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THE COCHLEAR IMPLANT EDUCATION CENTER: PERSPECTIVES ON EFFECTIVE EDUCATIONAL PRACTICES

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The number of children using cochlear implant technology is growing.[1] With this growth has emerged a population of children who are similar in the technology they are using, yet disparate in their demographic characteristics and spoken language communication outcomes (Belzner & Seal, 2009). Although the demographics of children using cochlear implant technology are wide ranging, professional recommendations surrounding language and communication approaches for these children often do not reflect their diversity. As a cochlear implant is an "auditory technology," recommendations often lean toward language and communication methodologies that focus on development and use of only spoken language. Although these auditory/oral approaches appear appropriate for a percentage of children with a cochlear implant, they do not appear to meet the comprehensive linguistic, cognitive, communicative, and social needs for many others.

Given this reality, the Laurent Clerc National Deaf Education Center (Clerc Center) at Gallaudet University established the Cochlear Implant Education Center (CIEC) in 2000. The CIEC was established to examine practices including both spoken and signed languages for the heterogeneous children who were obtaining cochlear implants and assimilating into educational programs. Since 2000, the CIEC has annually developed and implemented education, habilitation, and support service programs and services for approximately 20 to 30 students with cochlear implants enrolled at the Clerc Center demonstration schools (Kendall Demonstration Elementary School and the Model Secondary School for the Deaf).[2]

1. According to the Food and Drug Administration, as of April 2009, approximately 188,000 people worldwide have received implants. In the United States, roughly 41,500 adults and 25,500 children have received them. Most children who receive implants are between 2 and 6 years old (National Institute on Deafness and Other Communication Disorders, 2011).

2. Kendall Demonstration Elementary School serves students from birth through 8th grade from the Washington, DC metropolitan area. The Model Secondary School for the Deaf is a residential high school program.

The CIEC staff has also had the unique opportunity to interact with more than 10,000 professionals and families throughout the United States to network and share information about the common challenges and successes that many experience in their journey to meet the needs of children with cochlear implants. From these experiences, there is a clear message to share. That message is that no single approach fits the characteristics and needs of all children with a cochlear implant. All children with a cochlear implant are unique and should not be defined by the technology they are using. What the CIEC has observed and said many times in interactions with professionals and families is "If you have met one child with a cochlear implant, you have met *one* child with a cochlear implant."

So, if there is not one "right" approach, what does this signify for professionals and families seeking guidance in addressing the comprehensive needs of children with cochlear implants? It suggests the importance of considering whether pursuing solely an oral approach may put a child at risk cognitively, linguistically, and socially (Grosjean, 2008) as well as the need to examine broader recommendations that include both spoken and signed languages. In its journey to define "effective practices" for children with cochlear implants, the CIEC has learned the following:

- Multiple factors affect spoken language performance outcomes with a cochlear implant.
- Children with cochlear implants *can* benefit from the use of a signed language (e.g., American Sign Language [ASL]) and signs used to support spoken English.
- The key to facilitating successful linguistic, communicative, cognitive, and social-emotional development is purposeful language and communication planning.

Factors That Affect Spoken Language Performance Outcomes

Although it appears that most children with a cochlear implant can detect individual speech sounds, this does not automatically guarantee they will develop the necessary skills to comprehend spoken language for learning. All children with a cochlear implant will attain their own level of auditory functioning depending on a variety of characteristics intrinsic to each child (e.g., etiology of loss, additional disabilities) and extrinsic to the child (i.e., habilitation history, educational environment, family support, etc). With time and training, some children will develop auditory skill proficiency to a level in which they can "listen to learn" whereas others may not be able to effectively do so. The latter group nonetheless

may benefit from the implant for support and access to sound in other areas of life (e.g., music enjoyment, enhancement of speechreading, phonemic awareness, environmental sound awareness). Even though children will not all achieve the same level of auditory functioning and spoken language ability with their cochlear implant, the majority will develop skills beyond those they might have developed while using hearing aids (Eisenberg, Kirk, Martinez, Ying, & Miyamoto, 2004).

There are many complex and interactive factors that will affect a child's spoken language outcomes with his or her cochlear implant (Geers, 2003, 2004; Geers, Tobey, Moog, & Brenner, 2008; Nussbaum, 2003; Spencer & Marschark, 2003, 2006). It is critical that each of these factors be considered in the process of language, communication, and educational planning.

Factors Related to the Child

Age of implantation. Research and observation suggest that spoken language performance outcomes are best for children who are implanted during the early months of life (generally before 18 to 24 months) when language is typically developing. As children are implanted at progressively later ages, outcomes and rates of development vary (Dettman, Pinder, Briggs, Dowell, & Leigh, 2007; Geers, 2002; Geers, Nicholas, & Sedey, 2003; Holt & Svirsky, 2008; McConkey Robbins, Burton Koch, Osberger, Zimmerman-Phillips, & Kishon-Rabin, 2004; Sharma, Dorman, & Kral, 2005; Sommers & Lim, 2006; Spencer, Barker, & Tomblin, 2003; Svirsky, Teoh, & Neuburger, 2004; Waltzman, & Roland, 2005; Zwolan et al., 2004). For later implanted children who did not have access to sound during the early years of their lives, observation and research suggest that although there is greater benefit from a cochlear implant compared with traditional hearing aids, existing auditory delays at the time of implantation present continued educational and rehabilitation challenges that oftentimes cannot be overcome (Nicholas & Geers, 2007). It is therefore critical to counsel families regarding these limited outcomes.

