

Best Practice Guideline
“Audiologic Management of Infants and Toddlers
Who are Deaf/Hard of Hearing (Birth-3 years)”

Background:

With the initiation of universal newborn hearing screening, the age of identification of hearing loss has dramatically decreased. In 2016, 58% of infants identified with hearing loss were diagnosed no later than 3 months of age. As a result, the patient population served by audiologists has also changed requiring a specialized skill set to provide timely and effective habilitation to infants and toddlers who are deaf/hard of hearing. Children who receive early comprehensive services may reach or exceed age-appropriate developmental milestones by the time they begin school. To reach this level of achievement, the Joint Committee on Infant Hearing (JCIH) recommends that all infants identified with hearing loss receive appropriate early intervention services before 6 months of age.

The Michigan EHDI program respects a family’s decision regarding the choice of communication mode for their child. This guideline is written for those instances in which a family has chosen to include audition as a part of communication. This document should not be construed as endorsement of a specific communication mode by either the Michigan EHDI program or members of the subcommittee.

The purpose of this document is to provide direction to audiologists following the identification of hearing loss in infants and toddlers with the goal of ensuring consistent, quality care across the state. These guidelines also serve as criteria for inclusion on the Michigan EHDI Centers of Audiologic Management list.

1. Equipment Requirements:

- A. Diagnostic Tympanometer preferably capable of high frequency tympanometry and acoustic reflex measurements
- B. Diagnostic OAE (DP or TEOAE).
- C. Audiometric sound booth equipped with
 - 1) Calibrated Soundfield
 - 2) Visual Reinforcement Equipment
 - 3) Insert Earphones
 - 4) Furniture/materials to complete conditioned play audiometry
- D. Real Ear Measurement System including:
 - 1) RECD measurements, simulated/coupler and real ear/on ear) measures
 - 2) DSL or other pediatric appropriate prescriptive protocols
- E. Equipment for verifying the electroacoustic characteristics of the hearing aid for quality performance measures
- F. Equipment for programming hearing aids using universal prescriptive algorithms (such as, DSL and NAL-1) with updates as warranted by hearing aid manufacturers

2. Minimal Staff Requirements

Specialized skills and experience are essential to the management of infants and toddlers with hearing loss. The definition of “pediatric audiologist” has not been defined at a national level. The following criteria have been established in an attempt to quantify the level of experience and skills needed to provide expert and effective management of hearing loss in infants and toddlers.

- A. Michigan Licensure
- B. At least one staff member has two years of experience working with infants, toddlers and their families. Mentorship of staff members with less experience encouraged.
- C. Competence in the selection and use of diagnostic evaluation techniques appropriate for infants and toddlers (ASHA, 2004)
- D. Experience and expertise in management of infants and toddlers with hearing loss, defined as (must meet at least 3 criteria):
 - 1) 20% of client population is younger than 36 months
 - 2) On average each month, >3 audiologic evaluations completed for children less than 36 months.
 - 3) On average each month, > 5 appointments related to ongoing hearing aid management for children less than 36 months of age.
 - 4) The number of new hearing aid fittings for children less than 36 months is commensurate with the expected identification of hearing loss based upon local birthrates.

3. Recommendations regarding audiologic monitoring and management of hearing loss in children.

- A. Ongoing monitoring of hearing loss

Children less than three years of age with confirmed hearing loss (unilateral or bilateral) should receive periodic audiologic monitoring every 3-6 months. Concerns regarding children with progressive or fluctuating hearing loss or middle ear effusion resulting in conductive hearing loss may require more frequent monitoring.
- B. Hearing Aid Selection, Verification and Validation

As suggested by Bagatto and colleagues (2010), the assessment and management of children with hearing loss is not a single event, but a process involving many stages each with several important components. A summary of these stages with minimal components follows. Audiologists are encouraged to reference the AAA Pediatric Amplification Protocol (2003) and Bagatto et al (2010) for further discussion of factors important to selection, verification and validation of pediatric amplification.

