American Cochlear Implant Alliance Task Force Guidelines for Determining Cochlear Implant Candidacy in Children

Andrea D. Warner-Czyz,[1] J. Thomas Roland, Jr,[2] Denise Thomas,[3] Kristin Uhler,[4,5] and Lindsay Zombek[6]

This article summarizes the available evidence on pediatric cochlear implantation to provide current guidelines for clinical protocols and candidacy recommendations in the United States. Candidacy determination involves specification of audiologic and medical criteria per guidelines of the Food and Drug Administration. However, recommendations for a cochlear implant evaluation also should maintain flexibility and consider a child's skill progression (i.e., month-for-month progress in speech, language, and auditory development) and quality of life with appropriately fit hearing aids. Moreover, evidence supports medical and clinical decisions based on other factors, including (a) ear-specific performance, which affords inclusion of children with asymmetric hearing loss and single-sided deafness as implant candidates; (b) ear-specific residual hearing, which influences surgical technique and device selection to optimize hearing; and (c) early intervention to minimize negative long-term effects on communication and quality of life related to delayed identification of implant candidacy, later age at implantation, and/or limited commitment to an audiologic rehabilitation program. These evidence-based guidelines for current clinical protocols in determining pediatric cochlear implant candidacy encourage a team-based approach focused on the whole child and the family system.

Key words: Candidacy, Children, Cochlear implants, Interdisciplinary.

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PURPOSE

This document aims to provide professionals and consumers with current, evidence-based criteria for determining cochlear implant (CI) candidacy for the pediatric population. Evidence-based practice involves integration of external evidence from systematic scientific research, internal evidence from clinical expertise, and individualized evidence from fully informed patients' unique values, preferences, and goals (Sackett et al. 1996; Culbertson & Jones 2005; Dang & Dearholt 2018). The strength of scientific research follows levels of evidence, with the strongest recommendations coming from systematic reviews, meta-analyses, and randomized controlled trials, and the lowest recommendations emerging from expert opinion (see Appendix A, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884). Clinical expertise of the task force supplemented research evidence in developing these guidelines.

Pediatric CI candidacy is a rapidly changing and evolving process due to new research and technological advancements. Some candidacy recommendations have gained approval from country-specific entities (e.g., Australian Therapeutic Goods Administration, Belgian Federal Government, British CI Group, Danish National Board of Health, European CE Marking, US Food and Drug Administration [FDA]), whereas others reflect guidelines from individual CI companies or evidence-based practice before official change in approved guidelines. Most guidelines worldwide agree on pediatric implantation for profound bilateral hearing loss (HL), but differences arise relative to age at implantation, level of residual hearing, speech recognition, or auditory status of the contralateral ear (National Institute for Health and Clinical Excellence 2009; British CI Group 2017; and the Belgian Federal Government, described in Bruijnzeel et al. 2017). Still, protocols for candidacy determination for children vary greatly across CI centers. This document intends to mirror contemporary evidence-based practices in pediatric CI candidacy to provide professionals and consumers guidelines for current clinical protocols, individualized patient decisions, and support for insurance and peer-to-peer review discussions. This document fills the need for separate CI candidacy guidelines for the pediatric population (Messersmith et al. 2019) with the intent for regular updates based on research evidence and clinical expertise every 18 to 24 months.

BACKGROUND

The United States FDA approved the first multichannel CI as medically safe for use in children with bilateral profound sensorineural HL in 1990. Early research showed children who received an implant at a younger age outperformed children with similar degrees of HL using hearing aids in sound detection and auditory perception skills (Tobey 1994; Fryauf-Bertschy et al. 1997; Snik et al. 1997; Nikolopoulos et al. 1999; Kirk et al. 2000). Certain factors contribute to age at implantation, including the advent, acceptance, and implementation of early hearing detection and intervention programs, subsequent earlier initial hearing aid fitting (Cupples et al. 2018; Yoshinaga-Itano et al. 2018), plus research consistently supporting the positive influence of earlier implantation on speech perception (Ching et al. 2013, 2018; Dettman et al. 2021) and spoken language (Geers

[1]Department of Speech, Language, and Hearing, Callier Advanced Hearing Research Center, The University of Texas at Dallas, Dallas, Texas, USA; [2]Department of Otolaryngology-Head and Neck Surgery, New York University Langone, New York, New York, USA; [3]Department of Audiology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois, USA; [4]Department of Audiology, Speech-Language, and Learning, University of Children's Hospital Colorado, Denver, Colorado, USA; [5]Department of Physical Medicine and Rehabilitation, Colorado University Anschutz School of Medicine, Denver, Colorado; and [6]Department of Speech Language Pathology, University Hospitals Cleveland Medical Center, Cleveland, Ohio, USA.

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& Nicholas 2013; Percy-Smith et al. 2013; Tobey et al. 2013; Dettman et al. 2021, 2016b; Ching et al. 2017; Yoshinaga-Itano et al. 2018). The combination of these factors lead to FDA approval of CIs in children with profound HL (≥9 or 12 mo, depending on manufacturer) or severe to profound HL (≥25 mo). Recently, the FDA approved implantation for children (≥5 years) with single-sided deafness (SSD) (FDA, Reference Note 1).

The FDA lowered the age at implantation over the past 30 years, but pediatric CI candidacy guidelines could benefit from further expansion based on current research. Twenty years elapsed since the age-based criterion decreased from 12 to 9 mo. This delay in FDA approval occurred even though numerous studies published in that time frame supported significantly improved outcomes and adequate safety before age 12 mo (Waltzman & Roland 2005; Roland et al. 2009; Houston & Miyamoto 2010; Vlastarakos et al. 2010; Colletti et al. 2012; Holman et al. 2013; Leigh et al. 2013; Dettman et al. 2016b; Miyamoto et al. 2017; Hoff et al. 2019; Karltorp et al. 2020; Teagle et al. 2019).

In addition, published research and clinical outcomes support implantation in children who do not meet FDA-supported guidelines. These "off-label" applications yield successful treatment of children with younger chronologic age (<9 or 12 mo), more residual hearing (i.e., severe to profound HL younger than 25 mo, low-frequency residual hearing), asymmetric hearing (i.e., appropriate auditory technology for each ear when hearing thresholds differ between ears), and SSD (i.e., typical hearing in one ear, severe to profound HL in the contralateral ear) (Dettman et al. 2007; Roland et al. 2009; Leigh et al. 2011; Colletti et al. 2012; Cadieux et al. 2013; Carlson et al. 2015; Friedmann et al. 2016, 2020). "Off-label" applications of CI technology may not match current FDA criteria, but they do not violate licensure or certification regulations. Clinicians can go beyond FDA-approved criteria to support nontraditional CI candidacy based on medical appropriateness, as evidenced by systematic research and clinical experience, to benefit individual patients (see Off-Label Considerations).

In addition to considering research evidence, shifts in pediatric CI candidacy should consider recommendations of the Joint Committee on Infant Hearing. Multiple statements of the Joint Committee on Infant Hearing (2007, 2013, 2019) focus on issues important to early identification, intervention, and ongoing care of infants and children with HL. The medical team and interventionists should have expertise managing infants and children with HL. To emphasize the importance of earlier fitting of auditory technology and early intervention, the most recent position statement advocates hearing screening by 1 mo, identification of HL by 3 mo, and enrollment in early intervention by 6 mo (i.e., 1-3-6 benchmarks for management of pediatric HL) (Table 1). However, the 2019 Joint Committee on Infant Hearing position statement encourages early hearing detection and intervention programs to strive to meet 1-2-3 benchmarks: Screening by 1 mo, identification by 2 mo, and enrollment in intervention by 3 mo.

Younger ages at hearing aid fitting afford the opportunity to evaluate progress with hearing aids—or lack thereof—resulting in referrals to CI centers for candidacy evaluation within the first year of life. Many children complete the CI candidacy evaluation before the FDA-labeled minimum age for implantation (Carlson et al. 2018). Barriers to early implantation include delays in insurance approval, presence of residual hearing or medical comorbidities, family indecision, and geographical location (Armstrong et al. 2013; Fitzpatrick et al. 2015). This disparity in age at CI evaluation and the FDA-approved implantation age may not be in the best interest of young children with significant degrees of HL.

CI CANDIDACY CONSIDERATIONS

The question arises as to when to refer a pediatric patient for CI candidacy evaluation, especially because referral criteria vary by device manufacturer and child age. CI candidacy extends beyond audiometric criteria to include speech recognition and functional assessment. Insufficient benefit from appropriately fit amplification (i.e., lack of month-for-month progress in attaining speech, language, or auditory developmental milestones) and/or poorer quality of life also factor into candidacy decisions. Several instruments evaluate quality of life in children as young as 4 years through self-report or parent proxy, but most measures focus on generic aspects of life satisfaction (Starfield et al. 1993; Ravens-Sieberer & Bullinger 2000; Varni et al. 2002, 1999; Riley et al. 2004) rather than HL-specific well-being (Archbold et al. 2008; Patrick et al. 2011; Umansky et al. 2011; Hoffman et al. 2019) (see Appendix B, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884). Thus, assessing functional outcomes based on parent and clinician feedback on a child's auditory awareness, auditory responsiveness, and progress in acquiring language skills should become fundamental considerations for implant candidacy.

Figure 1 offers guidance for when clinicians should refer a child for a CI evaluation. These recommendations mimic momentum in adult implantation to streamline referrals for candidacy evaluation to include patients with unaided pure-tone average (mean of thresholds at 500, 1000, and 2000 Hz) ≥60 dB HL and aided monosyllabic word scores <60% correct in the ear to be implanted (Zwolan et al. 2020). When applied retrospectively to a large sample of adult implant candidates, these 60/60 screening guidelines yielded a 96% sensitivity rate (i.e., candidates met both word recognition and threshold criteria), a 65% specificity rate (i.e., noncandidates did not meet the 60/60 criteria), and a 76% positive predictive value (i.e., probability of meeting both traditional CI candidacy and the 60/60 guidelines). Based on the work of international clinical researchers,

TABLE 1. Early hearing detection and intervention benchmarks for management of infants who are deaf or hard of hearing

Early Hearing Detection and Intervention Benchmark	Stipulation	Current Guidelines (Joint Committee on Infant Hearing 2019)	Recommended Guidelines (Joint Committee on Infant Hearing 2019)
Hearing screening	(all infants)	By 1 mo chronologic age	By 1 mo chronologic age
Comprehensive audiologic and medical evaluation	Referral on hearing screening	By 3 mo chronologic age	By 2 mo chronologic age
Amplification fitting	Confirmed diagnosis as deaf or hard of hearing	Within 1 mo of identification	Within 1 mo of identification
Enrollment in appropriate therapeutic intervention	Confirmed diagnosis as deaf or hard of hearing	By 6 mo chronologic age	By 3 mo chronologic age

we recommend a 50/70+ guideline for referral to pediatric CI candidacy (Fig. 1). That is, clinicians should refer pediatric patients for evaluation if they meet any of the following criteria: appropriately selected word recognition scores <50% correct (Dettman et al. 2004; Bittencourt et al. 2012); unaided pure-tone thresholds >70 dB HL (Davidson 2006; Fitzpatrick et al. 2009; Leigh et al. 2011, 2016; Bittencourt et al. 2012; Leal et al. 2016); or poor functional performance, limited progress in language or auditory development, or poor quality of life (Mondain et al. 2002; Lazaridis et al. 2010; Vickers et al. 2016).

In summary, clinicians should consider audiometric criteria, speech perception, and functional outcomes when referring a child for a CI candidacy evaluation. If the CI team determines the child is a good candidate, they can proceed with implantation. If not, the team can continue to monitor the child's progress to ensure provision of opportunities to maximize communication.

The CI Team

Several factors play a role when identifying a pediatric CI candidate, including the onset and duration of HL, duration and consistency of hearing aid use, interactive communication among family members, access to postimplant therapy, and an educational setting that supports the development of formal communication methods. HL that results in candidacy for pediatric implantation might occur at birth or at any time thereafter. Continued monitoring of hearing status and outcomes from amplification is essential to provide the child the best (re)habilitation. This point is particularly cogent for genetic and acquired causes of HL, which can result in progressive losses that may require a shift in auditory technology (i.e., transitioning from hearing aids to CIs) (Fitzpatrick et al. 2015; Zwolan & Sorkin 2016). These decisions occur with input from parents and professionals involved in the child's care based on a holistic approach. Clinicians should think beyond rigid guidelines of hearing aid versus CI candidacy to embrace auditory technology as a continuum to allow a child to access necessary auditory information.

The CI team includes an interdisciplinary array of professionals, each of whom contributes information necessary to assess the appropriateness of a CI for a particular child with HL (Fig. 2). These professionals may include but are not limited to a physician, audiologist, speech-language pathologist, teacher of the deaf, early intervention specialist in children who are Deaf or Hard of Hearing, and counselor/psychologist/social worker (Bathgate et al. 2013; Martin & Raine 2013; Moeller et al. 2013; Athalye et al. 2015; Madell & Flexer 2019). The National Deaf Children's Society and the British CI Group recommend a team of at least seven different professionals, with the possibility of more professional involvement based on the child's unique situation (e.g., ophthalmologist, cardiologist) (Archbold et al. 2015). The caretaker(s) of the child are essential members of the CI team (Athalye et al. 2015). The CI team should aim for timely, coordinated services among team members to maximize the chance that children with significant HL can reach their individual potential (Martin & Raine 2013; Athalye et al. 2015). The rest of this document details the pediatric CI candidacy process.