Preimplant duration of hearing loss. The shorter the time from the identification of deafness to the time of cochlear implantation, the easier it tends to be for a child to develop spoken language (Hammes et al., 2002). Research suggests that the less time the auditory channels remain dormant and unused, the greater the chance for these pathways to demonstrate the plasticity to accept the new incoming information available through the cochlear implant. It is therefore necessary to understand the importance of stimulating auditory neural pathways via hearing aids as early as possible to prepare for implantation (Sharma et al., 2005; Sharma, Dorman, & Spahr, 2002; Sharma et al., 2004).

Language competence at time of implantation. When parents and children communicate effectively with each other from the time the child is identified with a hearing loss, a foundation for language acquisition (both spoken and signed languages) is established, and language delays may be prevented or minimized

(Yoshinaga-Itano, 2003). This also applies to children who obtain cochlear implants. It appears that children who have a strong language foundation (whether signed or spoken) before getting a cochlear implant have an easier time developing spoken language using their implant (Magnuson, 2000; Tait, Lutman, & Robinson; 2000). It has been demonstrated that children with early language foundations via ASL before implantation can transition well to spoken language following implantation. This early exposure prevents delay in establishing language foundations and can then be used to provide a "piggyback" to the development of spoken language (Yoshinaga-Itano, 2006).

Previous listening experience. Children who experience adventitious hearing loss, as well as children who have had meaningful auditory experiences with a hearing aid before implantation, typically achieve high levels of spoken language outcomes with a cochlear implant (Nicholas & Geers, 2006). This relates to past imprinting or memory for this information. Children implanted beyond the early language learning years who have had limited listening experiences before implantation, however, typically require more time and structured approaches to facilitating spoken language development and often do not achieve similar levels of receptive or expressive spoken language skills (Waltzman & Cohen, 2000).

Cause of hearing loss. Some of the associated secondary conditions arising from varying causes of hearing loss may influence the degree of benefit a child actualizes from a cochlear implant. For example, some children with hearing loss from cytomegalovirus have been observed to demonstrate auditory processing problems. Although a cochlear implant provides access to sound, it will not eliminate auditory processing problems related to interpretation of sound in the brain. Also, causes of hearing loss that affect the anatomy of the cochlea may present an obstacle to the insertion of all electrodes available through the cochlear implant, which may then limit outcomes (Pyman, Blamey, Lacy, Clark, & Dowell, 2000). For children with auditory neuropathy or auditory dys-synchrony (Starr, Picton, Sininger, Hood, & Berlin, 1996),[3] there appears to be varied benefit from a cochlear implant, depending on where the dysfunction occurs in the auditory system. It is important that a complete battery of diagnostic evaluations be completed before proceeding with a cochlear implant so that families are clear on the appropriateness of a cochlear implant and varied outcomes for children with this condition (Gardner-Berry, Gibson, & Sanli, 2005).

Additional challenges. Increasing numbers of children with additional challenges are getting cochlear implants and demonstrating a range of outcomes. The type of additional challenge children demonstrate influences the outcomes they may obtain with their implants. For example, children with physical challenges may

3. "Auditory neuropathy," also known as "auditory dys-synchrony," is a hearing disorder in which sound successfully reaches the inner ear, but for one or more reasons, the signals are not successfully transmitted from the inner ear to the brain.

still demonstrate similar auditory development as their non–physically challenged peers with cochlear implants (Garber & Nevins, 2007). However, if a child demonstrates other complex cognitive, language processing, or social communication challenges, these will affect outcomes related to the rate of spoken language development and the level of spoken language competence achieved (Edwards, 2007; Goldberg & Perigo, 2006). It is important that families and professionals do not expect that obtaining a cochlear implant will resolve these other challenges (Pyman et al., 2000).

Although some children obtain their implants with known additional challenges, other children obtain their implants at young ages before other additional challenges become apparent (e.g., autistic spectrum disorder, learning disabilities). As it is not possible to predict when additional challenges may emerge that can directly affect performance outcomes, it is critical to closely monitor each child for possible complicating issues and make necessary revisions and accommodations to approaches and strategies used as needed.

Learning styles. Some children are auditory learners; others are visual learners. Visual learners may benefit from visual context for learning through the use of visual reinforcement, for example, through books, videos, or diagrams. Auditory learners may benefit from strategies that provide auditory reinforcement, such as repetition of messages, listening to audiotapes, and repeating information aloud. A child's learning style may affect implant outcomes as well as the choice of strategies used to achieve optimal outcomes. Some children may demonstrate more "auditory inclination" than others, with some readily learning auditory information without much guidance and others struggling for similar competence (Chute & Nevins, 2006).

Personality. All children have a unique personality that may influence how they function with their cochlear implant. A child's assertiveness, positive attitude, resiliency, and ability to tolerate frustration are all integral to what outcomes may be actualized (Leigh & Christiansen, 2009). If a child is shy and not willing to participate in activities to support auditory and speech development, this may affect spoken language and communication growth. If the child demonstrates resistant behaviors and is not willing to use the implant consistently, this will also affect optimal outcomes. Successful outcomes will be tied to a child's motivation to use the implant and participate in activities to support auditory, speech, and spoken language development.