 - 1) *Assessment:*

In order to make appropriate recommendations regarding amplification, at a minimum the following should be completed:

 - a. Audiologic assessment to determine type, degree and configuration of hearing loss in each ear via electrophysiologic and/or behavioral evaluations. Electrophysiologic information may be the only diagnostic data available to quantify the hearing loss. It is preferable to have threshold information across multiple frequencies (500 Hz, 1000 Hz, 2000 Hz, 4000 Hz) for each ear, but at minimum threshold information for at least one low frequency and one high frequency. Furthermore, reported electrophysiologic thresholds should be reported in dBnHL or dBeHL in order to verify whether or not correction factors have been applied.
 - b. Evaluation by pediatric otolaryngologist or otolaryngologist with pediatric experience to obtain medical clearance for amplification and educational services; address etiology of hearing loss and provide management of middle ear pathology and other medical issues.

2) *Candidacy:*

- a. Consideration for amplification should be given to all children who demonstrate bilateral hearing loss of 25 dBHL or greater in both ears. (MDCH Hearing Aid Provider Manual, January 1, 2012)
- b. Children diagnosed with auditory neuropathy spectrum disorder (ANSO) should be considered candidates for amplification when reliable behavioral audiometry indicates elevated thresholds for pure tones and speech. (Guidelines for the Identification and Management of Infants and Young Children with Auditory Neuropathy, 2008)
- c. Research has demonstrated and continues to emerge on the negative impact of unilateral (Lieu, 2010; Bess, 1984) and mild/minimal (Bess, 1998; Bess, 1984) hearing loss on the development of speech and language and academic achievement. For this reason, amplification should also be considered on an individual basis for children with these types of hearing loss (AAA guidelines, 2003).
 - i. Factors to consider include: severity of hearing loss in the poorer ear, family support for amplification, age of child, other medical or development concerns
 - ii. A trial with amplification may be warranted to assist in making decisions about whether to proceed with hearing aid use. Documentation of hearing aid benefit during the trial can also assist in obtaining insurance approval.
 - iii. Ongoing and consistent monitoring to assess the benefits of amplification is recommended.
- d. Consideration of other health concerns or family factors which may prohibit timely fitting, selection and validation of amplification.

3) *Hearing Instrument Pre-selection Considerations*

The objectives of early amplification (Bagatto et al, 2010) are to provide amplification of speech such that it is audible across varying input levels without distortion. Additional objectives should ensure amplification of sounds in as broad a frequency range as possible, and to be sufficiently flexible to accommodate changes that may be needed as the child grows or as new auditory information becomes available.

a. Financial Considerations

Possible sources of financial assistance to cover the expense of hearing aids should be reviewed with families. Any child with hearing loss who is a Michigan resident is eligible to enroll in the Children's Special Health Care Services Program (800-359-3722). For families with private health insurance or higher income levels, this may not be a fiscally-wise option. However, it is recommended that information be provided to all families to allow them to make an informed decision.

b. Hearing aid styles and features:

There are many factors to consider when fitting amplification. Special consideration should be given to age appropriate safety features:

- i. Behind the ear (BTE) style
- ii. Use of soft flexible earmolds to decrease feedback and chance of injury
- iii. Tamper-resistant battery doors
- iv. Pediatric-sized filtered earhooks
- v. Compatibility with assistive listening devices, such as personal FM/loop systems.
- vi. Ability to enable/disable volume control.
- vii. Ability to enable/disable advanced features
- viii. T-coil
- ix. Accessories to facilitate hearing aid use and retention
- x. Device warranty and Loss/Damage Policy
- xi. Listening Kit

4) *Prescriptive Algorithms:*

Current pediatric guidelines recommend the use of a generic evidenced based prescriptive algorithm (such as DSL and NAL-I) that contains appropriate elements for use with infants and children (AAA, 2003; JCIH, 2007).