Demographics/Lifestyle

Audiometric and medical criteria provide guidance for when to discuss pediatric implantation, but the CI team also should take a holistic approach considering the family's lifestyle, goals, and expectations for the child (Moeller 2000; Moeller et al. 2013; Dettman et al. 2016b). Nonaudiologic factors such as the child and family's quality of life, availability of resources, history of family involvement, assurance of consistent device use during all waking hours, and realistic expectations afford a well-rounded perspective of a child's prognosis for CI outcomes (Moeller 2000; Nikolopoulos et al. 2004; O'Brien et al. 2010; Park et al. 2019a; Wiseman et al. 2021).

First, a child's success with a CI depends on the parent/guardian's available resources for the child. For example, higher socioeconomic status can affect a child's age at implantation, speech, language, and auditory-based outcomes (Kirkham et al. 2009;

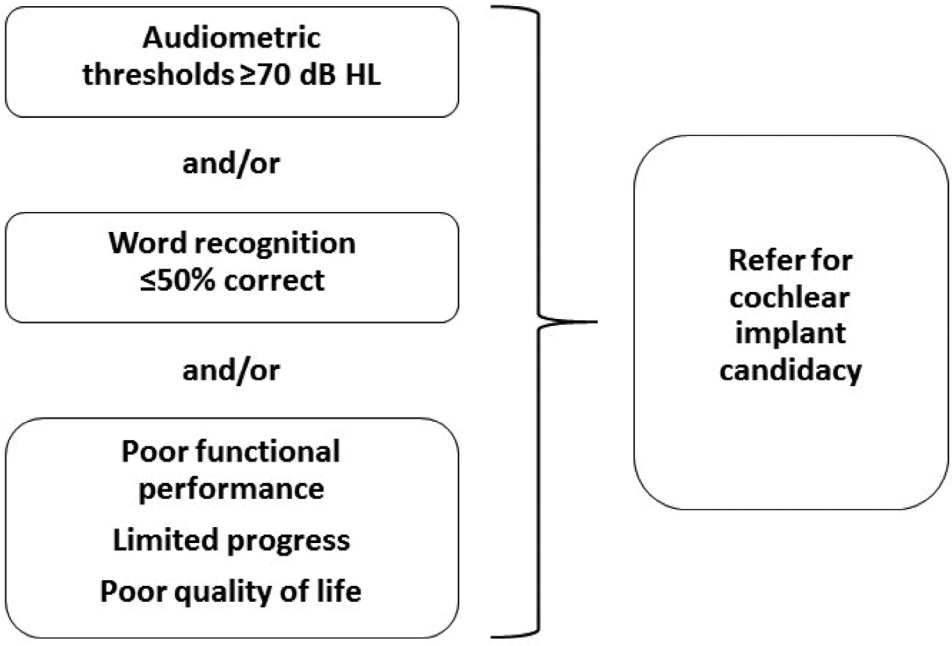

Fig. 1. Schematic for determination of CI candidacy. CI indicates cochlear implant.

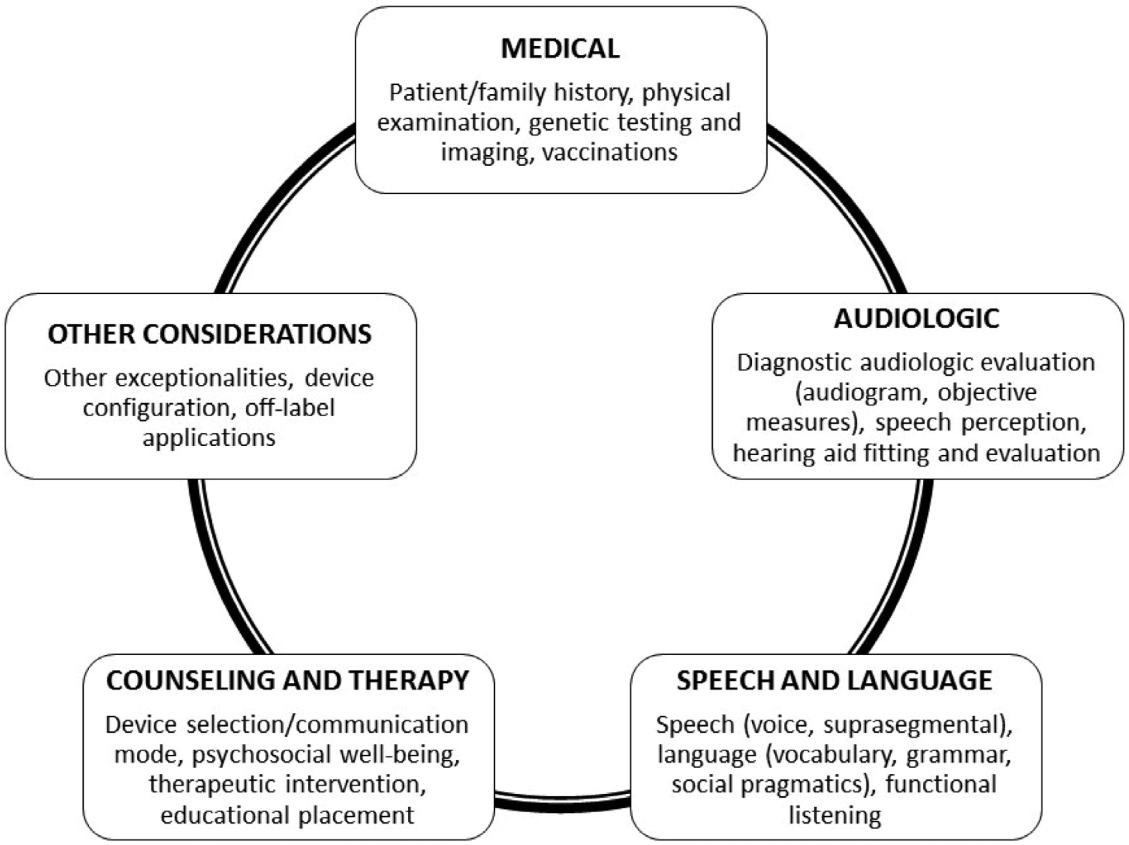

Fig. 2. Professionals associated with a multidisciplinary team to determine pediatric CI candidacy. CI indicates cochlear implant.

Niparko et al. 2010; Jeddi et al. 2012; Wu et al. 2015; Dettman et al. 2016a; Sharma et al. 2017). In addition, access to a support system (e.g., connection with other families with children with CIs, support groups) influences outcomes such that families with stronger support systems better navigate their child's hearing healthcare and have lower parental stress (Kluwin & Stewart 2000; Zaidman-Zait et al. 2016; Haddad et al. 2019; Ravi & Gunjawate 2020). A family's financial and support resources do not negate the decision to implant, but they might highlight the need for additional support and resources from professionals.

Subjective validation questionnaires can identify areas of strength and areas of concern to guide counseling and (re) habilitation for the child and family. For example, clinicians can use questionnaires to assess condition-specific quality of life (Archbold et al. 2002, 2008; Hoffman et al. 2019) and family-related factors such as family stress levels (Friedrich et al. 1983; Meadow-Orlans 1990; Abidin 1995; Quittner et al. 2010, 1990), self-efficacy (Desjardin 2003; Guimond et al. 2008), and family involvement and support (Dunst et al. 1984; Moeller 2000; Desjardin 2003) (see Appendix B, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884).

Second, child and family commitment are crucial to not only preimplantation evaluation and surgery, but also postimplantation (re)habilitation. The CI team should examine adherence to scheduled appointments and clinical recommendations because family involvement significantly contributes to early language skills in children with HL (Moeller 2000). Clinicians also should consider proximity of the patient to a qualified (re)habilitation provider because greater geographical distance to the clinic could reduce participation (Lai et al. 2014; Sharma et al. 2017). Sharma et al. (2017) explored teletherapy for speech and language services for patients who live farther from the clinical facility—a more feasible option with broader implementation of remote appointments during the coronavirus disease 2019 pandemic (Dimer et al. 2020; Tohidast et al. 2020).

Third, the CI team should reflect on the child's hearing aid retention and daily device use preimplant. The Outcomes of Children with HL study found children wearing their devices at least 10 hr per day learn language faster than children with less daily device use (Tomblin et al. 2015). Recent evidence supports the link between mean daily CI use and early auditory skills (Wiseman et al., 2021), speech recognition (Fryauf-Bertschy et al. 1997; Spencer et al. 2004; Wie et al. 2007; Easwar et al. 2018), and language abilities (Park et al. 2019a; Busch et al. 2020; Gagnon et al. 2020). The literature lacks a daily dose recommendation for pediatric implant users, although Park et al. (2019a) report better receptive and expressive language in children wearing their devices at least 80% of age-appropriate "hearing hours" (accounting for differences in sleep patterns by age). The positive effect of consistent use of auditory technology on communication outcomes persists regardless of device type. However, clinicians should acknowledge some children may resist wearing their hearing aid consistently because they do not perceive benefit from it, and this may not have a direct correspondence with consistent use of a CI.

Audiologic Evaluation

Hearing History • An accurate, comprehensive hearing health history underlies not only diagnosis, but also prognosis relative

to progression of HL, appropriateness of implantation, expectations for postimplant development, and counseling. Key components of a hearing health history include onset of HL, duration of profound HL, duration of hearing aid use (including current hearing aid use or lack thereof), and etiology of HL (Wolfe 2018). Poorer postoperative outcomes in children coincide with longer duration of deafness (Fryauf-Bertschy et al. 1997; Dowell et al. 2002; Vincenti et al. 2014), inconsistent hearing aid use (Teagle & Eskridge 2010), presence of syndromic or genetic etiology (Eze et al. 2013; Busi et al. 2015; Cejas et al. 2015), perinatal problems (e.g., cytomegalovirus, kernicterus, hypoxia) (Philippon et al. 2010; Kang et al. 2016), and atypical cochlear anatomy—especially narrow internal auditory canals and common cavity malformations (Busi et al. 2015; Kang et al. 2016).

Diagnostic Audiologic Evaluation • The audiologic evaluation provides valuable information regarding a child's unaided hearing capability, but should not serve as the sole determining factor when considering candidacy. Assessment of residual hearing in the ear under consideration and the contralateral ear (should hearing sensitivity differ between ears) affords information important for device and electrode selection as well as possible bimodal hearing solutions (see Off-Label Considerations).

Diagnostic hearing assessments should include age-appropriate measures necessary to characterize HL. Objective electrophysiological measures using frequency-specific stimuli (i.e., tone burst auditory brainstem response [ABR] or auditory steady state response) can provide estimates of type and degree of HL with completion of both air and bone conduction testing. These results facilitate hearing aid fitting at an early age (Baldwin & Watkin 2013; Hang et al. 2015; Leigh et al. 2019). A strong correlation exists between click ABR and tone burst/auditory steady state response thresholds and subsequent behavioral hearing thresholds from 1000 to 4000 Hz (Johnson & Brown 2005; McCreery et al. 2015). However, ABR thresholds can overestimate the best pure-tone threshold by more than 20 dB at some frequencies, justifying the need to obtain a behavioral audiogram (Picton et al. 2005; Baldwin & Watkin 2013; McCreery et al. 2015; Leigh et al. 2019). Even when a child has no response on diagnostic ABR testing, clinicians should seek confirmation of hearing thresholds with behavioral testing (Hang et al. 2015).

Other objective measures such as tympanometry should be completed at each visit to rule out middle ear dysfunction (e.g., otitis media), which can delay the implantation process without proactive management (Hang et al. 2015). Clinicians also should test acoustic reflexes and otoacoustic emissions as a cross-check for degree of HL (Jerger & Hayes 1976) and diagnosis of auditory neuropathy spectrum disorder (ANSD) (Berlin et al. 2010).

Evaluations also should include the following behavioral measures: parental questionnaires about auditory skills (e.g., LittlEARS, Auditory Skills Checklist), ear-specific unaided air and bone conduction threshold testing to determine hearing levels and to cross-check electrophysiological results, and speech recognition abilities, if possible (see Speech Recognition Testing). Ideally, audiologists with specific experience working with children will conduct the behavioral testing in a CI evaluation. Clinicians should be aware of the importance of obtaining ear-specific information required for selection of device configuration (e.g., ear selection for implantation, consideration of bimodal fitting; Bruce et al. 2014; Davidson et al. 2019) and documentation for insurance authorization (see Other considerations).

Speech Recognition Testing • Use of a uniform test battery for children with HL facilitates continuity of care, assists in clinical decision-making (e.g., transition from hearing aids to CIs or addition of remote microphone technology), and allows clinicians and researchers to define benchmarks for an aggregate clinical population—as evidenced by the Minimum Speech Test Battery for adults (Luxford 2001; Minimum-Speech-Test-Battery 2011; Spahr et al. 2012; Holder et al. 2018; Prentiss et al. 2020).

The Pediatric Minimum Speech Test Battery (PMSTB) by Uhler et al. (2017) includes a hierarchical organization of perceptual tasks ranging from prelexical instruments (e.g., parental questionnaires and speech discrimination testing) to lexically-based word and sentence tests administered in quiet and/or noise (Peterson & Lehiste 1962; Bench et al. 1979; Jerger & Jerger 1984; Moog & Geers 1990; Kirk et al. 1997; Etymotic Research 2005; Spahr et al. 2014) (see Appendix C, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884). The PMSTB recommends tests, in quiet and in noise, as a function of chronologic age and language age (e.g., receptive and expressive language skills), and provides guidance for when to move from one test to another. Figure 4 displays a skeleton version of the PMSTB protocol (see Uhler et al. 2017 for the full battery). Ideally, each testing session should yield a measure of word recognition, sentence recognition in quiet, and sentence recognition in noise. However, clinicians must be realistic in assessing a child's ability to complete a variety of tasks within a single session and recognize the need to schedule a follow-up testing session.