Factors Related to Family Characteristics

Family support. Children demonstrating the best outcomes with a cochlear implant (regardless of the other factors discussed) have strong family involvement and support (Moeller, 2000; Spencer, 2004). As expected, families who are integrally involved in providing a rich listening and language learning environment and helping a child to receive all of the necessary supports to maximize benefit from

his or her implant will have a positive impact on outcomes.

Language use in the home. There are children with cochlear implants from homes that are multilingual and multicultural. Some families speak English and another language fluently, some are learning English as a new language,[4] and some use a visual language such as ASL. Multilingual/multicultural factors will have an impact on the spoken language outcomes of a child with a cochlear implant. For children in this situation, it is necessary to identify and apply strategies and techniques in bilingual language learning based on which will be most effective for each child in relation to how language is used in the home (American Speech-Language-Hearing Association, 2004; Thordardottir, 2006). The factors that predict the best outcomes for bilingual spoken language development for a child with a cochlear implant are (1) two spoken languages used in the home, (2) early age of implantation (before age 2), (3) strong speech perception skills, (4) absence of additional disabilities, (5) intact language learning ability for the language of the home, (6) parent involvement, (7) motivation for bilingual learning, and (8) opportunities to use both languages in meaningful contexts with native users (McConkey Robbins, 2007). For children who come from families in which ASL is the language used in the home, strong language foundations in ASL coupled with ongoing implementation of strategies to address the development and use of spoken English will positively affect spoken language outcomes (Cummins, 2006; Grosjean, 2008; Yoshinaga-Itano, 2006).

Factors Related to Cochlear Implant Technology

Performance outcomes may vary depending on issues specific to the technology. Children implanted with more current technology appear to demonstrate increased potential in comparison with children implanted with earlier technologies with less sophisticated speech processing capabilities. Outcomes will also be affected by the continued appropriateness of the "MAP" (individualized speech processing settings) of a child's speech processor (Zwolan et al., 2004). It is imperative that the continued appropriateness of a child's MAP be closely monitored to ensure optimal benefit. This requires daily close monitoring of the implant at home and at school and support by the hospital implant center. In addition, increasing numbers of children are obtaining bilateral cochlear implants that can positively affect performance outcomes in relation to enhanced ease of listening and sound localization (Litovsky et al., 2006).

Based on the documented differences in performance outcomes for children with cochlear implants, it would seem logical that strategies and approaches endorsed for children using this technology would be equally diverse. However, we have not

4. "English as a new language" pertains to parents who are just learning to speak English or may have no English proficiency; another language is spoken in the home, and the child typically learns English at school.

found this to be the case. Through our interactions with families and professionals in our demonstration schools, as well as schools for the deaf and mainstream programs nationally, we encounter ongoing reports of medical and educational professionals making recommendations to families to use oral education approaches regardless of child characteristics. In consideration of broader practices for children with cochlear implants, the CIEC has focused on examining services and strategies that include both sign language and spoken language.

Children With Cochlear Implants Can Benefit From the Use of Sign

When considering the use of sign to support the language, communication, educational, and social-emotional development of children with cochlear implants, it is first necessary to address two issues: the definition of "sign" as its use is envisioned by professionals and families, and the controversy of using sign (regardless of how sign is defined) for children with cochlear implants. Without attention to these two issues, it is difficult to continue the discussion regarding recommendations for its use.

Defining "Sign"

Webster's New World College Dictionary (2005) defines sign language as "a system of signs and gestures used as a language." This definition implies that "sign language" encompasses a full language, as is the case with ASL, which is a complete visual language with all of the components of any language with its own vocabulary and grammar (Malloy, 2003). Use of "sign language" to mean ASL is different from using "sign language" when referring to signed representations of English such as Manually Coded English (MCE), Conceptually Accurate Signed English (CASE), Simultaneous Communication, (SimCom), or Sign Supported Speech (SSS), which are English-based sign systems employing sign as a support to English (Moores, 2001). These sign systems are not true languages.

As sign is discussed in professional circles and in research, however, it is often not defined. Consequently, it is important to detail exactly how it should be included. Our experience suggests that when methodologies that include sign are being recommended for children with cochlear implants, these recommendations typically imply the use of sign to support English, not ASL, as a full language. Professionals do not typically explain this distinction. This also is not generally understood by many families choosing to include sign. In addition, educational programs using both sign and spoken language for children with cochlear implants often do not clearly address how sign is used in their programs. We have found that lack of a clear definition of sign affects research validity when discussing per-

formance outcomes, family decision making regarding its use, and appropriate planning for how sign and spoken language can be jointly addressed in educational approaches for children with cochlear implants.

Addressing the Controversy of Sign Use for Children With Cochlear Implants

The second critical issue that is important to address is the pervasive fear that sign (either a sign system or ASL) may interfere with spoken language development. Although there are many documented factors (many cited earlier in this chapter) that potentially affect outcomes, use of sign often is the factor singled out as the primary factor limiting a child's spoken language progress. This prevents many families from choosing methodologies including sign for their child.

A review of research related to sign use, however, does *not* demonstrate that signing in and of itself impedes the development of spoken language on average across children. Instead, the quality and intensity of the spoken language used with a child has been found to have the most impact on the development of spoken language (Geers, 2006; Moeller, 2006; Moog & Geers, 2003; Spencer & Bass-Ringdahl, 2004; Yoshinaga-Itano, 2006).[5] It is critical to document, research, and share how spoken language can be actively developed, valued, and used in approaches that include sign, so these approaches will be more readily considered as a first choice option for children with implants to effectively meet their comprehensive linguistic, cognitive, communicative, and social needs.

