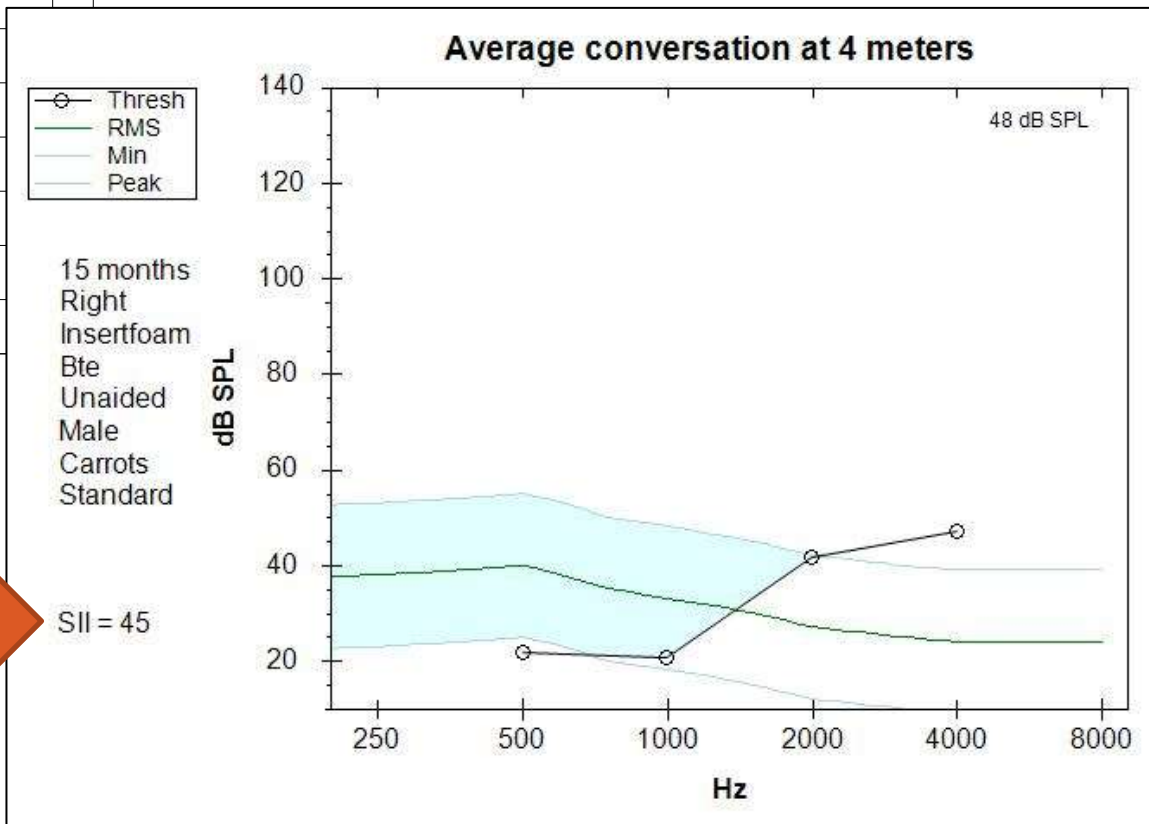
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[audres.org/rc/sharp](http://audres.org/rc/sharp)



Developmental  
status,  
Ambulatory  
status,  
Environment,  
Outcomes

Child  
Factors

SII = 45





# Decision Aid: Some Assumptions

- Audiologic certainty
  - Determination of degree, configuration and type in at least 2 frequencies (low and high) in each ear
- Family is well-informed of the pros and cons that need to be considered
- Selection of technology is one part of comprehensive management program