Functional Listening Assessment • Although audiologic testing identifies which sounds a child hears, functional listening assessments determine what meaning the child derives from the detected sounds through a diverse range of skills (see Appendix D, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884). This testing can be performed by an audiologist, speech-language pathologist, early intervention specialist, or teacher of the deaf, but should be completed by a professional with experience in treating children with HL.

Functional listening assessments may include analysis of suprasegmental features (e.g., duration, intensity, pitch) which form the basis for rhythm, timing, and stress in language (Moog & Geers 1990; Moog et al. 1995; Zimmerman-Phillips et al. 2000; Stredler-Brown & Johnson 2004a, b; Wilkes & Children 2001; Ertmer 2003). These assessments also may examine the child's ability to hear distinctive features necessary to identify vowels and consonants (Ling 1976, 1989; Ertmer 2003, 2015; Meinzen-Derr et al. 2007; Walker 2009; Sindrey 2014) or identify speech sounds, words, or sentences (Moog & Geers 1990; Robbins et al. 1991; Moog et al. 1995; Zimmerman-Phillips et al. 2000; Wilkes & Children 2001; Ertmer 2003; Kuehn-Inacker et al. 2003; Ching & Hill 2007; Meinzen-Derr et al. 2007). Functional listening assessment may include how a child's listening changes with noise and distance to provide real-life examples of how a child truly performs with the current amplification in noisy environments such as classrooms, community locations, and home (Johnson & VonAlmen 1997).

Hearing Aid Fitting and Evaluation • Figure 3 summarizes clinical practice guidelines on pediatric amplification from the American Academy of Audiology (2013). These guidelines support use of prescriptive formulae with targets based on pediatric, not adult, hearing needs in programming hearing aids to optimize

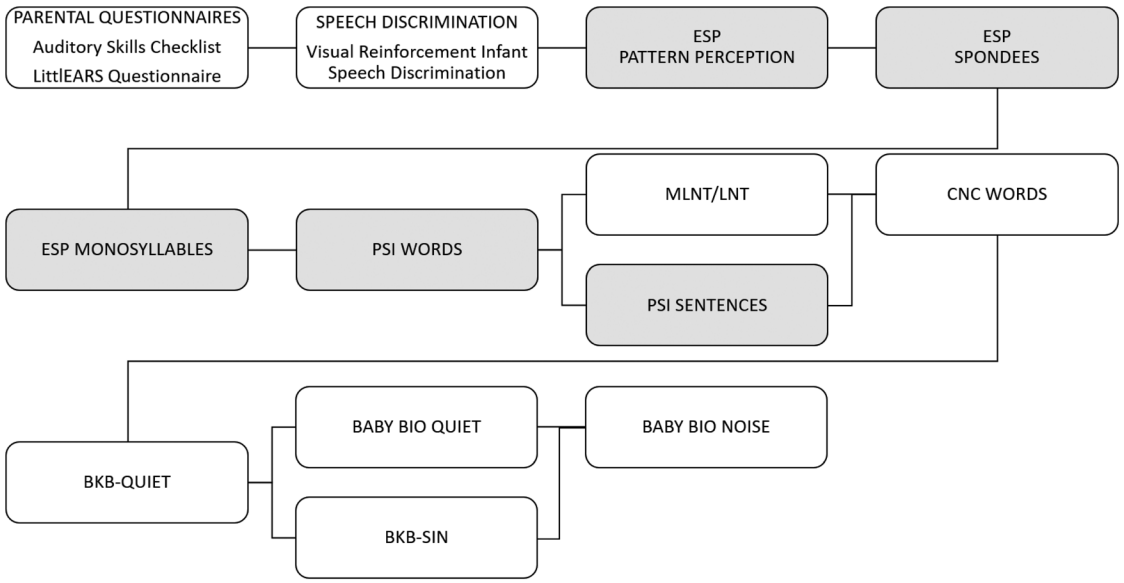

Fig. 3. Speech perception measures that comprise the Pediatric Minimum Speech Test Battery by Uhler et al. (2017). Gray boxes indicate closed-set measures. Baby Bio indicates Pediatric AzBio test; BKB-Quiet, Bamford-Kowal-Bench test in quiet; BKB-SIN, Bamford-Kowal-Bench Speech-in-Noise test; CNC, Consonant-Nucleus-Consonant test; ESP, Early Speech Perception test; LNT, Lexical Neighborhood test; MLNT, Multisyllabic Lexical Neighborhood Test; PSI, Pediatric Sentence Intelligibility test.

auditory access. Verification of hearing aid fittings—objective measures that ensure device settings afford maximum audibility across a wide frequency range at a comfortable level without over-amplification—should occur via real ear measurements or real ear to coupler difference measurements, which accommodate individual differences in ear canals based on anatomy, size, and/or chronologic age to ensure provision of adequate amplification. Validation of hearing aid fittings denotes subjective measures that quantify perceived cost and benefit or changes in quality of life relative to use of auditory technology. This typically involves aided testing, aided speech awareness and recognition testing in the best aided condition and in the ear to be implanted for older children, and parent/caregiver questionnaires for younger children. Aided testing should be completed after optimization of hearing aid fitting and confirmation of full-time device use. However, aided testing should not be the sole source of validation nor used in isolation to make candidacy decisions.

Not all implant candidates fit a typical audiometric profile. Children who do not make the expected progress with hearing aids to achieve auditory, speech, or language milestones, despite full-time use and participation in intervention, should be referred for evaluation.

Medical Evaluation/Status

Patient and Family Medical History • The medical professional evaluating CI candidacy for a child should consider both family and individual history. Family history affords a detailed assessment of the presence of premature, severe to profound, syndromic or nonsyndromic HL. A child's individual history specifies perinatal history (e.g., cytomegalovirus, prematurity,

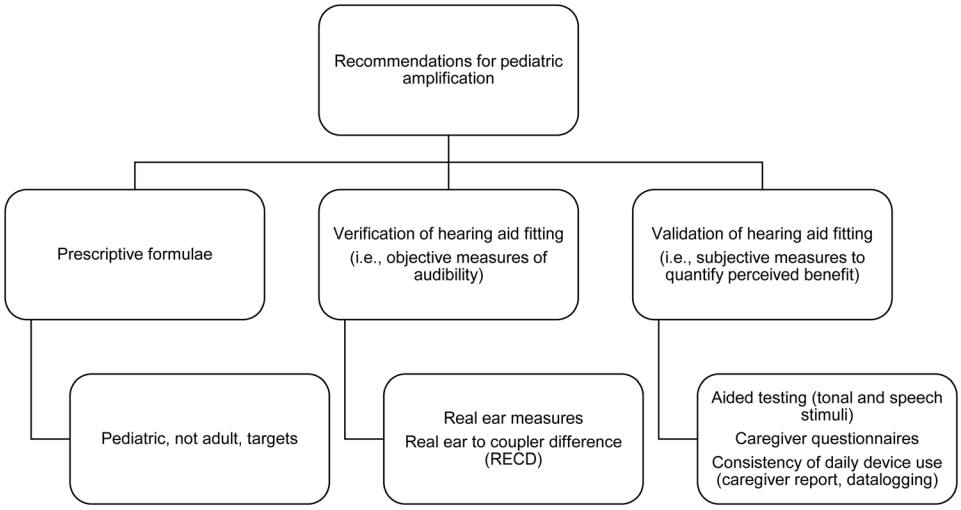

Fig. 4. Summary of guidelines for pediatric amplification. This figure is adapted from the American Academy of Audiology (2013) practice guideline on pediatric amplification, focusing on prescriptive formulae, verification, and validation of hearing aid fittings.

kernicterus, hypoxia) and otologic history (e.g., noise exposure, ototoxic medications, chronic ear disease, ear surgery, trauma). A child's medical, demographic, and otologic history contribute to determination and prognosis of candidacy, but few absolute contraindications exist in pediatric implantation.

Physical Examination • Consideration of medical candidacy for CI surgery may require input from several disciplines (e.g., otolaryngologist, neurotologist, neuroradiologist, genetic counselor, CI team). Physical evaluation of a pediatric implant candidate should include otologic and neurotologic examination, otomicroscopy, and assessment of syndromic features to a cranial nerve examination, and assessment of neurologic findings.

Additional Assessments: Genetic Testing and Imaging • Genetic testing is recommended for all children identified with HL. For imaging, both high resolution computed tomography and magnetic resonance imaging provide important information about anatomy, which influences the candidacy decision. Appropriate imaging allows the surgeon to ascertain the presence of cochleae and cochlear nerves, cochlear malformations and caliber of cochlear nerves, and the presence of other anatomic factors that might affect surgical planning. Thus, when selecting an imaging technique, physicians should use their discretion while also assessing cost, benefit, and risk on a case-by-case basis (Adunka et al. 2007; Vincenti et al. 2014; Digge et al. 2016).

Vaccinations • The Centers for Disease Control recommend pediatric CI candidates receive two of the standard childhood vaccines and one additional vaccination at age 2 years to protect against meningitis (see Appendix E, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884; details about recommended vaccinations are available at https://www.cdc.gov/vaccines/vpd/mening/public/dis-cochlear-faq-gen.html).

Speech and Language Evaluation

A determination of pediatric candidacy for implantation should include frequent speech and language assessments to determine if a child is making a month's progress in the same amount of time. Implant candidates typically demonstrate deficits in speech and/or spoken language due to insufficient access through appropriately fit and consistently worn hearing aids. Children with SSD, progressive, steeply sloping, or later onset HL (i.e., after developing spoken language) may have age-appropriate speech and language, so the CI team should consider signs of skill regression, the risk for future delays in speech and language, cognitive or listening fatigue, and the added time needed for processing auditory information through an impaired auditory system (Tharpe & Gustafson 2015).

Speech and language testing ought to be completed by a therapist with experience managing children with HL, particularly those with CIs, to afford comprehensive discussion of expectations and appropriate setting of goals (Tharpe & Gustafson 2015). When the goal for the child is age-appropriate speech and spoken language, then tests standardized on children without HL are appropriate to use. Specific assessment batteries may vary by age, but should include speech, language, and functional listening assessments (see Appendices D and F, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884).

Speech Assessment • Speech production evaluations encompass the quality and quantity of speech sounds produced (see Appendix F, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884). For preverbal children, this may include analysis of suprasegmental features (duration, intensity, and pitch) and vowels, consonants, and syllable combinations produced by the child (Goldman & Fristoe 2015; Fudala & Stegall 2017). Speech assessments advance from production of isolated sounds to measures at the word level and conversational intelligibility (i.e., how well the child is understood). For all children, clinicians can evaluate fluency, resonance, and voice quality of productions.

Children with severe to profound HL without CIs often have predictable speech patterns due to unclear hearing of phonemes and poor auditory feedback for their own productions. These speech differences include slower speaking rate, higher occurrence of prolonged vowels, hypernasality, centralized vowels, and restricted consonant repertoires (e.g., more labial and stop consonants) (Blamey et al. 2001; Warner-Czyz & Davis 2008; Baudonck et al. 2015; Sebastian et al. 2015; Jafari et al. 2016).

Language Assessment • Children with HL may demonstrate deficits in spoken language, which could reflect inadequate amplification, inappropriately fit hearing aids, decreased hearing sensitivity, inadequate daily device use of hearing aids, or additional diagnoses (Berger 2011; Hewitt et al. 2012; Madell et al. 2019). Pediatric CI candidates show delayed spoken language milestones (e.g., later babbling onset, restricted receptive, and expressive vocabulary) compared with age-matched peers with typical hearing via both informal criterion-based measures and formal standardized measures (Niparko et al. 2010; Penna et al. 2014, 2015). In addition, children with HL show differences in grammar, social pragmatic skills, and figurative language on standardized measures (see Appendix F, Supplemental Digital Content 1, http://links.lww.com/EANDH/A884).

Counseling and Therapy

Parent Alignment With Goals and Clinical Techniques • The strength of the family-practitioner relationship largely determines how well caregivers understand and follow through with team recommendations. Informed consent of the family is critical; parent engagement serves as a primary predictor of outcomes in children enrolled in early intervention (Moeller 2000). The parents' answers to two foundational questions drives much of the team's decision-making and counseling with the family:

1. What are your goals for your child?
2. What are your goals in seeking CIs for your child?

Device Selection and Communication Mode • During candidacy evaluation, professionals should discuss the range of available options for CI devices. Device selection includes not only the manufacturer, but also the speech processors, external accessories, and connectivity of the implant system.

Audiologists and speech-language pathologists also should discuss the spectrum of communication options ranging from reliance on visual language to spoken language (e.g., American Sign Language, Bilingual-Bicultural, Listening and Spoken Language) and, when possible, introduce the family to deaf mentors or families successfully using various communication modalities (Robbins 2009; Tharpe & Gustafson 2015; Humphries et al. 2020). This discussion may span multiple sessions from multiple professionals on the CI team to ensure parental understanding and informed choice of communication options. The CI team should highly value parent choice. Parents also should be aware that the child's communication modality may change as a function of the child's progress and preferred

mode of communication. Also, depending on the child's age relative to critical windows for auditory and language development, switching to a CI does not guarantee fluent use of spoken language, but that does not negate other potential benefits such as increased environmental sound awareness and general well-being. Regardless of communication modality, counseling should incorporate discussions with the family about use of appropriate amplification during all waking hours and realistic expectations of how a CI may support the child.