- a. Prescriptive targets for gain and output should be based on audiometric threshold data.
- b. Prescriptive algorithms used in pediatric populations should have the capability to provide appropriate correction factors if needed for electrophysiologic thresholds.
- c. Individual ear acoustics should be accounted for in the hearing aid selection process. Measurement and application of the real ear to coupler difference should be used to individualize the HL to SPL transform. When this measure is not possible, age appropriate averages should be used.

5) *Verification*

The goal of amplification is to provide optimal access to the speech spectrum for soft, average and loud inputs. Hearing aid verification is conducted to insure desired electroacoustic performance and should be completed prior to hearing aid fitting. Evidence-based strategies such as real-ear measurements and simulated or a coupler approach to real ear verification should be used to determine if the goal of amplification is accomplished.

- a. Individual or age appropriate ear acoustics should be accounted for in the hearing aid selection and fitting process. Whenever possible, individual real-ear to coupler differences (RECDs) are measured to maximize the customization of the hearing aid prescription and fitting. There are times when individual measurement of RECD is not possible. In these circumstances, age appropriate normative values for the RECD are a reasonable alternative to individualized measures (Bagatto et al., 2001, 2005)

Verification should always include measurement of real-ear saturation response and target maximum output values.

- b. Behavioral methods are not recommended as the primary method for verifying amplification fittings in children. The simulated or coupler approach is generally accepted to be more suitable.

6) *Validation/Outcome Evaluation*

Validation is an ongoing process designed to ensure that the child is receiving optimal speech input from others and that his or her own speech is adequately perceived (AAA, 2003). Madell (2009) further describes the importance of validation by highlighting that neither ABR nor real ear measures provide a direct measure of hearing and thereby cannot insure sufficient benefit from hearing aids. Possible methods to cross check hearing aid fitting and outcomes for infants and toddlers include:

- a. Functional Auditory Measures or Reports of Auditory Responses from family and/or early intervention providers (TC, SLP, etc.)
- b. Aided soundfield thresholds may provide information regarding the audibility of soft sounds.
- c. Aided speech perception measures appropriate for child's age

7) *Hearing Aid Orientation and Monitoring:*

Initial hearing aid fitting information and instruction should be provided to the family with ongoing information regarding appropriate use and care of the hearing aids. Special attention at the initial fitting should be given to the following which specifically apply to infant and toddlers:

- a. Daily Listening Check and Inspection of Earmold and Hearing Aid
- b. Basic Troubleshooting/Battery Safety
- c. Care and Maintenance
- d. Earmold /Hearing Aid Retention Strategies

8) *Hearing Aid Monitoring*

Following initial fitting of hearing aids, a recheck should be scheduled within 1-2 weeks. Evaluation of personal amplification should be monitored at three month intervals and more often as necessary. More frequent appointments may be advised for children requiring new earmolds, fluctuating/progressive hearing loss or middle ear dysfunction.

C. Collaboration with other professionals

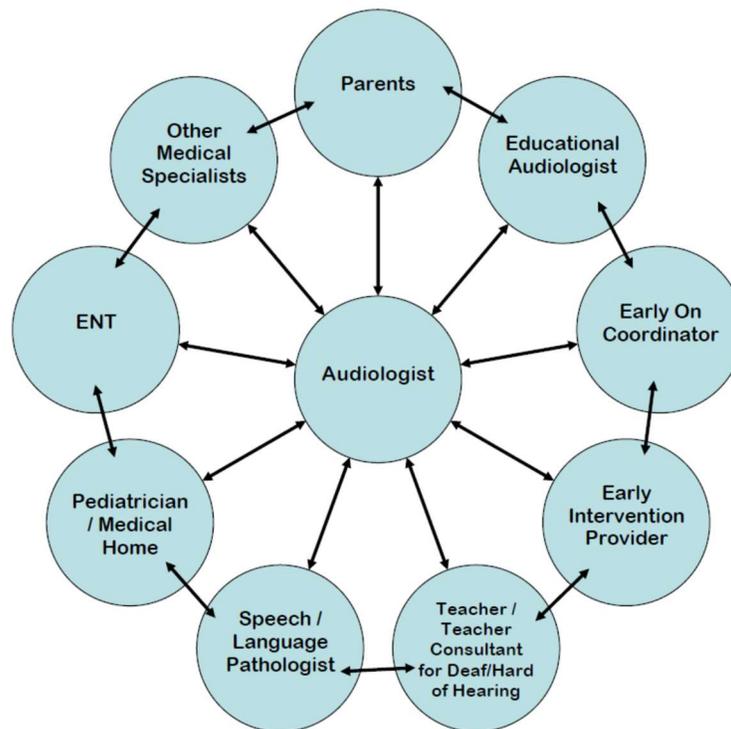
There are many professionals who contribute to the limitless success of children who are deaf/hard of hearing. The audiologist, otolaryngologist and teacher consultant for the D/HH are common members of the professional team. This team may include other professionals whose roles may vary depending upon the individual child's needs.

