

The profession of audiology is committed to providing auditory and vestibular care through ethical and evidence-based clinical practices that lead to optimal patient outcomes. Standard of practice documents outline basic services that audiologists are expected to include in the provision of quality healthcare. They reflect the values and priorities of the profession, providing direction for professional practice and a framework for the evaluation of practice. Standards of practice are prepared by subject matter experts, based on available evidence, peer-reviewed and subject to periodic updating.

HEARING AID FITTING STANDARD FOR PEDIATRIC PATIENTS

- This pediatric hearing aid fitting standard is applied to patients whose objectives are supported by the processes defined in this document. The audiologist attending to the needs of patients determines when pediatric or adult standards are applicable to each patient and are provided within the patient's given family/guardian setting respecting aspects of diversity, equity, inclusion, and belonging.
- The communication needs of pediatric patients are complex and changing over time; management of these needs is the responsibility of a multi-disciplinary professional team that includes family members and audiologists.^{1,13,46}
- 3. Each patient and family is unique. Audiologists make individualized recommendations based on the needs of each patient and their family. Decisions regarding hearing aid selection and use are made in collaboration with the patient when developmentally appropriate, as well as parents, guardians, other family members, etc. (herein described as "caregivers"). ^{8,23,25,26,27,45}
- 4. Communication with patients and caregivers is conducted in a clear, empathetic manner consistent with their preferred communication mode, family setting, comprehension, and health literacy level.^{7,8,9,17,27,37}
- 5. Applicable policies and regulations are always followed in fitting of hearing aids. Each step of the selection and fitting process and the rationale is documented, where appropriate.²²

- 6. The hearing aid selection and fitting process is based on a reliable and valid audiological assessment that includes ear and frequency-specific hearing thresholds. Frequency-specific thresholds are obtained at a minimum of one low frequency and one high frequency, based on auditory brainstem response (ABR) or developmentally appropriate audiometric techniques.^{18,33,38}
- 7. Hearing aids are indicated when persistent elevation of hearing thresholds affects access to spoken language and meaningful environmental sounds. The audiologist recognizes that hearing aids may be appropriate for pediatric patients beyond those who meet criteria outlined in this standard.^{6,14,15,20,36,39}
- 8. A needs assessment is used in the selection of hearing aids and may include audiological, physical, medical, communication, educational, social, and family & home needs of the patient.^{8,27}
- 9. Fitting of bilateral hearing aids is the recommended protocol if the patient is a candidate for hearing aids in both ears and it is supported by the needs assessment.¹¹
- 10. A patient with unilateral hearing loss may be a candidate for intervention as determined by the needs assessment.^{2,30,42}
- 11. Ear coupling and retention is adequate to support the physical and acoustic requirements of the fitting. This is re-evaluated regularly as the patient grows and develops.^{34,44}
- 12. Gain and output characteristics are determined and verified according to a validated pediatric prescriptive method and verified across the range of soft, moderate, and loud input levels of speech. Verification methods account for the child's ear canal acoustics to ensure safety and prescribed speech audibility.^{10,16,24,28}
- 13. Signal processing features that improve audibility are prescribed when supported by the needs assessment. Features are activated or adjusted as the child grows and listening needs change.^{29,31,35}
- 14. An assessment of initial product quality is completed, using standard electroacoustic measures to verify intended device function.^{10,12}
- 15. Hearing aids are fitted so that various input levels of speech result in verified ear canal output that meets the frequency-specific targets provided by an age-appropriate validated prescriptive method. The frequency-specific maximum power output is adjusted to optimize the patient's residual dynamic range and ensure safe output levels. Aided speech audibility is verified using an in situ probe microphone system or appropriate coupler-adjusted, simulated real-ear measures.^{5,19,47}
- 16. Assistive technology and accessories are recommended when indicated to satisfy the patient's listening and communication needs across social, vocational, and academic settings.^{2,40,41}

- 17. Outcomes are validated using developmentally appropriate tools. These may include aided speech recognition, caregiver and self-report questionnaires, and consultation with caregivers, healthcare providers, and other professionals supporting the needs of the patient.^{3,4,48}
- 18. Device orientation is family-centered and includes use, care, maintenance and troubleshooting of the hearing aids and accessories. Expectations for the patient's involvement in these tasks are established at a level appropriate for the patient.^{21,37,43,45}
- Counseling is conducted to ensure appropriate adjustment to amplification and to address other concerns regarding communication, as well as unique and specific personal and family needs. Additional habilitation/rehabilitation is recommended based on patient need.^{8,32,37}
- 20. Management of pediatric amplification is an on-going process. Re-evaluation of hearing status, needs assessment, verification, and validation are completed at intervals determined by the audiologist. This ensures that the child's needs are met as they grow and develop.^{5,8,13}