Helping families understand the degree to which each option emphasizes and reinforces auditory input will help guide discussions on realistic expectations and motivation for a CI (Robbins 2009; Tharpe & Gustafson 2015). Although each method of communication has at least some children who perform at high levels, the likelihood of achieving strong spoken language skills increases substantially in more auditory-based programs (Robbins 2009; Geers et al. 2017).

Psychosocial Well-Being • CI candidacy evaluations benefit from inclusion of a social worker, clinical psychologist, counselor and/or therapist to assess the child's cognitive function and general development and evaluate the family's support, commitment, and motivation (Bathgate et al. 2013; Madell & Flexer 2019). These professionals can evaluate the family's commitment to not only undergoing surgery, but also engaging in the intense follow-up appointments and aural (re)habilitation protocol required to maximize outcomes postimplantation (Heman-Ackah et al. 2012).

Acknowledgment and management of potential barriers to family participation also underlie a child's success after implantation. A social worker could help facilitate accommodations such as arrangement of transportation or daycare, assistance with paperwork, or coordination of appointments. A psychologist's evaluation of a child's level of functioning and mental well-being can direct family-based discussions on realistic expectations (Bathgate et al. 2013). First, nonverbal intelligence consistently predicts communication outcomes in children with CIs (Geers et al. 2002, 2003; Phillips et al. 2014; Park et al. 2015), though these relationships may be confounded by language skills. Second, assessment of psychological factors (e.g., emotions, internalizing and externalizing behaviors) may benefit a candidacy evaluation due to higher rates of aggression, anxiety, and attention deficits in children with HL (Theunissen et al. 2014; Saki et al. 2019). Third, examination of social factors (e.g., peer relationships, family circumstances, and cultural issues) provides a framework for intervention (Bathgate et al. 2013). Family socioeconomic characteristics may not affect the decision to implant (Brkic et al. 2010), but children from families with lower socioeconomic status, maternal education, and caregiver support tend to have poorer outcomes postimplantation (Niparko et al. 2010; Geers & Sedey 2011; Ching & Dillon 2013) so the family may need additional support to minimize barriers.

The team should consider and respect each family's home language and culture (e.g., multilingualism, hearing and deaf community involvement) because these issues may influence decisions, including the type of therapeutic intervention to pursue for a child. Use of a language other than English in the home is never a reason to exclude a child from CI candidacy. Finally, engagement with a professional trained in counseling or therapy can connect families with appropriate public and private resources (e.g., Department of Developmental Disabilities, community and online support groups) to reduce stress in all areas, including financial planning.

Therapeutic Intervention • Speech, language, and listening therapy forms an essential component of (re)habilitation pre- and postimplantation. Selection of the therapist should emphasize the skill set (i.e., expertise in working with children who are deaf or hard of hearing), not the degree designation of the professional providing the services (e.g., speech-language pathologist, audiologist) (Tharpe & Gustafson 2015). In addition, practitioners have different exposure in different communication modalities. For example, a certified auditory-verbal practitioner can provide services promoting listening and spoken language; other clinicians have experience guiding families with sign language in combination with oral language. It is important to find a professional who can provide services in a specific child's preferred mode of communication.

Therapy Before Cochlear Implantation • By receiving speech and language services with appropriately fit hearing devices before implantation, the CI team can establish whether the child is making adequate progress with their hearing aids or has potential to perform better with a CI. Most children with HL have some unaided or aided access to sound and speech; thus, therapy should begin soon after identification of HL and receipt of hearing devices. Therapy while waiting for a CI allows development of early auditory, functional listening, speech, and language skills to the best of the child's ability. Involving caregivers in therapy sessions prepares them to serve as the child's primary teacher for ongoing communication skill development and advocacy skills.

Educational Placement • Depending on the child's age, professionals should discuss realistic expectations for educational environments. This involves assessing the child's educational needs in their own environment, at home, and at school; available services in the child's school district (e.g., auditory technology, sign language interpreter, teacher of the deaf); and guiding families through the process to obtain such services to maximize future use of the CI at home and at school.

Other Considerations

Presence of Other Exceptionalities • The presence of secondary disabilities other than HL occurs in one-third of children with HL (Birman et al. 2012; Roush & Wilson 2013; Archbold et al. 2015; Cupples et al. 2018). The most common comorbid conditions include intellectual disabilities, learning disabilities, and developmental delay. Although children with HL and other exceptionalities often have lower mean performance levels, slower rate of skill acquisition, and greater variability in communication outcomes compared with those without other exceptionalities, additional conditions should not automatically preclude cochlear implantation.

Due to the unpredictability and variability in communication outcomes in children with HL who have additional disabilities, professionals and parents may need to define progress differently relative to speech, language, and hearing milestones. Understanding the family's reasons, expectations, and goals for their child's future with a CI is critical. Clinicians may need to examine nontraditional factors such as the child's use of amplification or changes in the child's affect and social engagement while using auditory technology (Clark et al. 2007; Meinzen-Derr et al. 2010; Hayward et al. 2016).

Children with ANSD, a heterogeneous group, constitute ~10% of children with HL (Ching et al. 2013). Children with ANSD often exhibit inconsistent response to sound, which can make it difficult to determine adequacy of hearing aid fitting preimplantation and CI fitting postactivation (Berlin et al. 2010; Teagle et al. 2010). Children should be evaluated as potential CI candidates based on their speech perception scores, parent questionnaires, and therapist reports even if audiometric threshold results do not meet typical candidacy guidelines (Rance & Barker 2008). ANSD often presents with disproportionately poor speech recognition abilities—particularly in noise—relative to degree of HL (Rance & Barker 2008; Berlin et al. 2010).

Device Configuration • Professionals and families must decide on the configuration of auditory technology (i.e., unilateral CI, bilateral CIs, or bimodal with a CI on one side and a hearing aid on the contralateral ear). Bilateral CIs or bimodal configurations take advantage of binaural benefits such as improved localization and better speech perception in noise (Litovsky 2011; Schafer et al. 2011; Litovsky & Gordon 2016). Bimodal configurations capitalize on residual hearing in the contralateral ear, which contributes to improved speech perception in noise, better music perception, and possibly better speech production (especially suprasegmental quality) compared with other device configurations (Nittrouer et al. 2012; Wenrich et al. 2017; Davidson et al. 2019). However, binaural configurations may not be suitable for all children with HL, including those with absent/abnormal cochleovestibular anatomy, additional exceptionalities (e.g., to reduce sensory stimulation), or SSD. In cases of unilateral or bimodal configurations, audiologists should regularly monitor the auditory status of the nonimplanted ear to determine the potential need for a second implant.

Insurance Coverage • FDA labeling and Medicaid coverage for CIs defines candidates more conservatively than current practices throughout the United States (FDA 2000, 2019, 2020a, b, c; Medicaid, 2021; Services 2005). Centers for Medicare and Medicaid Services last updated their Decision Memo for cochlear implantation in 2005 (https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=134), and deemed CIs a covered benefit for Medicaid recipients up to age 20 years (https://www.medicaid.gov/medicaid/benefits/early-and-periodic-screening-diagnostic-and-treatment/index.html). Because each state administers its own Medicaid programs, differences exist in determination of CI candidacy requirements. Thus, children with the same degree of HL and speech perception scores may meet eligibility requirements for an implant through some state Medicaid or private insurance programs, but not others. This position paper aims to reduce such candidate inconsistency. If consistent candidacy guidelines (e.g., 50/70+ protocol) were adopted by the FDA and Centers for Medicare and Medicaid Services, children across the country would have equal opportunities to receive a CI if they were deemed a candidate by their implant team.

Off-Label Considerations • While standard FDA CI candidacy approvals exist, clinicians often use cochlear implantation for children outside these guidelines (i.e., younger age at implantation, better speech perception, more residual hearing) when they feel the advantages significantly outweigh disadvantages—also known as "off-label" implantation. More than three-fourths of surgeons in the United States currently implant off-label (Carlson et al. 2018). The FDA has released statements regarding responsible use of off-label devices in certain circumstances (see https://www.fda.gov/regulatory-information/search-fda-guidance-documents/label-and-investigational-use-marketed-drugs-biologics-and-medical-devices).

Age at Implantation • The FDA approved age of implantation at 9 and 12 mo; however, hundreds of children have received devices at earlier ages. For example, if a child sustained profound HL due to meningitis and imaging provides evidence of fibrosis and ossification, the child should receive a CI as soon as possible because a completely ossified cochlea might prohibit full insertion of the electrode array, likely resulting in a poor outcome (Rotteveel et al. 2005; Roland et al. 2008; Nichani et al. 2011; Black et al. 2014; Liu et al. 2015). In addition, many centers routinely implant infants (6 to 9 mo) if they feel confident in the behavioral and physiologic testing results. The literature supports the efficacy and safety of this approach, with no higher risk of implantation in a child at 6 versus 12 mo of age (Roland et al. 2009; Heman-Ackah et al. 2012; Friedmann et al. 2020). Moreover, children implanted before 12 mo exhibit better speech, language, and auditory outcomes than those implanted after 12 mo, supporting the benefit the brain receives from meaningful auditory information at a younger age (Waltzman & Roland 2005; Vlastarakos et al. 2010; Leigh et al. 2013; Nicholas & Geers 2013; Mitchell et al. 2019; Dettman et al. 2021).

Speech Recognition Skills • Speech recognition abilities represent another boundary pushed by off-label implantation. Current FDA guidelines base pediatric candidacy on speech perception skills (when measured). The criteria indicate sentence comprehension, but do not specify the measure, stimulus intensity, or listening condition (quiet or noise). Clinicians increasingly rely on word versus sentence recognition to reduce confounding effects of cognitive factors (e.g., working memory, top-down processing) on speech perception skills.

Presence of Residual Hearing • Current practice also challenges the traditional implantation criteria of severe to profound HL. Low-frequency residual hearing in both the implanted and nonimplanted ear has been used as a valuable tool to predict speech perception outcomes in pediatric implant recipients (Chiossi & Hyppolito 2017). Preservation of residual hearing is possible (Skarzyński et al. 2002; James et al. 2005; Rajan et al. 2018; Park et al. 2019b) and can lead to better speech perception in noise (Dettman et al. 2004; Mok et al. 2010; Wolfe et al. 2017; Park et al. 2019b), appreciation of music (Gfeller et al. 2006; Yüksel et al. 2019), psychoacoustics (i.e., pitch perception) (Yüksel et al. 2019), and improved sound quality (James et al. 2005). The presence of residual hearing should not be a deterrent to implantation, but should influence surgical technique, electrode choice, and consideration of acoustic plus electric hearing in the implanted ear.

Electroacoustic Stimulation • Electroacoustic stimulation (EAS) devices represent an emerging technology for children with no more than a moderate HL in the low frequencies and a severe HL in the high frequencies. EAS devices include an acoustic component in the low frequencies and an electric CI component in the high frequencies. At present, all three FDA-approved manufacturers have EAS options with ear-level processors, but no EAS options have received FDA approval for use in children. Recent outcomes with hearing preservation, electrode technology, and surgical techniques during pediatric implantation detail superior results, especially with hearing in noise and

music appreciation (Dettman et al. 2004; Gfeller et al. 2006; Mok et al. 2010; Wolfe et al. 2017; Park et al. 2019b; Yüksel et al. 2019). However, low-frequency residual hearing in a child has a higher risk of degradation over time than in adults with stable low frequency hearing. Therefore, surgeons should consider a longer electrode array to accommodate conversion from EAS to electrical stimulation only over time. The audiologist, in tandem, can fit the acoustic component of a sound processor with the presence of residual and usable low-frequency hearing.

Single-Sided Deafness • Many children with SSD struggle despite hearing aid or osseointegrated amplification. Children with unilateral HL have increased risk for speech, language, social, and academic difficulties (e.g., 10 times more likely to repeat a grade than peers with typical hearing) (Bess & Tharpe 1988; Kenworthy et al. 1990; Tharpe 2008; Lieu et al. 2012; Anne et al. 2017; Mahomva et al. 2021). Children with SSD receiving CIs show positive outcomes similar to adults (e.g., speech recognition in noise, localization, and confidence) compared with other technology options (e.g., contralateral routing of sound hearing aid, bone-anchored hearing aid) (Vlastarakos et al. 2014; Friedmann et al. 2016; Greaver et al. 2017; Polonenko et al. 2017; Sladen et al. 2017a, b; Zeitler et al. 2019), and the FDA recently approved implantation for children (≥5 years) with SSD (FDA, Reference Note 1) (Greaver et al. 2017; Zeitler et al. 2019). Implantation for SSD has gained momentum in young children, especially in patients with conditions that put the better-hearing ear at risk (e.g., cytomegalovirus) (Friedmann et al. 2016). Magnetic resonance imaging forms a crucial component in the consideration to proceed with implantation in children with SSD to determine the status of the cochlear nerve and the cochlea (Friedmann et al. 2016). Nearly half of children with SSD have cochlear nerve deficiency or no cochlear nerve on the affected side (Buchman et al. 2006). The presence of inner ear malformations (e.g., common cavity, enlarged vestibular aqueduct) in the poorer-hearing ear increases the urgency to implant to combat negative cascading effects associated with longer durations of deafness. Thus, the implant team should discuss with parents and caregivers the option of implanting a child with SSD at a young age to reap the benefits of this technology.