Configuration  
& Degree of  
Loss

## Minimal/Mild Bilateral Hearing Loss: Birth to 5 Years

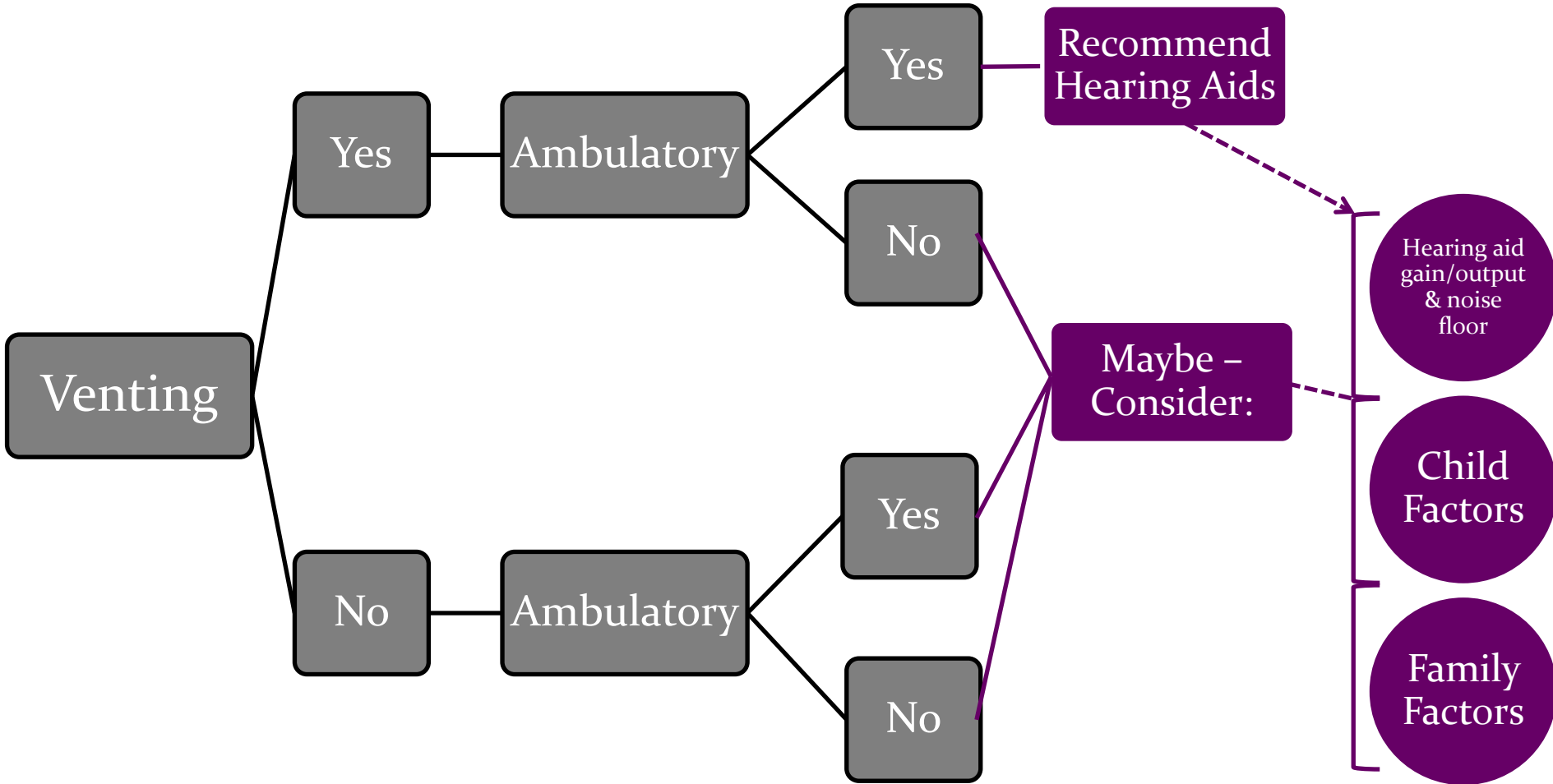
### High Frequency Loss

Pure tone air conduction  
thresholds  
> 25 dB HL at 2 or more  
frequencies above 2 kHz