It is essential that collaboration exist between the managing and educational audiologist (or appropriate educational professional) to optimize the child's listening environment in all settings.

As stated in the 2007 JCIH position statement, "A complete language evaluation should be performed at regular intervals for infants and toddlers with hearing loss." Audiologists managing children who are deaf/hard of hearing should be able to provide resources to locate speech and language services. These services can be provided through the local Early On or Special Education Programs, hospitals or private practice settings.

The JCIH further suggests that ophthalmology and genetic evaluations should be discussed with all families. If concerns arise regarding other aspects of the child's development or health, referrals to other medical specialties should also be discussed.

It is important to recognize and bridge the gaps in the "communication" chain to ensure all professionals are working towards similar goals. This is not only important at diagnosis, but also as the child continues to grow and their needs change. As the audiologist may be in contact with the family most often, they can serve as the hub of the wheel in the service coordination as illustrated in the diagram below. To facilitate ongoing collaboration, it is important to obtain and maintain current release of information documents.



References:

American Speech-Language-Hearing Association. (2008). Service Provision to Children Who Are Deaf and Hard of Hearing, Birth to 36 Months [Technical Report].

Joint Committee on Infant Hearing Year. (2007). 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. *Pediatrics* 2007; 120; 898-921.

American Speech-Language-Hearing Association. (2004). Guidelines for the Audiologic Assessment of Children from Birth to 5 Years of Age [Guidelines].

Bagatto M, Scollie SD, Hyde M, Seewald, R. (2010). Protocol for the Provision of Amplification within the Ontario Infant Hearing Program. *International Journal of Audiology*, 49:S70-S79.

American Academy of Audiology. (2003) Pediatric Amplification Protocol.
<http://www.audiology.org/resources/documentlibrary/Documents/pedamp.pdf>.

Guidelines Development Conference on the Identification and Management of Infants with Auditory Neuropathy. 2008. International Newborn Hearing Screening Conference. June 19–21. Como, Italy. Accessed at: www.thechildrenshospital.org/conditions/speech/danielscenter/ANSD-Guidelines.aspx.

Michigan Department of Community Health. (2011) Hearing Aid Provider Manual. Accessed at: <http://www.mdch.state.mi.us/dch-medicaid/manuals/MedicaidProviderManual.pdf>.

Lieu JE, Tye-Murray N, Karzon RK, Piccirillo JF. (2010). Unilateral Hearing Loss is Associated with Worse Speech-Language Scores in Children. *Pediatrics*, 125: e1348-1355.

Bess FH, Tharpe AM. (1984). Unilateral Hearing Impairment in Children. *Pediatrics*, 74: 206-216.

Bess FH, Dodd-Murphy J, Parker RA. (1998). Children with Minimal Sensorineural Hearing Loss: Prevalence, Educational Performance, and Functional Status. *Ear and Hearing*, 19(5): 339-354.

Bagatto, M.P, Moodie, S.T., Scollie, S.D., Seewald, R.C., Moodie, K.S., et al. (2005). Clinical Protocols for Hearing Instrument Fitting in the Desired Sensation Level Method. *Trends Amplify*, 9(4), 199–226.