SUMMARY/GUIDELINES FOR IDENTIFICATION OF CI CANDIDATES

1. Numerous factors influence pediatric CI candidacy. This document specifies audiologic (i.e., severe to profound sensorineural HL) and medical criteria. However, an unsuccessful hearing aid user who does not achieve month-for-month progress in speech, language or hearing; who has poor functional listening due to HL; and/or who has reduced quality of life should be considered for referral.
2. Evidence suggests ear-specific consideration in cases of asymmetric HL.
3. Cochlear implantation should not be a last resort. Earlier implantation leads to better outcomes in children.
4. Residual hearing in both the implanted and nonimplanted ear can lead to better speech understanding in noise, music appreciation, and sound quality. The presence of residual hearing should not be a deterrent to implantation, but should influence surgical technique, electrode choice, and consideration of acoustic plus electric hearing in the implanted ear.
5. Implementation of and commitment to an aural (re) habilitation program is necessary and required.
6. FDA and Medicaid guidelines do not necessarily align with best clinical practice. The CI team should use evidence-based practice to guide clinical decision-making and should not rely on payer policies to determine candidacy. Rather, consideration of coverage should be included in counseling to supplement clinical recommendations.
7. When an individual is determined to be a CI candidate, consideration should also be given to the nonimplanted ear to allow for appropriate recommendations for hearing technology for optimization of overall hearing and use of compatible accessories.
8. There are no inappropriate referrals for a CI. If a patient does not meet candidacy criteria, the evaluation will provide an opportunity for counseling and a baseline for monitoring progression. Early intervention in the form of implantation or improved amplification is paramount, but missing an opportunity to improve a patient's auditory access and quality of life can be extremely detrimental to their long-term hearing health.
9. While medical, demographic, and otologic history deserve consideration in determining candidacy, they are rarely absolute contraindications.

CONCLUSIONS

Professionals working with children who have HL should closely monitor the development of communication skills with hearing aids to determine if and when they should refer a child with HL for a comprehensive evaluation by the CI team. Research findings and clinical expertise often precede changes in FDA, necessitating attention to ever-changing standards of evidence-based practice for pediatric cochlear implantation. Finally, adoption of a team-based approach will facilitate optimization of candidacy decisions and communication outcomes for each individual child.

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Address for correspondence: Andrea D. Warner-Czyz, The University of Texas at Dallas, Callier Advanced Hearing Research Center, 1966 Inwood Road, Dallas, TX 75235, USA. E-mail: warnerczyz@utdallas.edu

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REFERENCES

Abidin, R. R. (1995). Parenting Stress Index: Professional Manual. Psychological Assessment Resources, Inc.

Adunka, O. F., Jewells, V., Buchman, C. A. (2007). Value of computed tomography in the evaluation of children with cochlear nerve deficiency. *Otol Neurotol, 28*, 597–604.

American Academy of Audiology. (2013). Clinical Practice Guidelines: Pediatric Amplification. American Academy of Audiology.

Anne, S., Lieu, J. E. C., Cohen, M. S. (2017). Speech and language consequences of unilateral hearing loss: A systematic review. *Otolaryngol Head Neck Surg, 157*, 572–579.

Archbold, S., Athalye, S., Mulla, I., Harrigan, S., Wolters-Leermakers, N., Isarin, J., Knoors, H. (2015). Cochlear implantation in children with complex needs: The perceptions of professionals at cochlear implant centres. *Cochlear Implants Int, 16*, 303–311.

Archbold, S. M., Lutman, M. E., Gregory, S., O'Neill, C., Nikolopoulos, T. P. (2002). Parents and their deaf child: Their perceptions three years after cochlear implantation. *Deafness Educ Int*, *4*, 12–40.

Archbold, S. M., Sach, T., O'Neill, C., Lutman, M. E., Gregory, S. (2008). Outcomes from cochlear implantation for child and family: Parental perspectives. *Deafness Educ Int*, *10*, 120–142.

Armstrong, M., Maresh, A., Buxton, C., Craun, P., Wowroski, L., Reilly, B., Preciado, D. (2013). Barriers to early pediatric cochlear implantation. *Int J Pediatr Otorhinolaryngol, 77*, 1869–1872.

Athalye, S., Archbold, S., Mulla, I., Lutman, M., Nikolopoulous, T. (2015). Exploring views on current and future cochlear implant service delivery: The perspectives of users, parents and professionals at cochlear implant centres and in the community. *Cochlear Implants Int, 16*, 241–253.

Baldwin, M., & Watkin, P. (2013). Predicting the degree of hearing loss using click auditory brainstem response in babies referred from newborn hearing screening. *Ear Hear, 34*, 361–369.

Bathgate, F., Bennett, E., Cropper, J., Edwards, L., Emond, A., Gamble, C., Kentish, R., Samuel, V. (2013). Good practice guidelines for clinical psychologists working in paediatric cochlear implant teams. *Cochlear Implants Int*, *14*(Suppl 4), S32–S34.

Baudonck, N., Van Lierde, K., D'haeseleer, E., Dhooge, I. (2015). Nasalance and nasality in children with cochlear implants and children with hearing aids. *Int J Pediatr Otorhinolaryngol, 79*, 541–545.

Bench, J., Kowal, A., Bamford, J. (1979). The BKB (Bamford-Kowal-Bench) sentence lists for partially-hearing children. *Br J Audiol, 13*, 108–112.

Berger, J. (2011). Overstimulation in children with cochlear implants. 13th Symposium on Cochlear Implants in Children, Chicago, IL.

Berlin, C. I., Hood, L. J., Morlet, T., Wilensky, D., Li, L., Mattingly, K. R., Taylor-Jeanfreau, J., Keats, B. J., John, P. S., Montgomery, E., Shallop, J. K., Russell, B. A., Frisch, S. A. (2010). Multi-site diagnosis and management of 260 patients with auditory neuropathy/dys-synchrony (auditory neuropathy spectrum disorder). *Int J Audiol, 49*, 30–43.

Bess, F. H., & Tharpe, A. M. (1988). Performance and management of children with unilateral sensorineural hearing loss. *Scand Audiol Suppl, 30*, 75–79.

Birman, C. S., Elliott, E. J., Gibson, W. P. (2012). Pediatric cochlear implants: Additional disabilities prevalence, risk factors, and effect on language outcomes. *Otol Neurotol, 33*, 1347–1352.

Bittencourt, A. G., Torre, A. A., Bento, R. F., Tsuji, R. K., Brito, R. D. (2012). Prelingual deafness: Benefits from cochlear implants versus conventional hearing aids. *Int Arch Otorhinolaryngol, 16*, 387–390.

Black, J., Hickson, L., Black, B., Khan, A. (2014). Paediatric cochlear implantation: Adverse prognostic factors and trends from a review of 174 cases. *Cochlear Implants Int, 15*, 62–77.

Blamey, P. J., Barry, J. G., Jacq, P. (2001). Phonetic inventory development in young cochlear implant users 6 years postoperation. *J Speech Lang Hear Res, 44*, 73–79.

British CI Group. (2017). Consensus statement on candidacy for cochlear implantation. https://www.cicandidacy.co.uk.

Brkic, F., Piric, L., Salihovic, N., Kabil, J. (2010). Cochlear implantation in children: Socioeconomic family characteristics. *Med Arh, 64*, 25–27.

Bruce, I. A., Felton, M., Lockley, M., Melling, C., Lloyd, S. K., Freeman, S. R., Green, K. M. (2014). Hearing preservation cochlear implantation in adolescents. *Otol Neurotol, 35*, 1552–1559.

Bruijnzeel, H., Bezdjian, A., Lesinski-Schiedat, A., Illg, A., Tzifa, K., Monteiro, L., Volpe, A. D., Grolman, W., Topsakal, V. (2017). Evaluation of pediatric cochlear implant care throughout Europe: Is European pediatric cochlear implant care performed according to guidelines? *Cochlear Implants Int, 18*, 287–296.

Buchman, C. A., Roush, P. A., Teagle, H. F., Brown, C. J., Zdanski, C. J., Grose, J. H. (2006). Auditory neuropathy characteristics in children with cochlear nerve deficiency. *Ear Hear, 27*, 399–408.

Busch, T., Vermeulen, A., Langereis, M., Vanpoucke, F., van Wieringen, A. (2020). Cochlear implant data logs predict children's receptive vocabulary. *Ear Hear, 41*, 733–746.

Busi, M., Rosignoli, M., Castiglione, A., Minazzi, F., Trevisi, P., Aimoni, C., Calzolari, F., Granieri, E., Martini, A. (2015). Cochlear implant outcomes and genetic mutations in children with ear and brain anomalies. *Biomed Res Int, 2015*, 696281.

Cadieux, J. H., Firszt, J. B., Reeder, R. M. (2013). Cochlear implantation in nontraditional candidates: Preliminary results in adolescents with asymmetric hearing loss. *Otol Neurotol, 34*, 408–415.

Carlson, M. L., Sladen, D. P., Gurgel, R. K., Tombers, N. M., Lohse, C. M., Driscoll, C. L. (2018). Survey of the American Neurotology Society on Cochlear Implantation: Part 1, Candidacy Assessment and Expanding Indications. *Otol Neurotol*, *39*, e12–e19.

Carlson, M. L., Sladen, D. P., Haynes, D. S., Driscoll, C. L., DeJong, M. D., Erickson, H. C., Sunderhaus, L. W., Hedley-Williams, A., Rosenzweig, E. A., Davis, T. J., Gifford, R. H. (2015). Evidence for the expansion of pediatric cochlear implant candidacy. *Otol Neurotol, 36*, 43–50.

Cejas, I., Hoffman, M. F., Quittner, A. L. (2015). Outcomes and benefits of pediatric cochlear implantation in children with additional disabilities: A review and report of family influences on outcomes. *Pediatric Health Med Ther, 6*, 45–63.

Ching, T. Y., Day, J., Seeto, M., Dillon, H., Marnane, V., Street, L. (2013). Predicting 3-year outcomes of early-identified children with hearing impairment. *B-ENT,* (Suppl 21), 99–106.

Ching, T. Y., & Dillon, H. (2013). Major findings of the LOCHI study on children at 3 years of age and implications for audiological management. *Int J Audiol, 52*(Suppl 2), S65–S68.

Ching, T. Y. C., Dillon, H., Button, L., Seeto, M., Van Buynder, P., Marnane, V., Cupples, L., Leigh, G. (2017). Age at intervention for permanent hearing loss and 5-year language outcomes. *Pediatrics, 140*, e20164274.

Ching, T. Y. C., Dillon, H., Leigh, G., Cupples, L. (2018). Learning from the Longitudinal Outcomes of Children with Hearing Impairment (LOCHI) study: Summary of 5-year findings and implications. *Int J Audiol*, *57*(Suppl 2), S105–S111.

Ching, T. Y., Dillon, H., Marnane, V., Hou, S., Day, J., Seeto, M., Crowe, K., Street, L., Thomson, J., Van Buynder, P., Zhang, V., Wong, A., Burns, L., Flynn, C., Cupples, L., Cowan, R. S., Leigh, G., Sjahalam-King, J., Yeh, A. (2013). Outcomes of early- and late-identified children at 3 years of age: Findings from a prospective population-based study. *Ear Hear, 34*, 535–552.

Ching, T. Y., & Hill, M. (2007). The parents' evaluation of aural/oral performance of children (PEACH) scale: Normative data. *J Am Acad Audiol, 18*, 220–235.

Chiossi, J. S. C., & Hyppolito, M. A. (2017). Effects of residual hearing on cochlear implant outcomes in children: A systematic-review. *Int J Pediatr Otorhinolaryngol, 100*, 119–127.

Clark, T. C., Johnston, J., Nussbaum, A., O'Brien, L. C., Kammerer, B. (2007). Functional outcomes in medically complex children who receive cochlear implants. International Conferences on Cochlear Implants in Children, Charlotte, NC.

Colletti, L., Mandalà, M., Colletti, V. (2012). Cochlear implants in children younger than 6 months. *Otolaryngol Head Neck Surg, 147*, 139–146.

Culbertson, D. S., & Jones, S. M. (2005). Evidence-based practice in audiology. *ASHA Perspect Admin Supervision*, *15*, 17–20.

Cupples, L., Ching, T. Y. C., Button, L., Leigh, G., Marnane, V., Whitfield, J., Gunnourie, M., Martin, L. (2018). Language and speech outcomes of children with hearing loss and additional disabilities: Identifying the variables that influence performance at five years of age. *Int J Audiol*, *57*(Suppl 2), S93–S104.

Dang, D., & Dearholt, S. L. (2018). *Johns Hopkins Nursing Evidence-Based Practice: Model and Guidelines* (3rd ed.). Sigma Theta Tau International.

Davidson, L. S. (2006). Effects of stimulus level on the speech perception abilities of children using cochlear implants or digital hearing aids. *Ear Hear, 27*, 493–507.

Davidson, L. S., Geers, A. E., Uchanski, R. M., Firszt, J. B. (2019). Effects of early acoustic hearing on speech perception and language for pediatric cochlear implant recipients. *J Speech Lang Hear Res, 62*, 3620–3637.

Desjardin, J. L. (2003). Assessing parental perceptions of self-efficacy and involvement in families of young children with hearing loss. *Volta Rev*, *103*, 391–409.

Dettman, S., Choo, D., Au, A., Luu, A., Dowell, R. (2021). Speech perception and language outcomes for infants receiving cochlear implants before or after 9 months of age: Use of category-based aggregation of data in an unselected pediatric cohort. *J Speech Lang Hear Res, 64*, 1023–1039.

Dettman, S., Choo, D., Dowell, R. (2016a). Barriers to early cochlear implantation. *Int J Audiol*, *55*(Suppl 2), S64–S76.