CONTRIBUTORS

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REFERENCES

- Ainbinder, J. G., Blanchard, L. W., Singer, G. H. S., Sullivan, M. E., Powers, L. K., Marquis, J. G., & Santelli, B. (1998). A Qualitative Study of Parent to Parent Support for Parents of Children With Special Needs. *Journal of Pediatric Psychology*, 23(2), 99-109.
- Bagatto, M., DesGeorges, J., King, A., Kitterick, P., Laurnagaray, D., Lewis, D., Roush, P., Sladen, D. P., & Tharpe, A. M. (2019). Consensus practice parameter: audiological assessment and management of unilateral hearing loss in children. *International Journal of Audiology*, 58, 805 -815. https://doi.org/10.1080/14992027.2019.1654620

- 3. Bagatto, M. P., Moodie, S. T., Malandrino, A. C., Richert, F. M., Clench, D. A., & Scollie, S. D. (2011). The University of Western Ontario pediatric audiological monitoring protocol (UWO PedAMP). *Trends in amplification*, 15(1), 57-76.
- Bagatto, M., Moodie, S., Brown, C., Malandrino, A., Richert, F., Clench, D., & Scollie, S. (2016). Prescribing and verifying hearing aids applying the american academy of audiology pediatric amplification guideline: protocols and outcomes from the Ontario infant hearing program. *Journal of the American Academy of Audiology*, 27(3), 188-203. https://doi.org/10.3766/jaaa.15051
- 5. Bagatto, M., Moodie, S., Scollie, S., Seewald, R., Pumford, J., & Liu, K. R. (2005). Clinical protocols for hearing instrument fitting in the Desired Sensation Level method. *Trends in amplification*, 9(4), 199-226.
- 6. Bess, F. H., Dodd-Murphy, J. & Parker, R. A. (1998). Children with minimal sensorineural hearing loss: Prevalence, educational performance, and functional status. *Ear and Hearing*, 19(5), 339–354.
- Donald, A. J., & Kelly-Campbell, R. J. (2016). Pediatric audiology report: Assessment and revision of an audiology report written to parents of children with hearing impairment. *Journal of Speech, Language, and Hearing Research*, 59(2), 359-372. https://doi.org/10.1044/2015_JSLHR-H-15-0120
- English, K., Walker, E., Farah, K., Munoz, K., Pelosi, A., Scarinci, N., DesGeorges, J, Angust, H., Madell, J., Moeller, M.P., Marriage, J., Flexer, C., & Jones, C. (2017) Implementing family-centered care in early intervention for children with hearing loss: Engaging parents with a question prompt list (QPL). *Hearing Review*. 2017;24(11):12-18.
- Fitzpatrick, E., Coyle, D. E., Durieux-Smith, A., Graham, I. D., Angus, D. E., & Gaboury, I. (2007). Parents' preferences for services for children with hearing loss: A conjoint analysis study. *Ear and hearing*, 28(6), 842-849.
- Folkeard, P., Bagatto, M., & Scollie, S. (2020). Evaluation of Hearing Aid Manufacturers' Software-Derived Fittings to DSL v5.0 Pediatric Targets. *Journal of the American Academy of Audiology*, 31(05), 354-362. https://doi.org/10.3766/jaaa.19057
- 11. Gordon, K., Henkin, Y., & Kral, A. (2015). Asymmetric hearing during development: the aural preference syndrome and treatment options. *Pediatrics*, 136(1), 141-153. https://doi.org/10.1542/peds.2014-3520
- Holder, J. T., Picou, E. M., Gruenwald, J. M., & Ricketts, T. A. (2016). Do Modern Hearing Aids Meet ANSI Standards? *Journal of the American Academy of Audiology*, 27(8), 619-627. https://doi.org/10.3766/jaaa.15027
- Joint Committee on Infant Hearing. (2019). Year 2019 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. *The Journal of Early Hearing Detection and Intervention*, 2019; 4(2): 1-44.
- 14. Kenworthy, O. T., Klee, T., & Tharpe, A. M. (1990). Speech recognition ability of children with unilateral sensorineural hearing loss as a function of amplification, speech stimuli, and listening condition. *Ear and Hearing*, 11(4), 264–270.
- 15. Kopun, J. G., Stelmachowicz, P. G., Carney, E., & Schulte, L. (1992). Coupling of FM systems to individuals with unilateral hearing loss. *Journal of Speech, Language, and Hearing Research*, 35(1), 201-207. 1
- 16. Kim, H., & Ricketts, T. A. (2013). Test-Retest Reliability of Probe-Microphone Verification in Children Fitted with Open and Closed Hearing Aid Tips. *Journal of the American Academy of Audiology*, 24(7), 635-642.
- 17. Luterman, D. (2004). Counseling families of children with hearing loss and special needs. *The Volta Review*, 104(4), 215.
- McCreery, Brennan, Walker, & Spratford (2017). Perceptual impliciations of level- and frequency-specific deviations from hearing aid prescription in children. *Journal of the American Academy of Audiology*. 28(9), 861-875.