Although there may be debate regarding use of sign for children following implantation, the benefit of providing visual access to language via sign before implantation to prevent linguistic, cognitive, and communicative deprivation appears to be indisputable (Schick, de Villiers, de Villiers, & Hoffmeister, 2002; Snoddon, 2008). The lack of age appropriate language development can negatively affect a child's cognitive and social development, which in turn interferes with success in school and in later life (Marge & Marge, 2005). Even in the best-case scenario regarding early implantation, children will typically miss approximately 14 to 15 months of prime language learning opportunities before gaining access to sound as they await eligibility for implantation, undergo surgery and the initial fitting of the externally worn speech processor, and learn listening skills. If spoken language access during these formative months is inadequate to promote linguistic competence, this alone is a strong justification to use ASL, a full visual language (while also stimulating auditory development through hearing aids and associated

5. Patricia Spencer (2009) summarized research findings addressing the use of sign for children with cochlear implants during her presentation titled "Research to practice" at the CIEC conference, Cochlear Implants and Sign Language: Building Foundations for Effective Educational Practices.

auditory/speech habilitation), at least to establish early language foundations and as a bridge to spoken language development (Malloy, 2003; Snoddon, 2008; Yoshinaga-Itano, 2006).

Although direct comparisons cannot be made between how deaf children with cochlear implants and hearing children learn language, it is interesting to observe the popularity of teaching sign to young hearing children. As sign is shown to jumpstart cognitive development, reduce communication frustration, enhance early communication confidence, and support speech development for hearing children (Goodwyn, Acredolo, & Brown, 2000), it seems unreasonable to object to the use sign for children who are deaf and could gain similar if not more benefit.

At the Kendall Demonstration Elementary School, we have observed students as they develop spoken language in our ASL/English bimodal–bilingual program, which actively incorporates both ASL and spoken English. Although we have not yet had the opportunity to formally research outcomes, we have documented student progress in both ASL and spoken English for educational planning purposes. The variable spoken English outcomes appear more strongly related to the many other factors that may affect performance rather than the use of ASL. Since 2000, many of our students with cochlear implants have developed spoken English skills at a level to effectively transition to educational settings using primarily spoken English and/or mainstream environments with an interpreter. We have also observed diverse students (e.g., children who are more visually inclined, children from Deaf families, children with additional language processing challenges, children implanted at a later age, children from hearing families interested in a bilingual education for their children) who demonstrate continued growth in their spoken English development but remain in our program as they continue to benefit from and value the development and use of ASL and English for the learning and communication afforded them in a bilingual environment.

Approaches to Sign Use for Children With Cochlear Implants

We have observed the following approaches that include sign (based on Moeller, 2006) in various educational programs throughout the United States:

- Use of sign vocabulary to facilitate early language development before obtaining a cochlear implant. Children are exposed to sign vocabulary (conceptually accurate ASL signs or an English-based sign system) to jumpstart language development before cochlear implantation. Signing is discontinued immediately upon implantation.
- Use of sign as a bridge or transition to proficiency in spoken English. Sign (ASL or an English-based sign system) is used with the child before implantation and as a bridge to transitioning to the use of spoken English following

implantation. Sign is slowly diminished as the child demonstrates increased proficiency in spoken English.

- Continued use of sign as a support to spoken English. An English-based sign system is used in conjunction with spoken English (either via simultaneous communication, sequentially as a support to English, or via an interpreter).
- Bilingual development. ASL and spoken English are each developed and addressed as independent languages. Spoken English is facilitated for both social and academic purposes based on the individual characteristics and goals of each child.
- Primary use of ASL. ASL is the child's primary language. Listening through the cochlear implant provides some linguistic support.

It has been our observation that medical and educational professional recommendations often lean toward use of English-based sign systems rather than bilingual approaches that include ASL and spoken English. The inclination to recommend English-based sign systems appears connected to desired long-term aspirations for proficiency in spoken English. Consequently, many professionals and families considering sign will gravitate toward use of an English-based sign system to promote this goal. ASL as a visual language, with a grammatical system separate from English and without a spoken component, is often not favorably viewed nor understood as a choice for children with cochlear implants, as the relationship between ASL as a visual language and English as a spoken and written language is often difficult for many professionals and families to envision. However, as stated earlier, there is research that clearly supports the use of ASL for children with cochlear implants in establishing early language foundations. In addition, there is strong support for the brain's capacity to readily accomplish both sign and spoken language acquisition without detriment to the development of language through either modality (Kovelman et al., 2009; Petitto et al., 2001; Petitto & Kovelman, 2003). Although the rate of developing speech perception/production skills may be slower for some children using both sign language and spoken language, the benefit of using approaches that include sign to safeguard linguistic, cognitive, and literacy development have been documented (Connor, Hieber, Arts, & Zwolen, 2000; Connor & Zwolan, 2004; Courtin, 2000; Fagen, Pisoni, Horn, & Dillon, 2007; Marschark & Hauser, 2008; Marschark, Rhoten, & Fabich, 2007; Mayberry, Lock, & Kazmi, 2002; Petitto et al., 2001).