Dettman, S. J., D'Costa, W. A., Dowell, R. C., Winton, E. J., Hill, K. L., Williams, S. S. (2004). Cochlear implants for children with significant residual hearing. *Arch Otolaryngol Head Neck Surg, 130*, 612–618.

Dettman, S. J., Dowell, R. C., Choo, D., Arnott, W., Abrahams, Y., Davis, A., Dornan, D., Leigh, J., Constantinescu, G., Cowan, R., Briggs, R. J. (2016b). Long-term communication outcomes for children receiving cochlear implants younger than 12 months: A multicenter study. *Otol Neurotol, 37*, e82–e95.

Dettman, S., Pinder, D., Briggs, R. J., Dowell, R. C., Leigh, J. R. (2007). Communication development in children who receive the cochlear implant younger than 12 months: Risks versus benefits. *Ear Hear*, *28*(Suppl 2), 11S–18S.

Digge, P., Solanki, R. N., Shah, D. C., Vishwakarma, R., Kumar, S. (2016). Imaging modality of choice for pre-operative cochlear implaging: HRCT vs. MRI temporal bone. *J Clin Diagn Res*, *10*, TC01–TC04.

Dimer, N. A., Canto-Soares, N. D., Santos-Teixeira, L. D., Goulart, B. N. G. (2020). The COVID-19 pandemic and the implementation of telehealth in speech-language and hearing therapy for patients at home: An experience report. *Codas, 32*, e20200144.

Dowell, R. C., Dettman, S. J., Blamey, P. J., Barker, E. J., Clark, G. M. (2002). Speech perception in children using cochlear implants: Prediction of long-term outcomes. *Cochlear Implants Int, 3*, 1–18.

Dunst, C. J., Jenkins, V., Trivette, C. M. (1984). The family supprot scale: Reliability and validity. *J Individual Family Community Wellness*, *1*, 45–52.

Easwar, V., Sanfilippo, J., Papsin, B., Gordon, K. (2018). Impact of consistency in daily device use on speech perception abilities in children with cochlear implants: Datalogging evidence. *J Am Acad Audiol, 29*, 835–846.

Ertmer, D. J. (2003). Contrasts for Auditory and Speech Training. Pro-Ed.

Ertmer, D. J. (2015). The Open- & Closed-set Task. MED-EL Corporation.

Etymotic Research Inc. (2005). *BKB-SIN Speech in Noise Test (Version 1.03)*. Etymotic Research.

Eze, N., Ofo, E., Jiang, D., O'Connor, A. F. (2013). Systematic review of cochlear implantation in children with developmental disability. *Otol Neurotol, 34*, 1385–1393.

FDA. (2000). Nucleus 24 Cochlear Implant System - P970051/S011. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpma/pma.cfm?id=P970051S011.

FDA. (2020a). Medical device user fee amendments (MDUFA). January 10, 2021. https://www.fda.gov/industry/fda-user-fee-programs/medical-device-user-fee-amendments-mdufa.

FDA. (2020b). Nucleus 24 Cochlear Implant System - P970051/S172. https://www.fda.gov/medical-devices/recently-approved-devices/nucleus-24-cochlear-implant-system-p970051s172.

FDA. (2020c). Overview of device regulation. January 10, 2021. https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/overview-device-regulation.

Fitzpatrick, E. M., Ham, J., Whittingham, J. (2015). Pediatric cochlear implantation: Why do children receive implants late? *Ear Hear, 36*, 688–694.

Fitzpatrick, E., Olds, J., Durieux-Smith, A., McCrae, R., Schramm, D., Gaboury, I. (2009). Pediatric cochlear implantation: How much hearing is too much? *Int J Audiol*, *48*, 91–97.

Friedmann, D. R., Ahmed, O. H., McMenomey, S. O., Shapiro, W. H., Waltzman, S. B., Roland, J. T. Jr. (2016). Single-sided deafness cochlear implantation: Candidacy, evaluation, and outcomes in children and adults. *Otol Neurotol, 37*, e154–e160.

Friedmann, D. R., Tona, K. M., Roland, J. T. Jr, Spitzer, E. R., Waltzman, S. B. (2020). Cochlear implantation in children under 12 months: Prevalence and implications of 'hidden' disabilities. *Cochlear Implants Int, 21*, 307–312.

Friedrich, W. N., Greenberg, M. T., Crnic, K. (1983). A short-form of the questionnaire on resources and stress. *Am J Ment Defic, 88*, 41–48.

Fryauf-Bertschy, H., Tyler, R. S., Kelsay, D. M., Gantz, B. J., Woodworth, G. G. (1997). Cochlear implant use by prelingually deafened children: The influences of age at implant and length of device use. *J Speech Lang Hear Res, 40*, 183–199.

Fudala, J. B., & Stegall, S. (2017). *Arizona Articulation and Phonology Scale - Fourth Revision*. WPS.

Gagnon, E. B., Eskridge, H., Brown, K. D. (2020). Pediatric cochlear implant wear time and early language development. *Cochlear Implants Int, 21*, 92–97.

Geers, A., Brenner, C., Nicholas, J., Uchanski, R., Tye-Murray, N., Tobey, E. (2002). Rehabilitation factors contributing to implant benefit in children. *Ann Otol Rhinol Laryngol Suppl, 189*, 127–130.

Geers, A. E., Mitchell, C. M., Warner-Czyz, A., Wang, N. Y., Eisenberg, L. S., CDaCI Investigative Team. (2017). Early sign language exposure and cochlear implantation benefits. *Pediatrics*, *140*, e20163489.

Geers, A. E., & Nicholas, J. G. (2013). Enduring advantages of early cochlear implantation for spoken language development. *J Speech Lang Hear Res, 56*, 643–655.

Geers, A. E., Nicholas, J. G., Sedey, A. L. (2003). Language skills of children with early cochlear implantation. Ear Hear, *24*(Suppl 1), 46S–58S.

Geers, A. E., & Sedey, A. L. (2011). Language and verbal reasoning skills in adolescents with 10 or more years of cochlear implant experience. *Ear Hear*, *32*(Suppl 1), 39S–48S.

Gfeller, K. E., Olszewski, C., Turner, C., Gantz, B., Oleson, J. (2006). Music perception with cochlear implants and residual hearing. *Audiol Neurootol*, *11*(Suppl 1), 12–15.

Goldman, R., & Fristoe, M. (2015). Goldman-Fristoe Test of Articulation - 3. Pearson Assessments.

Greaver, L., Eskridge, H., Teagle, H. F. B. (2017). Considerations for pediatric cochlear implant recipients with unilateral or asymmetric hearing loss: Assessment, device fitting, and habilitation. *Am J Audiol, 26*, 91–98.

Guimond, A. B., Wilcox, M. J., Lamorey, S. G. (2008). The early intervention parenting self-efficacy scale (EIPSES): Scale construction and initial psychometric evidence. *J Early Intervention*, *30*, 295–320.

Haddad, K. L., Steuerwald, W. W., Garland, L. (2019). Family impact of pediatric hearing loss: Findings from parent interviews and a parent support group. *J Early Hear Detect Intervention*, *4*, 43–53.

Hang, A. X., Roush, P. A., Teagle, H. F., Zdanski, C., Pillsbury, H. C., Adunka, O. F., Buchman, C. A. (2015). Is "no response" on diagnostic auditory brainstem response testing an indication for cochlear implantation in children? *Ear Hear, 36*, 8–13.

Hayward, D. V., Ritter, K., Mousavi, A., Vatanapour, S. (2016). The Sound Access Parent Outcomes Instrument (SAPOI): Construction of a new instrument for children with severe multiple disabilities who use cochlear implants or hearing aids. *Cochlear Implants Int, 17*, 81–89.

Heman-Ackah, S. E., Roland, J. T., Jr., Haynes, D. S., Waltzman, S. B. (2012). Pediatric cochlear implantation: Candidacy evaluation, medical and surgical considerations, and expanding criteria. *Otolaryngol Clin North Am*, *45*, 41–67.

Hewitt, L., Bewitt, J., Owen, L., Madell, J. R. (2012). Analysis of common speech perception errors prior to cochlear implant mapping and successful, remedial programming changes 12th International Conference on Cochlear Implants and Other Implantable Technologies, Baltimore, MD.

Hoff, S., Ryan, M., Thomas, D., Tournis, E., Kenny, H., Hajduk, J., Young, N. M. (2019). Safety and effectiveness of cochlear implantatino of young children, including those with complicating conditions. *Otol Neurotol*, *40*, 454–463.

Hoffman, M. F., Cejas, I., Quittner, A. L. (2019). Health-related quality of life instruments for children with cochlear implants: Development of child and parent-proxy measures. *Ear Hear, 40*, 592–604.

Holder, J. T., Reynolds, S. M., Sunderhaus, L. W., Gifford, R. H. (2018). Current profile of adults presenting for preoperative cochlear implant evaluation. *Trends Hear, 22*, 2331216518755288.

Holman, M. A., Carlson, M. L., Driscoll, C. L., Grim, K. J., Petersson, R. S., Sladen, D. P., Flick, R. P. (2013). Cochlear implantation in children 12 months of age and younger. *Otol Neurotol, 34*, 251–258.

Houston, D. M., & Miyamoto, R. T. (2010). Effects of early auditory experience on word learning and speech perception in deaf children with cochlear implants: Implications for sensitive periods of language development. *Otol Neurotol, 31*, 1248–1253.

Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Rathmann, C. (2020). Global regulatory review needed for cochlear implants: A call for FDA leadership. *Matern Child Health J, 24*, 1345–1359.

Jafari, N., Yadegari, F., Jalaie, S. (2016). Acoustic analysis of persian vowels in cochlear implant users: A comparison with hearing-impaired children using hearing aid and normal-hearing children. *J Voice, 30*, 763.e1–763.e7.

James, C., Albegger, K., Battmer, R., Burdo, S., Deggouj, N., Deguine, O., Dillier, N., Gersdorff, M., Laszig, R., Lenarz, T., Rodriguez, M. M., Mondain, M., Offeciers, E., Macías, A. R., Ramsden, R., Sterkers, O., Von Wallenberg, E., Weber, B., Fraysse, B. (2005). Preservation of residual hearing with cochlear implantation: How and why. *Acta Otolaryngol, 125*, 481–491.

Jeddi, Z., Jafari, Z., Motasaddi Zarandy, M. (2012). Effects of parents' level of education and economic status on the age at cochlear implantation in children. *Iran J Otorhinolaryngol, 24*, 7–15.

Jerger, J. F., & Hayes, D. (1976). The cross-check principle in pediatric audiometry. *Arch Otolaryngol, 102*, 614–620.

Jerger, S., & Jerger, J. (1984). *Pediatric Speech Intelligibility*. Auditec.

Johnson, T. A., & Brown, C. J. (2005). Threshold prediction using the auditory steady-state response and the tone burst auditory brain stem response: A within-subject comparison. *Ear Hear, 26*, 559–576.

Johnson, C. D., & VonAlmen, P. (1997). The functional listening evaluation. In C. D. Johnson, P. V. Benson, J. B. Seaton (Eds.), *Educational Audiology Handbook*. Cengage Learning.

Joint Committee on Infant Hearing. (2007). Year 2007 position statement: Principles and guidelines for early hearing detection and intervention programs. *Pediatrics*, *120*, 898–921.

Joint Committee on Infant Hearing. (2013). Supplement to the JCIH 2007 Position Statement: Principles and guidelines for early intervention after confirmation that a child is deaf or hard of hearing. *Pediatrics*, *131*, e1324–e1349.

Joint Committee on Infant Hearing. (2019). Year 2019 Position Statement: Principles and Guidelines for Ealry Hearing Detection and Intervention Programs. *J Early Hear Detect Intervention*, *4*, 1–44.

Kang, D. H., Lee, M. J., Lee, K. Y., Lee, S. H., Jang, J. H. (2016). Prediction of cochlear implant outcomes in patients with prelingual deafness. *Clin Exp Otorhinolaryngol, 9*, 220–225.

Karltorp, E., Eklöf, M., Östlund, E., Asp, F., Tideholm, B., Löfkvist, U. (2020). Cochlear implants before 9 months of age led to more natural spoken language development without increased surgical risks. *Acta Paediatr, 109*, 332–341.

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 Hear, 11*, 264–270.

Kirk, K. I., Miyamoto, R. T., Ying, E., Perdew, A. E., Zuganelis, H. (2000). Cochlear implantation in young children: Effects of age at implantation and communication mode. *Volta Rev*, *102*, 127–145.

Kirk, K. I., Sehgal, M., Miyamoto, R. T. (1997). Speech perception performance of nucleus multichannel cochlear implant users with partial electrode insertions. *Ear Hear, 18*, 456–471.

Kirkham, E., Sacks, C., Baroody, F., Siddique, J., Nevins, M. E., Woolley, A., Suskind, D. (2009). Health disparities in pediatric cochlear implantation: An audiologic perspective. *Ear Hear, 30*, 515–525.

Kluwin, T. N., & Stewart, D. A. (2000). Cochlear implants for younger children: A preliminary description of the parental decision process and outcomes. *Am Ann Deaf, 145*, 26–32.

Kuehn-Inacker, H., Weichbold, V., Tsiakpini, L., Coninx, F., D'Haese, P. (2003). *LittlEARS Auditory Questionnaire: Parents Questionnaire to Assess Auditoyr Behaviour*. MED-EL.

Lai, F. Y., Serraglio, C., Martin, J. A. (2014). Examining potential barriers to early intervention access in Australian hearing impaired children. *Int J Pediatr Otorhinolaryngol, 78*, 507–512.