Bagatto, M.P. (2001). Optimizing Your RECD Measurements. *Hear J*, 54(9), 3–36.

Madell, J. R. (2009). The Challenges Ahead in Pediatric Audiology. *ENT News*, 18(1), 66–68.

Appendix A:

Finding E HL:

Considerations (Bagatto & Scollie, 2010)

- a. FS-ABR thresholds estimates (nHL) are typically higher than behavioral thresholds, so the correction is subtracted from the nHL value to estimate behavioral thresholds such that:
dB nHL – correction = dB eHL
- b. It is recommended that dispensing audiologist have a clear understanding of the ABR test results to ensure that corrections have been reported **or** to determine if the correction needs to be applied.
- c. This FS-ABR correction approach is incorporated with the Desired Sensation Level (DSL) Method for hearing aid prescription and fitting (Bagatto et. Al, 2005; Scollie et al., 2005)
- d. Clinics may also refer to the following: <http://www.audiospeech.ubc.ca.haplab> or Stappells, 200 a; Stapells, et al., 1995; Bagatto et al., 2005)
- e. Some researchers/clinicians recommend the use of individual earmolds during VRA ear specific testing. Use of individualized HL to SPL transforms can be used to convert thresholds to either real-ear SPL or equivalent adult HL.
- f. Whenever possible, individual real-ear to coupler differences (RECDs) are measured to maximize the customization of the hearing aid prescription and fitting.
- g. There are times when individual measurement of RECD is not possible. In these circumstances, age appropriate normative values for the RECD are a reasonable alternative to individualized measures (Bagatto et al., 2002, 2005)

Appendix B:

Calculation of expected number of hearing loss cases in your specific area (per live birth rate)

Rationale:

The incidence of permanent hearing loss is 1-3 infants per 1,000 live births. For this reason, the actual **number** of infants diagnosed with hearing loss will vary across facilities based upon the number of live births in an area. To determine if the number of infants diagnosed with hearing loss at your facility reflects prevalence of hearing loss in Michigan, the following steps are recommended:

1. Determine the number of births in your area by referring to the "Vital Statistics" website located at: <http://www.mdch.state.mi.us/pha/osr/Chi/Births/frame.asp>. Depending upon the location of your facility, select the county/counties served by your facility. If appropriate, add the births across counties.

Example:

Ingham County 2008 live births= 3,538

2. Complete the following calculations:

Multiply:

(Total Births) x .001 = A Example: 3,538 x .001 = 3.5 infants

(Total Births) x .003 = B Example: 3,538 x .003 = 10.5 infants

3. The expected number of infants with hearing loss for your area, in the specified time period (i.e. 2008) will be a range from A to B

Example:

The expected number of infants with hearing loss for Ingham County in 2008 is 3-11 infants.

Appendix C:

There are a number of Michigan programs which serve infants and children with hearing loss. A few are listed below:

CSHCS 800-359-3722

General Information:

www.michigan.gov/mdch/0,4612,7-132-2942_4911_35698-15087--,00.html

Provider Information Page:

www.michigan.gov/mdch/0,1607,7-132-2942_4911_35698-157534--,00.html

Patient Information Brochure can be downloaded at:

www.michigan.gov/documents/mdch/English_brochure_June_2006_216284_7.pdf

Early On 800-327-5966

General Information:

www.1800earlyon.org

Free Early On materials:

earlyon.cenmi.org/products

Michigan EHDI 517-335-8955

General Information:

www.michigan.gov/ehdi

Free EHDI resources:

www.michigan.gov/documents/mdch/Microsoft_Word_-_ehdiOrder_form_07-07-08_245579_7.pdf

**Early Hearing Detection and Intervention (EHDI) Program
EHDI Audiologic Management Facility
Application**

Date:	
Person Completing:	
Email:	
Facility Name:	
Facility Address:	
Facility Management Coordinator:	
Email:	
Telephone:	
Fax:	

To be included on the *EHDI Centers of Audiologic Management Facility List*, please complete this application. Applications and supporting documents can be submitted to Michelle Garcia's attention by email or fax. EHDI will contact you with questions or approval within 2 weeks upon receipt of application.