If ASL/English bilingual programs are to be considered a favorable option for children with cochlear implants, it is important that the benefit of developing and using ASL and English as separate languages be clearly explained to families; strategies demonstrating how ASL can successfully link to and promote development of English be shared; and educational programs explicitly delineate

their philosophies, beliefs, and strategies regarding how spoken language can be effectively addressed in this approach. Rationales for why an English-based sign system may or may not be an appropriate recommendation for a child need to be reviewed by professionals as they plan effective programs and discuss these with families.

Sign Language, Cochlear Implants, and the Deaf Community

During the early years of cochlear implantation, there was speculation regarding whether individuals with cochlear implants would choose to be a part of the Deaf community (Christiansen & Leigh, 2002, 2004).[6] This issue emerged from the expectation that these individuals would function as "hearing" and no longer have an interest or need to associate with the larger Deaf community. Our interactions with cochlear implant users and their families in our demonstration school programs suggest that many individuals choose to use cochlear implant technology and maintain associations with the Deaf community. This includes Deaf adults obtaining a cochlear implant for themselves as well as both hearing and Deaf families choosing a cochlear implant for their children.

A connection with the Deaf community can be beneficial for children with cochlear implants in a variety of ways. This community can provide an essential resource for accessing native, proficient ASL language models for children and families who are learning and using ASL. Regardless of the families' language and communication choices, the Deaf community can provide a network for socialization and support. Some of the strategies that may facilitate involvement with the Deaf community are the following:

- Educational placements that include Deaf teachers, support professionals, and paraprofessionals.
- Opportunities to participate in summer camps and weekend activities that include deaf children and Deaf adults, especially if children do not have opportunities for interaction with other Deaf individuals through their educational placement.
- Availability of support groups for children with cochlear implants with activities to address identity.

6. "Deaf" with a capital D, refers to individuals who share the use of ASL and other common values, rules for behavior, traditions, and views of themselves (Padden & Humphries, 1988). The "Deaf community" refers to a cultural group sharing common experiences, concerns, and language (Ladd, 2003).

- Opportunities for families of children with cochlear implants to learn about the Deaf community and interact with Deaf adults and other parents of deaf children (e.g., social gatherings, parent support groups).
- Interaction with organizations that support association with the Deaf community such as the American Society for Deaf Children[7] and the National Association for the Deaf[8].

Considerations for Effective Language and Communication Planning

The CIEC has observed that an important factor in designing effective educational practices for children with cochlear implants is purposeful language and communication planning at both the *schoolwide level* and at the *individual student level*.

Schoolwide Planning

At the schoolwide level, it is important that any program enrolling children with cochlear implants first prepare by clearly articulating the school/program's vision, establishing language use practices, providing access to a range of support services, and promoting professional competence.

A Clearly Articulated Vision on the Use of Spoken and Signed Language

In developing a vision that considers the overall linguistic and cognitive needs of children in conjunction with auditory, speech, and spoken language development, it is helpful for schools to develop philosophy and belief statements to exemplify how the school program values and supports the education of children with cochlear implants (as well as other students who have access to sound through hearing aids). Philosophy and belief statements should reflect the importance of looking at the language, communication, cognitive, linguistic, and social-emotional development of the child. It is critical that this vision be applied to designing and implementing program practices that reflect a balance between development and

7. The American Society for Deaf Children supports and educates families of deaf and hard of hearing children and advocates high-quality educational programs and services. For more information, see http://www.deafchildren.org

8. The National Association for the Deaf is an advocacy organization of, for, and by deaf and hard of hearing individuals. In 2000, the National Association for the Deaf developed a position statement on cochlear implants that supports families in their right to make informed choices regarding language preference and use, educational placement and training opportunities, psychological and social development, and the use of cochlear implants and other assistive devices. For more information, see http://www.nad.org

use of auditory, speech, and spoken language skills and provision of an accessible learning environment through the development and use of sign.

Establishment of Language Use Practices

As educational programs establish practices that include both spoken language and sign, several types of sign-inclusive approaches may be considered. The approach chosen should best fit the needs of each individual child. The effectiveness of the approach should be evaluated regularly to determine whether it provides the child with sufficient opportunities to facilitate and use spoken language.

1. Sign as a support to spoken English. Children with a cochlear implant are presumed to have the potential to access, develop, and use spoken English for learning. It is therefore reasoned that if sign is included, it should be used to clarify or support concepts spoken in English. If this approach is chosen, it is important for the child to have the ability to use his or her listening ability to access English as a full language for academic learning as well as for social interactions (see section on diverse outcomes). When determining classroom placement for children based primarily on their auditory, speech, and spoken language goals, it is important to think about how grouping students in this manner will affect planning and implementation of the child's academic program.

2. Bilingual development of ASL and spoken English. An ASL/English bimodal–bilingual approach promotes language foundations and access to learning through both modalities (auditory and visual) and both languages (ASL and English). Both ASL and spoken English are addressed as independent languages. Strategies to develop and use spoken English are implemented to match the characteristics and goals of each child. ASL can serve an integral role in promoting linguistic and cognitive competence in varied ways—preimplantation as a child transitions to spoken English learning, and postimplantation as a child continues to develop spoken English (Swanwick & Tsverik, 2007).

3. Interpreters in the mainstream. An educational interpreter can provide access to communication and learning in a mainstream environment for children with cochlear implants who do not demonstrate the auditory, speech, and spoken language competency to fully access the curriculum and communicate with their peers without the use of a signed language or sign system. Interpreting services should be evaluated on an ongoing basis to determine how best to support the comprehensive needs of the child in the educational setting.