Lazaridis, E., Therres, M., Marsh, R. R. (2010). How is the children's implant profile used in the Cochlear Implant Candidacy Process? *Int J Pediatr Otorhinolaryngol, 74*, 412–415.

Leal, C., Marriage, J., Vickers, D. (2016). Evaluating recommended audiometric changes to candidacy using the speech intelligibility index. *Cochlear Implants Int*, *17*(Suppl 1), 8–12.

Leigh, J. R., Dettman, S. J., Dowell, R. C. (2016). Evidence-based guidelines for recommending cochlear implantation for young children: Audiological criteria and optimizing age at implantation. *Int J Audiol*, *55*(Suppl 2), S9–S18.

Leigh, J., Dettman, S., Dowell, R., Briggs, R. (2013). Communication development in children who receive a cochlear implant by 12 months of age. *Otol Neurotol, 34*, 443–450.

Leigh, J., Dettman, S., Dowell, R., Sarant, J. (2011). Evidence-based approach for making cochlear implant recommendations for infants with residual hearing. *Ear Hear, 32*, 313–322.

Leigh, J., Farrell, R., Courtenay, D., Dowell, R., Briggs, R. (2019). Relationship between objective and behavioral audiology for young children being assessed for cochlear implantation: Implications for CI candidacy assessment. *Otol Neurotol, 40*, e252–e259.

Lieu, J. E., Tye-Murray, N., Fu, Q. (2012). Longitudinal study of children with unilateral hearing loss. *Laryngoscope, 122*, 2088–2095.

Ling, D. (1976). Speech and the Hearing-Impaired Child: Theory and Practice. Alexander Graham Bell Association for the Deaf.

Ling, D. (1989). Foundations of Spoken Language for the Hearing-Impaired Child. Alexander Graham Bell Association for the Deaf.

Litovsky, R. Y. (2011). Review of recent work on spatial hearing skills in children with bilateral cochlear implants. *Cochlear Implants Int*, *12*(Suppl 1), S30–S34.

Litovsky, R. Y., & Gordon, K. (2016). Bilateral cochlear implants in children: Effects of auditory experience and deprivation on auditory perception. *Hear Res, 338*, 76–87.

Liu, C. C., Sweeney, M., Booth, T. N., Lee, K. H., Kutz, J. W., Roland, P., Isaacson, B. (2015). The impact of postmeningitic labyrinthitis ossificans on speech performance after pediatric cochlear implantation. *Otol Neurotol, 36*, 1633–1637.

Luxford, W. M.; Ad Hoc Subcommittee of the Committee on Hearing and Equilibrium of the American Academy of Otolaryngology-Head and Neck Surgery. (2001). Minimum speech test battery for postlingually deafened adult cochlear implant patients. *Otolaryngol Head Neck Surg, 124*, 125–126.

Madell, J. R., & Flexer, C. (2019). Collaborative team management of children with hearing loss. In J. R. Madell, C. Flexer, J. Wolfe, E. C. Schafer (Eds.), Pediatric Audiology: Diagnosis, Technology, and Management (pp. 279–286). Thieme Medical Publishers.

Madell, J. R., Hewitt, J. G., Rotfleisch, S. (2019). Red flags: Identifying and managing barriers to the child's optimal auditory development. In J. R. Madell, C. Flexer, J. Wolfe, E. C. Schafer (Eds.), *Pediatric Audiology: Diagnosis, Technology, and Management* (3rd ed., pp. 267–275). Thieme.

Mahomva, C., Kim, A., Lieu, J. E. C., Goldberg, D. M., Anne, S. (2021). Speech and language outcomes in mild-moderate unilateral sensorineural hearing loss. *Int J Pediatr Otorhinolaryngol, 141*, 110558.

Martin, J., & Raine, C. H. (2013). Quality standards for cochlear implantation in children and young adults. *Cochlear Implants Int*, *14*(Suppl 2), S13–S20.

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 Hear*, *36*, 309–319.

Meadow-Orlans, K. P. (1990). The impact of childhood hearing loss on the family. In F. Moores & K. P. Meadow-Orlans (Eds.), Educational and Developmental Aspects of Deafness (pp. 321–388). Gallaudet University Press.

Medicaid. (2021). Early and periodic screening, diagnostic, and treatment. January 10, 2021. https://www.medicaid.gov/medicaid/benefits/early-and-periodic-screening-diagnostic-and-treatment/index.html.

Meinzen-Derr, J., Wiley, S., Creighton, J., Choo, D. (2007). Auditory Skills Checklist: Clinical tool for monitoring functional auditory skill development in young children with cochlear implants. *Ann Otol Rhinol Laryngol, 116*, 812–818.

Meinzen-Derr, J., Wiley, S., Grether, S., Choo, D. I. (2010). Language performance in children with cochlear implants and additional disabilities. *Laryngoscope, 120*, 405–413.

Messersmith, J. J., Entwisle, L., Warren, S., Scott, M. (2019). Clinical practice guidelines: Cochlear implants. *J Am Acad Audiol, 30*, 827–844.

Minimum-Speech-Test-Battery. (2011). The new minimum speech test battery. Auditory Potential. January 5, 2021. http://www.auditorypotential.com/MSTB_Nav.html.

Mitchell, R. M., Christianson, E., Ramirez, R., Onchiri, F. M., Horn, D. L., Pontis, L., Miller, C., Norton, S., Sie, K. C. Y. (2019). Auditory comprehension outcomes in children who receive a cochlear implant before 12 months of age. *Laryngoscope*, *130*, 776–781.

Miyamoto, R. T., Colson, B., Henning, S., Pisoni, D. (2017). Cochlear implantation in infants below 12 months of age. *World J Otorhinolaryngol Head Neck Surg, 3*, 214–218.

Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics, 106*, E43.

Moeller, M. P., Carr, G., Seaver, L., Stredler-Brown, A., Holzinger, D. (2013). Best practices in family-centered early intervention for children who are deaf or hard of hearing: An international consensus statement. *J Deaf Stud Deaf Educ, 18*, 429–445.

Mok, M., Galvin, K. L., Dowell, R. C., McKay, C. M. (2010). Speech perception benefit for children with a cochlear implant and a hearing aid in opposite ears and children with bilateral cochlear implants. *Audiol Neurootol, 15*, 44–56.

Mondain, M., Sillon, M., Vieu, A., Levi, A., Reuillard-Artieres, F., Deguine, O., Fraysse, B., Cochard, N., Truy, E., Uziel, A. (2002). Cochlear implantation in prelingually deafened children with residual hearing. *Int J Pediatr Otorhinolaryngol, 63*, 91–97.

Moog, J. S., Biedenstein, J. J., Davidson, L. S. (1995). Speech Perception Instructional Curriculum and Evaluation (2nd ed.). Central Institute for the Deaf.

Moog, J. S., & Geers, A. E. (1990). Early Speech Perception Test. Central Institute for the Deaf.

National Institute for Health and Clinical Excellence. (2009). Cochlear implants for children and adults with severe to profound deafness. https://www.nice.org.uk/guidance/ta166.

Nichani, J., Green, K., Hans, P., Bruce, I., Henderson, L., Ramsden, R. (2011). Cochlear implantation after bacterial meningitis in children: Outcomes in ossified and nonossified cochleas. *Otol Neurotol, 32*, 784–789.

Nicholas, J. G., & Geers, A. E. (2013). Spoken language benefits of extending cochlear implant candidacy below 12 months of age. *Otol Neurotol, 34*, 532–538.

Nikolopoulos, T. P., Archbold, S. M., O'Donoghue, G. M. (1999). The development of auditory perception in children following cochlear implantation. *Int J Pediatr Otorhinolaryngol, 49*(Suppl 1), S189–S191.

Nikolopoulos, T. P., Gibbin, K. P., Dyar, D. (2004). Predicting speech perception outcomes following cochlear implantation using Nottingham children's implant profile (NChIP). *Int J Pediatr Otorhinolaryngol, 68*, 137–141.

Niparko, J. K., Tobey, E. A., Thal, D. J., Eisenberg, L. S., Wang, N. Y., Quittner, A. L., Fink, N. E.; CDaCI Investigative Team. (2010). Spoken language development in children following cochlear implantation. *JAMA, 303*, 1498–1506.

Nittrouer, S., Caldwell, A., Lowenstein, J. H., Tarr, E., Holloman, C. (2012). Emergent literacy in kindergartners with cochlear implants. *Ear Hear, 33*, 683–697.

O'Brien, L. C., Kenna, M., Neault, M., Clark, T. A., Kammerer, B., Johnston, J., Waldman, E., Thomas, S. P., Forbes, P., Licameli, G. R. (2010). Not a "sound" decision: Is cochlear implantation always the best choice? *Int J Pediatr Otorhinolaryngol, 74*, 1144–1148.

Park, L. R., Gagnon, E. B., Thompson, E., Brown, K. D. (2019a). Age at full-time use predicts language outcomes better than age of surgery in children who use cochlear implants. *Am J Audiol, 28*, 986–992.

Park, M., Song, J. J., Oh, S. J., Shin, M. S., Lee, J. H., Oh, S. H. (2015). The relation between nonverbal IQ and postoperative CI outcomes in cochlear implant users: Preliminary result. *Biomed Res Int, 2015*, 313274.

Park, L. R., Teagle, H. F. B., Gagnon, E., Woodard, J., Brown, K. D. (2019b). Electric-acoustic stimulation outcomes in children. *Ear Hear, 40*, 849–857.

Patrick, D. L., Edwards, T. C., Skalicky, A. M., Schick, B., Topolski, T. D., Kushalnagar, P., Leng, M., O'Neill-Kemp, A. M., Sie, K. S. (2011). Validation of a quality-of-life measure for deaf or hard of hearing youth. *Otolaryngol Head Neck Surg, 145*, 137–145.

Penna, L. M., Lemos, S. M., Alves, C. R. (2014). The lexical development of children with hearing impairment and associated factors. *Codas, 26*, 193–200.

Penna, L. M., Lemos, S. M., Alves, C. R. (2015). Auditory and language skills of children using hearing aids. *Braz J Otorhinolaryngol, 81*, 148–157.

Percy-Smith, L., Busch, G., Sandahl, M., Nissen, L., Josvassen, J. L., Lange, T., Rusch, E., Cayé-Thomasen, P. (2013). Language understanding and vocabulary of early cochlear implanted children. *Int J Pediatr Otorhinolaryngol, 77*, 184–188.

Peterson, G. E., & Lehiste, I. (1962). Revised CNC lists for auditory tests. *J Speech Hear Disord, 27*, 62–70.

Philippon, D., Bergeron, F., Ferron, P., Bussières, R. (2010). Cochlear implantation in postmeningitic deafness. *Otol Neurotol, 31*, 83–87.

Phillips, J., Wiley, S., Barnard, H., Meinzen-Derr, J. (2014). Comparison of two nonverbal intelligence tests among children who are deaf or hard-of-hearing. *Res Dev Disabil, 35*, 463–471.

Picton, T. W., Dimitrijevic, A., Perez-Abalo, M. C., Van Roon, P. (2005). Estimating audiometric thresholds using auditory steady-state responses. *J Am Acad Audiol, 16*, 140–156.

Polonenko, M. J., Papsin, B. C., Gordon, K. A. (2017). Children with single-sided deafness use their cochlear implant. *Ear Hear, 38*, 681–689.

Prentiss, S., Snapp, H., Zwolan, T. (2020). Audiology practices in the preoperative evaluation and management of adult cochlear implant candidates. *JAMA Otolaryngol Head Neck Surg, 146*, 136–142.

Quittner, A. L., Barker, D. H., Cruz, I., Snell, C., Grimley, M. E., Botteri, M.; the CDaCI Investigative Team. (2010). Parenting stress among parents of deaf and hearing children: Associations with language delays and behavior problems. *Parent Sci Pract, 10*, 136–155.

Quittner, A. L., Glueckauf, R. L., Jackson, D. N. (1990). Chronic parenting stress: Moderating versus mediating effects of social support. *J Pers Soc Psychol, 59*, 1266–1278.

Rajan, G., Tavora-Vieira, D., Baumgartner, W. D., Godey, B., Müller, J., O'Driscoll, M., Skarzynski, H., Skarzynski, P., Usami, S. I., Adunka, O., Agrawal, S., Bruce, I., De Bodt, M., Caversaccio, M., Pilsbury, H., Gavilán, J., Hagen, R., Hagr, A., Kameswaran, M., Karltorp, E., et al. (2018). Hearing preservation cochlear implantation in children: The HEARRING Group consensus and practice guide. *Cochlear Implants Int, 19*, 1–13.

Rance, G., & Barker, E. J. (2008). Speech perception in children with auditory neuropathy/dyssynchrony managed with either hearing AIDS or cochlear implants. *Otol Neurotol, 29*, 179–182.

Ravens-Sieberer, U., & Bullinger, M. (1998). Assessing health-related quality of life in chronically ill children with the German KINDL questionnaire: First psychometric and content analytical results. *Qual Life Res, 7*, 399–407.

Ravi, R., & Gunjawate, D. R. (2020). Parent reported barriers and facilitators towards cochlear implantation - A systematic review. *Int J Pediatr Otorhinolaryngol, 136*, 110163.

Riley, A. W., Forrest, C. B., Rebok, G. W., Starfield, B., Green, B. F., Robertson, J. A., Friello, P. (2004). The child report form of the CHIP-child edition: Reliability and validity. *Med Care, 42*, 221–231.

Robbins, A. M. (2009). Rehabilitation after cochlear implantation. In J. K. Niparko (Ed.), Cochlear Implants: Principles and Practices (2nd ed., pp. 269–312). Lippincott, Williams, & Wilkins.