- 19. McCreery, R. W., Kaminski, J., Beauchaine, K., Lenzen, N., Simms, K., & Gorga, M. P. (2015). The Impact of Degree of Hearing Loss on Auditory Brainstem Response Predictions of Behavioral Thresholds. *Ear and Hearing*, *36*(3), 309-319.
- 20. McCreery, R. W., Venediktov, R. A., Coleman, J. J., & Leech, H. M. (2012). An evidence-based systematic review of directional microphones and digital noise reduction hearing aids in school-age children with hearing loss. *American Journal of Audiology*, 21(2), 295-312.
- 21. McCreery, R. W., Venediktov, R. A., Coleman, J. J., & Leechb, H. M. (2012). An Evidence-Based Systematic Review of Frequency Lowering in Hearing Aids for School-Age Children With Hearing Loss. *American Journal of Audiology*, 21, 313-328.
- 22. McCreery, R. W., Venediktov, R. A., Coleman, J. J., & Leechb, H. M. (2012). An Evidence-Based Systematic Review of Amplitude Compression in Hearing Aids for School-Age Children With Hearing Loss. *American Journal of Audiology*, 21, 269-294.
- 23. McCreery, R. W., Walker, E. A., Spratford, M., Bentler, R., Holte, L., Roush, P., Oleson, J., Van Buren, J., & Moeller, M. P. (2015). Longitudinal Predictors of Aided Speech Audibility in Infants and Children. *Ear and hearing*, *36*(0 1), 24S-37S.
- 24. McCreery, R. W., Walker, E. A., Stiles, D. J., Spratford, M., Oleson, J. J., & Lewis, D. E. (2020). Audibility-based hearing aid fitting criteria for children with mild bilateral hearing loss. Language, *Speech, and Hearing Services in Schools*, 51(1), 55-67.
- 25. Meibos, A., Muñoz, K., White, K., Preston, E., Pitt, C., & Twohig, M. (2016). Audiologist Practices: Parent Hearing Aid Education & Support, *Journal of American Academy of Audiology*, 27, 324-332.
- 26. Moeller, M. P., Hoover, B., Peterson, B., & Stelmachowicz, P. (2009). Consistency of Hearing Aid Use in Infants With Early-Identified Hearing Loss. *American Journal of Audiology*, 18(1), 14-23.
- Moodie, S. T., Network of Pediatric Audiologists of Canada, Scollie, S. D., Bagatto, M. P., & Keene, K. (2017). Fit-to-targets for the desired sensation level version 5.0 a hearing aid prescription method for children. *American journal of audiology*, 26(3), 251-258.
- 28. Muñoz, K., Rusk, S. E., Nelson, L., Preston, E., White, K. R., Barrett, T. S., & Twohig, M. P. (2016). Pediatric hearing aid management: Parent-reported needs for learning support. *Ear and Hearing*, 37(6), 703-709.
- 29. Muñoz, K., Olson, W. A., Twohig, M. P., Preston, E., Blaiser, K., & White, K. R. (2015). Pediatric hearing aid use: Parent-reported challenges. *Ear and Hearing*, 36(2), 279-287.
- 30. National Center on Birth Defects and Developmental Disabilities: Division of Human Development and Disability. The "What Else" Checklist. Retrieved from https://www.cdc.gov/ncbddd/hearingloss/ freematerials/Checklist.pdf
- 31. Amri N. A., Quar T. K., Chong F. Y., & Bagatto M. (2021): Optimising hearing aid output to paediatric prescriptive targets improves outcomes in children, *International Journal of Audiology*, 61(11), 924-931.
- 32. Palmer, C. V., & Grimes, A.M. (2005). Effectiveness of signal processing strategies for the pediatric population: a systematic review of the evidence. *Journal of the American Academy of Audiology*, 16(07), 505-514. <u>https://10.1080/14992027.2021.2005832</u>
- Picou, E. M., Davis, H., & Tharpe, A. M. (2020). Considerations for choosing microphone technologies for students with limited useable hearing unilaterally. *Language, Speech, and Hearing Services in Schools*, 51(1), 74 - 83.
- 34. Ricketts, T. A., Picou, E. M., & Galster, J. (2017). Directional microphone hearing aids in school environments: Working toward optimization. *Journal of Speech, Language, and Hearing Research,* 60, 263 275.
- 35. Rao, A., Rishiq, D., Yu, L., Zhang, Y., & Abrams, H. (2017). Neural correlates of selective attention with hearing aid use followed by ReadMyQuips auditory training program. *Ear and Hearing*, 38, 28-41.