As children demonstrate increasing proficiency in understanding complex, fast-paced spoken language, it may become appropriate to transition from ASL to a sign system that supports or clarifies English. This decision should be closely scrutinized and monitored. If interpreting is provided via an English-based sign system, consideration should be given to the use of conceptually accurate signing

rather than the use of other MCE systems that do not necessarily convey concepts visually and are typically based on how a word sounds.

The interpreter's role may be expanded to provide support in areas such as preteaching concepts, clarifying information upon request, clarifying multiple meanings of words (e.g., present, park, run), clarifying words that sound the same but are spelled differently (e.g., bear/bare), and cueing the student during fast-paced discussions. If the interpreter is to take on multiple responsibilities in conjunction with interpreting, it is critical that the interpreter, educational program professionals, and the child's family agree on these services as a component of the planning/Individualized Education Program (IEP) process and that the interpreter be qualified to take on these added responsibilities.

Interpreters can incorporate strategies that offer students the opportunity (as appropriate) to rely on their spoken language ability. These include allowing a child to listen to the teacher or other students before immediately providing interpretation, allowing the child to first listen to the message and then signing words and concepts for clarification as needed, and assisting the child in making links between sign and spoken language (e.g., say it–sign it or sign it–say it).

Provide a Range of Support Services

Support services are integral to successfully meeting the needs of children with cochlear implants. Regardless of the educational setting, consideration of the following supports can be incorporated into planning and provided by the school or outside professionals.

Auditory and speech training. Effective programs for children with cochlear implants should include opportunities to address development of individualized spoken language skills as well as opportunities for spoken language to be used and valued in the child's daily learning environment. There is extensive discussion in the field regarding who is qualified to provide auditory habilitation, how it should be provided (i.e., incorporated in natural environments or in therapy settings), and how often a child should be seen for services. Our experience suggests that (1) there is no uniform recommendation for all children, (2) there may be professionals with varied credentials and backgrounds qualified to provide auditory and speech habilitation services, and (3) more is not always better. Based on our experience, we recommend that the following issues be taken into consideration as decisions are made regarding spoken language habilitation practices:

- All children with cochlear implants should receive some type of auditory and speech habilitation services following implantation either through their hospital implant center, their school program, or a private professional. A habilitation program should continue as long as the child is progressing in his or her development of spoken language skills.
- Auditory habilitation services should be provided by knowledgeable professionals with cross-disciplinary skills in three primary areas: audiology,

speech-language pathology, and education of the deaf. The professionals should have training and experience with the development of auditory, speech, and language skills for children with hearing loss and demonstrate proficiency in the communication mode that the child uses (American Speech-Language-Hearing Association & Council on Education of the Deaf, 2004). Increasing numbers of training/certification programs are preparing professionals to facilitate spoken language for children with cochlear implants.[9] However, experienced specialists who do not have formal certification may be qualified to provide the necessary services. It is important to explore the qualifications of the professional who will be providing services to each child to assure he or she has the necessary training and experience.

- Development of spoken language skills may effectively be addressed in individualized therapeutic sessions, integrated into the child's natural environments (home or classroom), or a combination of both. Some children may learn best in a therapy setting, whereas others may readily develop skills in more natural settings.
- Recommendations regarding the frequency of habilitation services should be specific to each child. Immediately after implantation, the child may require more frequent and focused attention on skill development. As spoken language foundations are established, the frequency of individualized training should be revisited.

Collaborative planning. Ongoing collaboration between hospital implant centers and educational settings (i.e., observations between centers/schools, workshops, teaming, attendance at Individualized Family Service Plan (IFSP)/IEP meetings) is integral to promoting effective language and communication planning and educational program implementation for children with cochlear implants. It is important that hospital implant centers understand the full range of issues involved in educational placement and language/communication planning and that the school understand the clinical and medical side of implantation. This collaboration is vital to facilitating unified and cohesive recommendations to the family regarding educational placement and language use as well as habilitation practices.

Equipment troubleshooting. A child's success with an implant depends on the device's consistent functioning. Although it is not common, the internal

9. The AG Bell Academy for Listening and Spoken Language offers certification for listening and spoken language specialists (LSLS) as either auditory-verbal therapists (LSLS Cert. AVT) or auditory-verbal educators (LSLS Cert. AVEd). Another training program, the Professional Preparation in Cochlear Implants (PPCI), represents a multicenter collaboration to address both the medical and educational aspects of pediatric cochlear implantation. PPCI is specifically designed for teachers of deaf children, speech-language pathologists, and educational audiologists to provide training and experience in providing (re)habilitation services to children with implants.

component of the implant device can fail (Hughes & Pensak, 2006). More common are issues related to the functioning of the implant's external speech processor. To assure optimal functioning, it is critical that professionals working with the child are comfortable with the device, know the personal device settings for each child, and can check the device on a daily basis. School professionals needing support in this area will benefit from access to an educational audiologist in their school system and/or an audiologist from the hospital implant center. Information about how to troubleshoot implant devices can be found on each manufacturer's Web site. To ensure that children are functioning as expected with their implant, it is recommended that in addition to checking the integrity of the equipment itself (speech processor, cords, batteries, settings, etc.) on a daily basis, someone in the child's environment also complete a daily functional check of the equipment while it is on the child using the Ling 6-sound check.[10]

Frequency modulation systems. As more and more children are obtaining cochlear implants, the use of frequency modulation (FM) systems to enhance listening is being evaluated (Schafer, 2008). Although FM systems provide significant benefit in noisy environments and when listening from a distance, questions about the most effective use of these devices for children with implants remain (Thibodeau, 2006). There are questions about whether to use direct audio input (an FM device coupled directly to a child's cochlear implant) or a sound field device (an FM system using speakers placed strategically in the classroom). When FM equipment is used for children in ASL/English bilingual classrooms where spoken English is at times directed to only some children in the classroom, a direct audio input system rather than a sound field system may be better suited to not distract students who are not involved in that communication interaction.