Robbins, A. M., Renshaw, J. J., Berry, S. W. (1991). Evaluating meaningful auditory integration in profoundly hearing-impaired children. *Am J Otol, 12 Suppl*, 144–150.

Roland, J. T. Jr, Coelho, D. H., Pantelides, H., Waltzman, S. B. (2008). Partial and double-array implantation of the ossified cochlea. *Otol Neurotol, 29*, 1068–1075.

Roland, J. T. Jr, Cosetti, M., Wang, K. H., Immerman, S., Waltzman, S. B. (2009). Cochlear implantation in the very young child: Long-term safety and efficacy. *Laryngoscope, 119*, 2205–2210.

Rotteveel, L. J., Snik, A. F., Vermeulen, A. M., Mylanus, E. A. (2005). Three-year follow-up of children with postmeningitic deafness and partial cochlear implant insertion. *Clin Otolaryngol, 30*, 242–248.

Roush, J., & Wilson, K. (2013). Interdisciplinary assessment of children with hearing loss and multiple disabilities. Perspect Hear Hear Disord Child, *23*, 13–26.

Sackett, D. L., Rosenberg, W. M., Gray, J. A., Haynes, R. B., Richardson, W. S. (1996). Evidence based medicine: What it is and what it isn't. *BMJ, 312*, 71–72.

Saki, N., Bayat, A., Moniri, S., Moogahi, N. K. (2019). The influence of cochlear implantation on aggression behaviors in children. *Int J Pediatr Otorhinolaryngol, 127*, 109669.

Schafer, E. C., Amlani, A. M., Paiva, D., Nozari, L., Verret, S. (2011). A meta-analysis to compare speech recognition in noise with bilateral cochlear implants and bimodal stimulation. *Int J Audiol, 50*, 871–880.

Sebastian, S., Sreedevi, N., Lepcha, A., Mathew, J. (2015). Nasalance in cochlear implantees. *Clin Exp Otorhinolaryngol, 8*, 202–205.

Services, C. f. M. a. M. (2005). Decision memo for cochlear implantation (CAG-00107N). January 10, 2021. https://www.cms.gov/medicare-coverage-database/details/nca-decision-memo.aspx?NCAId=134.

Sharma, S., Bhatia, K., Singh, S., Lahiri, A. K., Aggarwal, A. (2017). Impact of socioeconomic factors on paediatric cochlear implant outcomes. *Int J Pediatr Otorhinolaryngol, 102*, 90–97.

Sindrey, D. (2014). Compass Test of Auditory Discrimination. https://successforkidswithhearingloss.com/wp-content/uploads/2014/09/Compass-Instruction_Recording-Form.pdf.

Skarzyński, H., Lorens, A., D'Haese, P., Walkowiak, A., Piotrowska, A., Sliwa, L., Anderson, I. (2002). Preservation of residual hearing in children and post-lingually deafened adults after cochlear implantation: An initial study. *ORL J Otorhinolaryngol Relat Spec, 64*, 247–253.

Sladen, D. P., Carlson, M. L., Dowling, B. P., Olund, A. P., Teece, K., DeJong, M. D., Breneman, A., Peterson, A., Beatty, C. W., Neff, B. A., Driscoll, C. L. (2017a). Early outcomes after cochlear implantation for adults and children with unilateral hearing loss. *Laryngoscope*, *127*, 1683–1688.

Sladen, D. P., Frisch, C. D., Carlson, M. L., Driscoll, C. L., Torres, J. H., Zeitler, D. M. (2017b). Cochlear implantation for single-sided deafness: A multicenter study. *Laryngoscope*, *127*, 223–228.

Snik, A. F., Vermeulen, A. M., Geelen, C. P., Brokx, J. P., van den Broek, P. (1997). Speech perception performance of children with a cochlear implant compared to that of children with conventional hearing aids. II. Results of prelingually deaf children. *Acta Otolaryngol, 117*, 755–759.

Spahr, A. J., Dorman, M. F., Litvak, L. M., Cook, S. J., Loiselle, L. M., DeJong, M. D., Hedley-Williams, A., Sunderhaus, L. S., Hayes, C. A., Gifford, R. H. (2014). Development and validation of the pediatric AzBio sentence lists. *Ear Hear, 35*, 418–422.

Spahr, A. J., Dorman, M. F., Litvak, L. M., Van Wie, S., Gifford, R. H., Loizou, P. C., Loiselle, L. M., Oakes, T., Cook, S. (2012). Development and validation of the AzBio sentence lists. *Ear Hear, 33*, 112–117.

Spencer, L. J., Gantz, B. J., Knutson, J. F. (2004). Outcomes and achievement of students who grew up with access to cochlear implants. *Laryngoscope, 114*, 1576–1581.

Starfield, B., Bergner, M., Ensminger, M., Riley, A., Ryan, S., Green, B., McGauhey, P., Skinner, A., Kim, S. (1993). Adolescent health status measurement: Development of the Child Health and Illness Profile. *Pediatrics, 91*, 430–435.

Stredler-Brown, A., & Johnson, D. C. (2004a). Functional Auditory Performance Indicators: An Integrated Approach to Auditory Development. http://www.cde.state.co.us/cdesped/specificdisabilityhearing.htm.

Stredler-Brown, A., & Johnson, C. D. (2004b). Functional auditory performance indicators: An integrated approach to auditory skills development. Colorado Department of Education, Special Education Services Unit, 2001-2004. http://www.cde.state.co.us/cdesped/specificdisabilityhearing.htm.

Teagle, H. F. B., & Eskridge, H. (2010). Predictors of success for children with cochlear implants: The impact of individual differences. In A. Weiss (Ed.), *Perspectives on Individual Differences Affecting Therapeutic Change in Communication Disorders* (pp. 251–272). Psychology Press.

Teagle, H. F. B., Park, L. R., Brown, K. D., Zdanski, C., Pillsbury, H. C. (2019). Pediatric cochlear implantation: A quarter century in review. *Cochlear Implants Int, 20*, 288–298.

Teagle, H. F., Roush, P. A., Woodard, J. S., Hatch, D. R., Zdanski, C. J., Buss, E., Buchman, C. A. (2010). Cochlear implantation in children with auditory neuropathy spectrum disorder. *Ear Hear, 31*, 325–335.

Tharpe, A. M. (2008). Unilateral and mild bilateral hearing loss in children: Past and current perspectives. *Trends Amplif*, *12*, 7–15.

Tharpe, A. M., & Gustafson, S. (2015). Management of children with mild, moderate, and moderately severe sensorineural hearing loss. *Otolaryngol Clin North Am, 48*, 983–994.

Theunissen, S. C., Rieffe, C., Kouwenberg, M., De Raeve, L. J., Soede, W., Briaire, J. J., Frijns, J. H. (2014). Behavioral problems in school-aged hearing-impaired children: The influence of sociodemographic, linguistic, and medical factors. *Eur Child Adolesc Psychiatry, 23*, 187–196.

Tobey, E. A. (1994). Cochlear implants in children with profound hearing loss. *Am J Audiol, 3*, 6.

Tobey, E. A., Thal, D., Niparko, J. K., Eisenberg, L. S., Quittner, A. L., Wang, N. Y.; CDaCI Investigative Team. (2013). Influence of implantation age on school-age language performance in pediatric cochlear implant users. *Int J Audiol, 52*, 219–229.

Tohidast, S. A., Mansuri, B., Bagheri, R., Azimi, H. (2020). Provision of speech-language pathology services for the treatment of speech and language disorders in children during the COVID-19 pandemic: Problems, concerns, and solutions. *Int J Pediatr Otorhinolaryngol, 138*, 110262.

Tomblin, J. B., Harrison, M., Ambrose, S. E., Walker, E. A., Oleson, J. J., Moeller, M. P. (2015). Language outcomes in young children with mild to severe hearing loss. *Ear Hear*, *36*(Suppl 1), 76S–91S.

Uhler, K., Warner-Czyz, A., Gifford, R., Working Group, P. (2017). Pediatric minimum speech test battery. *J Am Acad Audiol, 28*, 232–247.

Umansky, A. M., Jeffe, D. B., Lieu, J. E. (2011). The HEAR-QL: Quality of life questionnaire for children with hearing loss. *J Am Acad Audiol, 22*, 644–653.

Varni, J. W., Seid, M., Knight, T. S., Uzark, K., Szer, I. S. (2002). The PedsQL 4.0 Generic Core Scales: Sensitivity, responsiveness, and impact on clinical decision-making. *J Behav Med, 25*, 175–193.

Varni, J. W., Seid, M., Rode, C. A. (1999). The PedsQL: Measurement model for the pediatric quality of life inventory. *Med Care, 37*, 126–139.

Vickers, D., De Raeve, L., Graham, J. (2016). International survey of cochlear implant candidacy. *Cochlear Implants Int*, *17*(Suppl 1), 36–41.

Vincenti, V., Bacciu, A., Guida, M., Marra, F., Bertoldi, B., Bacciu, S., Pasanisi, E. (2014). Pediatric cochlear implantation: An update. *Ital J Pediatr, 40*, 72.

Vlastarakos, P. V., Nazos, K., Tavoulari, E. F., Nikolopoulos, T. P. (2014). Cochlear implantation for single-sided deafness: The outcomes. An evidence-based approach. *Eur Arch Otorhinolaryngol, 271*, 2119–2126.

Vlastarakos, P. V., Proikas, K., Papacharalampous, G., Exadaktylou, I., Mochloulis, G., Nikolopoulos, T. P. (2010). Cochlear implantation under the first year of age--the outcomes. A critical systematic review and meta-analysis. *Int J Pediatr Otorhinolaryngol*, *74*, 119–126.

Walker, B. (2009). Auditory Learning Guide. http://www.firstyears.org/c4/alg/alg.pdf.

Waltzman, S. B., & Roland, J. T. Jr. (2005). Cochlear implantation in children younger than 12 months. *Pediatrics, 116*, e487–e493.

Warner-Czyz, A. D., & Davis, B. L. (2008). The emergence of segmental accuracy in young cochlear implant recipients. *Cochlear Implants Int, 9*, 143–166.

Wenrich, K. A., Davidson, L. S., Uchanski, R. M. (2017). Segmental and suprasegmental perception in children using hearing aids. *J Am Acad Audiol, 28*, 901–912.

Wie, O. B., Falkenberg, E. S., Tvete, O., Tomblin, B. (2007). Children with a cochlear implant: Characteristics and determinants of speech recognition, speech-recognition growth rate, and speech production. *Int J Audiol, 46*, 232–243.

Wilkes, E. M., & Sunshine Cottage School for Deaf Children. (2001). *Cottage Acquisition Scales for Listening, Language, and Speech* (2nd ed.). Sunshine Cottage School for Deaf Children.

Wiseman, K. B., Warner-Czyz, A. D., Kwon, S., Fiorentino, K., Sweeney, M. (2021). Relationships between daily device use and early communication outcomes in young children with cochlear implants. *Ear Hear*, *42*, 1042–1053.

Wolfe, J. (2018). Cochlear implant candidacy: Pediatric audiologic assessment. In J. Wolfe (Ed.), *Cochlear implants: Audiologic Management and Considerations for Implantable Hearing Devices*. Plural Publishing.

Wolfe, J., Neumann, S., Schafer, E., Marsh, M., Wood, M., Baker, R. S. (2017). Potential benefits of an integrated electric-acoustic sound processor with children: A preliminary report. *J Am Acad Audiol*, *28*, 127–140.

Wu, D., Woodson, E. W., Masur, J., Bent, J. (2015). Pediatric cochlear implantation: Role of language, income, and ethnicity. *Int J Pediatr Otorhinolaryngol, 79*, 721–724.

Yoshinaga-Itano, C., Sedey, A. L., Wiggin, M., Mason, C. A. (2018). Language outcomes improved through early hearing detection and earlier cochlear implantation. *Otol Neurotol, 39*, 1256–1263.

Yüksel, M., Meredith, M. A., Rubinstein, J. T. (2019). Effects of low frequency residual hearing on music perception and psychoacoustic abilities in pediatric cochlear implant recipients. *Front Neurosci, 13*, 924.

Zaidman-Zait, A., Most, T., Tarrasch, R., Haddad-eid, E., Brand, D. (2016). The impact of childhood hearing loss on the family: Mothers' and Fathers' stress and coping resources. *J Deaf Stud Deaf Educ, 21*, 23–33.

Zeitler, D. M., Sladen, D. P., DeJong, M. D., Torres, J. H., Dorman, M. F., Carlson, M. L. (2019). Cochlear implantation for single-sided deafness in children and adolescents. *Int J Pediatr Otorhinolaryngol, 118*, 128–133.

Zimmerman-Phillips, S., Robbins, A. M., Osberger, M. J. (2000). Assessing cochlear implant benefit in very young children. *Ann Otol Rhinol Laryngol Suppl, 185*, 42–43.

Zwolan, T. A., Schvartz-Leyzac, K. C., Pleasant, T. (2020). Development of a 60/60 guideline for referring adults for a traditional cochlear implant candidacy evaluation. *Otol Neurotol, 41*, 895–900.

Zwolan, T. A., & Sorkin, D. L. (2016). Cochlear implants 2016: Advances in candidacy, technology, and outcomes, factors that drive the expansion of pediatric cochlear implant candidacy. *Perspect Hear Hear Disord Child*, *1*, 21–28.

REFERENCE NOTE

1. FDA. (2022). Cochlear Americas Nucleus 24 Cochlear Implant System – P970051/S205.