Please refer to the *EHDI Audiologic Management of Infants and Toddlers Who are Deaf/Hard of Hearing (Birth-3 years)" Best Practice Guidelines* for additional information. Inclusion on the list is voluntary.

The EHDI staff is available to make a site visit to facilities requesting assistance in developing protocols and applying for inclusion in the State of Michigan's EHDI Audiologic Management Facility listing. If you would be interested in assistance, please contact:

Michelle Garcia, Au.D., CCC-A

EHDI Follow-Up Consultant

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Fax: 517-763-0183

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EHDI Audiologic Management Facility Application

Equipment: Please indicate whether the following equipment is available at your facility.

Yes	No	
		Diagnostic Tympanometer: Preferably capable of high frequency tympanometry and acoustic reflex measurements.
		Diagnostic Otoacoustic Emission (OAE): Distortion Product or Transient Evoked
		Audiometric sound booth equipped with <ul style="list-style-type: none"> • Calibrated Soundfield • Visual Reinforcement Equipment • Insert Earphones • Furniture/materials to complete conditioned play audiometry.
		Real Ear Measurement System including: <ul style="list-style-type: none"> • Coupler and real ear measures. • DSL or other pediatric appropriate prescriptive protocols.
		Equipment for verifying the electroacoustic characteristics of the hearing aid.
		Equipment for programming hearing aids using universal prescriptive algorithms (such as, DSL and NAL-1) with updates as warranted by hearing aid manufacturers.
		Calibration schedule for above equipment.

Staff Requirements: Please indicate whether the following statements accurately describe the staff at your facility.

Yes	No	
		Valid Michigan Audiology Licensure.
		At least one staff member has two years of experience working with infants, toddlers and their families willing to mentor staff members with less experience.
		Competence in the selection and use of diagnostic evaluation techniques appropriate for infants and toddlers (ASHA, 2004).

Please indicate whether the following statements accurately describe the client population at your facility.

Yes	No	
		20% of client population is younger than 36 months.
		On average each month, >3 audiologic evaluations completed for children less than 36 months.
		On average each month, > 5 appointments related to ongoing hearing aid management for children less than 36 months of age.
		The number of new hearing aid fittings for children less than 36 months is commensurate with the expected identification of hearing loss based upon local birthrates.

Yes	No	
		Are you currently a CSHCS provider? (This is for information purposes only and will not impact application approval.)

Please answer the questions below regarding your general clinic guidelines:

1. How often do you typically monitor hearing for children less than three years of age with confirmed hearing loss (unilateral or bilateral)?
2. Does your monitoring schedule change if there are concerns regarding children with progressive or fluctuating hearing loss or middle ear effusion? If so, what is the frequency?
3. What is the minimum audiologic information you require to consider hearing aid evaluation for a child less than 3 years of age?
4. Do you require an evaluation by pediatric otolaryngologist or otolaryngologist with pediatric experience prior to hearing aid evaluation?
 Yes
 No
5. Please provide a brief explanation of what special considerations are taken into account when considering hearing aid evaluation for children with:
 - a. Auditory Neuropathy Spectrum Disorder:

 - b. Unilateral Hearing Loss:
6. What information do you provide regarding financial assistance programs (ie, CSHCS or nonprofit organizations) for families without private insurance coverage for hearing aids?
7. Please describe what factors are considered related to hearing aid styles and features when fitting amplification 3 years and younger.
8. Please indicate the prescriptive formula typically used for children less than 3 years of age.
9. Please indicate how hearing aid fittings are verified:
10. Please indicate how hearing aid fittings are validated:
11. What is the frequency of hearing aid monitoring for children less than 3 years?
12. What other professionals do you collaborate with in order to optimize the children's listening environment in all settings?