Student support groups. If an educational program has several students with cochlear implants, it is beneficial to set up support groups. Support groups provide students with the opportunity to discuss issues specific to their personal experiences with a cochlear implant. Older students can be role models for younger implanted students.

Family education and support. It is critical that school professionals partner with families who are in the process of considering implantation. It is helpful to identify teachers or staff members who are knowledgeable about cochlear implants and can collaboratively provide the family with information about the technology

10. The Ling Six Sound Check is a tool used to evaluate children's functioning with their cochlear implant using six sounds representative of varied English phonemes across the frequencies integral to understanding speech (ah, ee, oo, sh, s, mm). A child is asked to produce a conditioned response to sound (put a block in a can, raise hand, etc.) to indicate that they are aware of each of these sounds at a quiet listening level. After a baseline is obtained, a change in the child's responses indicates a red flag for further troubleshooting of the child's cochlear implant. For further information about how to do the Ling Six Sound Check, see http://www.advancedbionics.com/UserFiles/File/Ling_Six_Sound_Check-6.pdf

itself, the medical and audiological evaluations involved in the implant process, and expected performance outcomes for their child (Chute & Nevins, 2002). The school may consider hosting family education workshops on this topic and providing individual counseling to families. It is also beneficial to identify a professional in the school program to act as a liaison between the school and the hospital implant center and assist families in networking with other families who have already gone through the implant process.

Promote Professional Competence

As increasing numbers of professionals in signing settings work with children who have cochlear implants, school programs need to ensure that these professionals are comfortable with cochlear implant technology, understand the varied outcomes for children with cochlear implants, and are competent in incorporating strategies to support not only signs/ASL but also auditory and speech development, academic learning, and social-emotional growth. There are numerous professional training opportunities and educational training guides available through the three cochlear implant manufacturers as well as agencies and organizations with the mission of promoting oral education. There are currently limited training opportunities available to address strategies and techniques for addressing both sign and spoken languages for children with cochlear implants.

Presently, teachers trained in educational philosophies that include sign often do not have the background and experience in facilitating spoken English skill development, and teachers trained in spoken language methodologies often do not have the sign skills necessary to work with students who may benefit from its use. The CIEC has therefore focused attention on offering professional training opportunities throughout the United States to educate professionals about considerations for establishing bimodal educational programs (use of both sign and spoken languages) for children with cochlear implants. To further address this topic, the CIEC has hosted two conferences[11] to encourage national discussion on how to work collaboratively to identify, research, and share evidence-based practices for the growing diverse population of children with cochlear implants who could benefit from bimodal approaches. In addition, the CIEC has worked collaboratively with the Center for ASL/English Bilingual Education and Research[12] at Gallaudet

11. Cochlear Implants and Sign: Putting It All Together (April 2002) http://clerccenter.gallaudet.edu/Documents/Clerc/CIandSL.pdf and Cochlear Implants and Sign: Building Foundations for Effective Educational Practices (April 2009) http://clerccenter.gallaudet.edu/Clerc_Center/Information_and_Resources/Cochlear_Implant_Education_Center/Cochlear_Implants_and_Sign_Language_Building_Foundations_for_Effective_Educational_Practices.html

12. The Center for ASL/English Bilingual Education and Research is housed at Gallaudet University. Its mission is to foster educational leadership and collaborative opportunities for educators implementing ASL/English bilingual programs in their schools.

University in sharing strategies to address spoken English development and use in an ASL/English bilingual framework. This framework is shared with professionals through the Center for ASL/English Bilingual Education and Research's ASL/English Bilingual Professional Development, which is designed for teachers and staff who work in schools for the deaf that follow an ASL/English bilingual philosophy (Nover, Andrews, Baker, Everhart, & Bradford, 2002).

As school programs that use both sign and spoken languages include children with cochlear implants, it is important that teachers and staff be prepared to work with this population of students. It is important to address the following issues in professional training:

- How teachers, audiologists, speech-language pathologists, sign language specialists, counselors, teaching assistants, and interpreters (if in the mainstream) can work as a team to meet a child's language and communication needs. Ideally, teams should consist of deaf and hearing professionals and paraprofessionals. It is important that all teachers and staff understand their role in relation to working with students with cochlear implants.
- The need to establish guidelines for interpreters working with students who have cochlear implants (i.e., use of ASL or English-based sign systems, interpreting strategies for students with varying levels of auditory and speech competence, the possible expanded role of interpreters for students with cochlear implants).
- The importance of understanding each child's auditory functioning level—the level at which a child is functioning on a hierarchy of auditory development (i.e., detection, discrimination, identification, or comprehension; Erber, 1977). A child's auditory functioning level will determine how spoken language and sign will each be used to facilitate language development and use in communication interactions throughout the day.
- Strategies associated with how to promote a child's access to auditory information by modifying the challenge of a listening situation. Professionals and families can incorporate varying strategies related to managing either the content or presentation of a message to make spoken language information either more accessible or more challenging.[13]
- Strategies related to how and when to include (or not include) visual clarification (sign and/or speechreading) to support spoken English in signing environments so appropriate opportunities are available to promote auditory develop-