- Robins, A.M., Svirsky, M., Osberger, M.J. & Pisoni, D.B. (1998). Beyond the audiogram: the role of functional assessments. In: Bess F. (Ed.) *Children with Hearing Impairment: contemporary trends*. Vanderbilt Bill Wilkerson Center Press, 105-124.
- 37. Roush, P. A. (2005). Hearing aid fitting in infants: Practical considerations and challenges. A sound foundation through early amplification, 105-114.
- Scollie, S., Levy, C., Pourmand, N., Abbasalipour, P., Bagatto, M., Richert, F., Moodie, S., Crukley, J., & Parsa, V. (2016). Fitting Noise Management Signal Processing Applying the American Academy of Audiology Pediatric Amplification Guideline: Verification Protocols. *Journal of the American Academy of Audiology*, 27(03), 237-251.
- 39. Shapiro, I. (1977). Children's use of CROS hearing aids. Archives of Otolaryngology, 103(12), 712-716.
- 40. Sjoblad, S., Harrison, M., Roush, J., & McWilliam, R.A. (2001). Parents' reactions and recommendations after diagnosis and hearing aid fitting. *American Journal of Audiology*, 10(1), 24-31.
- 41. Stapells, D. R. (2011). Frequency-specific ABR and ASSR threshold assessment in young infants. *Phonak. Com*, 409-448.
- 42. Tharpe, A.M. (2008). Unilateral and mild bilateral hearing loss in children: Past and current perspectives. *Trends in Amplification*, 12(1), 7–15
- 43. Tharpe, A. M., Ricketts, T., & Sladen, D. P. (2004). FM systems for children with minimal to mild hearing loss. ACCESS: Achieving Clear Communication Employing Sound Solutions. Chicago: Phonak AG, 191-197.
- 44. Thompson, E. C., Benítez-Barrera, C. R., Angley, G. P., Woynaroski, T., & Tharpe, A. M. (2020). Remote Microphone System Use in the Homes of Children with Hearing Loss: Impact on Caregiver Communication and Child Vocalizations. *Journal of Speech, Language, and Hearing Research*, 63(2), 633-642.
- 45. Toole K, & Batheja, R (2022). Best practices for infant hearing aid fittings. *Audiology Today* 34(1), 12-21.
- 46. Watermeyer, J., Kanji, A., & Sarvan, S. (2017). The first step to early intervention following diagnosis: Communication in pediatric hearing aid orientation sessions. *American Journal of Audiology*, 26(4), 576-582.
- 47. Watts, K. M., Bagatto, M., Clark-Lewis, S., Henderson, S., Scollie, S., & Blumsack, J. (2020). Relationship of Head Circumference and Age in the Prediction of the Real-Ear-to-Coupler Difference (RECD). *Journal of the American Academy of Audiology*, 31(07), 496-505.
- 48. Whicker, J. J., Muñoz, K., & Nelson, L. H. (2019). Parent challenges, perspectives and experiences caring for children who are deaf or hard-of-hearing with other disabilities: a comprehensive review. *International Journal of Audiology*, 58(1), 5-11.