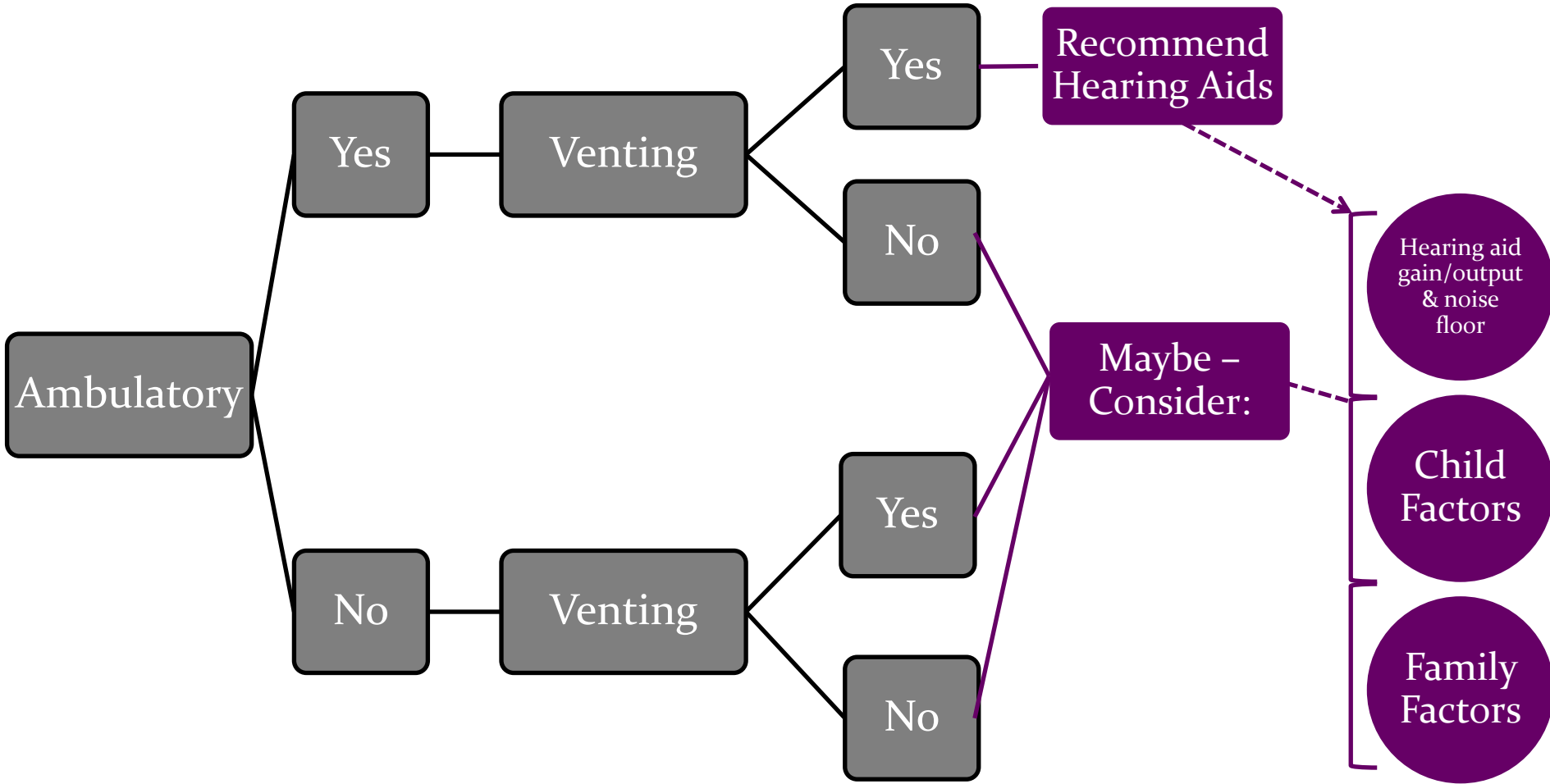
### Flat Loss

Pure tone average air conduction  
thresholds at .5, 1 & 2 kHz  
between  
20 & 40 dB HL

# High Frequency Hearing Loss: Hearing Aid Guide



# Flat Hearing Loss: Hearing Aid Guide



# Importance of Monitoring

- As the child's ear canal grows and changes, the acoustic properties change which impact hearing thresholds (dB HL)
  - Important to consider when monitoring hearing levels and considering intervention strategies
- Children in the first 3 years of life experience otitis media with effusion (OME) which can increase hearing thresholds
  - Include immittance measures in audiological monitoring protocol
- Audiologists should closely monitor the child's functional auditory abilities as part of routine evaluation
  - Recommend every 6 months
  - Intervention strategies should be adjusted as needed

# Summary

- Children with MBHL experience difficulties with language, academic and psychosocial development
  - Bess et al, 1998, Hicks & Tharpe, 2002; Most 2004; Wake et al, 2004
- Hearing technology management decisions are not well-established
- Provided decision aids in the form of flow charts to support clinical decision making when dealing with individual children with MBHL and their families
  - Several factors to consider



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