13. Mary E. Koch, *Bringing Sound to Life: Principles and Practices of Cochlear Implant Rehabilitation* (available through Advanced Bionics Corporation) is a training program for professionals and parents that offers a systematic approach to learning how to listen and understand the connection between a sound and its meaning. This program includes strategies on how to facilitate a child's auditory learning through modification of "challenge factors" related to the content and presentation of a message.

ment and use. Note: although cued speech[14] is a visual strategy considered for use in supporting the English development of children with cochlear implants, the CIEC has not been involved with using and evaluating cued speech.

- Effective strategies to help children make connections between signed and spoken languages. For example, if a child has established vocabulary and language concepts in sign, professionals (and families) can implement strategies to assist children in making links from their known signs to the correlating spoken vocabulary and concepts.

Individual Planning

Individualized planning for each child is the second part of the language and communication planning process integral to effective educational programming for children with a cochlear implant. Whether a child is in a school for the deaf, a self-contained classroom, a mainstream program, or a typical classroom, an effective program is a program designed to match a child's individual needs related to language use and necessary support services.

To promote individualized planning, it is helpful to develop an individualized language and communication plan. This plan should include documentation of the following:

- A student profile summarizing integral background information and a description of a child's spoken and sign competence.
- Support service recommendations to promote the development of both spoken and sign skills (e.g., auditory habilitation services, sign language classes/services, family sign language classes).
- Recommendations for spoken language and sign language use throughout the school program to support learning.

Although the framework used to document a child's individualized plan may be unique to each school program, the important issue is to have some type of planning process to guide systematic decision making and program monitoring of classroom characteristics and services for each child. This plan can be incorporated into the IFSP/IEP process or used in other ways to share information with families as decisions are made about appropriate programs and services to meet a child's needs.

14. As defined by the National Cued Speech Association, cued speech is a visual communication system that uses eight handshapes in four different placements near the face in combination with the mouth movements of speech to make the sounds of spoken language look different from each other.

Regardless of the format used, it is recommended that the development of an individualized language and communication plan be facilitated by a team of professionals working with the student including the child's teacher(s), speech-language specialist, audiologist, family members, sign language specialists (when available), interpreters, and the student (when appropriate). If auditory habilitation specialists outside of the school are involved with the child, information sharing to facilitate the development of this plan would be beneficial.

Developing a student profile. When developing student profiles at Kendall Demonstration Elementary School, we have found it beneficial to document and discuss a child's functioning along the following two continuums:[15] a receptive continuum for how a child accesses language (visually, auditorily, or somewhere in between) and an expressive continuum for how a child expresses language (sign, spoken, or somewhere in between) (Nussbaum, Scott, Waddy-Smith, & Koch, 2004). Documenting a child's functioning on each continuum has been valuable in providing a baseline for each child to support decision making regarding language and communication practices to best match his or her unique characteristics.

Children's placement on the receptive continuum (see Figure 1) is based on how they generally tend to access information for communication and learning. When children do not have access to auditory information, they would be described as a **big V** learner, indicating that they best access information for learning visually

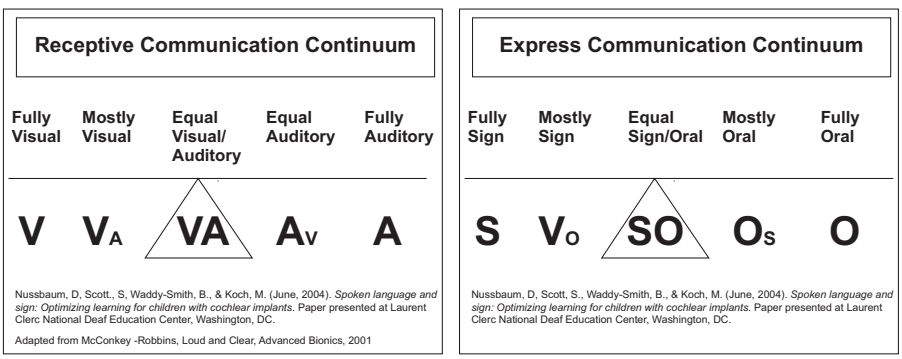

Figure 1: Tool used at the Laurent Clerc National Deaf Education Center to document a child's receptive and expressive communication as part of the individualized language planning process.

15. The receptive continuum was adapted from McConkey Robbins (2001). Both continuums have been included in Clerc Center national professional training workshops provided by the CIEC titled "Spoken language and sign: Optimizing learning for children with cochlear implants" as well as other professional training activities. These continuums are incorporated into the individualized planning process at Kendall Demonstration Elementary School.

through sign. As the child first receives a hearing aid and/or cochlear implant and begins to access auditory information, he or she may move to becoming a **big V, little A** learner, indicating that although primary learning still occurs visually via sign, some learning is beginning to occur through the slowly developing sense of audition. At the **VA** stage of the continuum, the child is able to access information equally through either visual or auditory channels. At the **big A, little V** point in the continuum, the child is able to access auditory information for learning; however, he or she may still benefit from visual information through sign or other visual clarifiers (e.g., pictures, cues, objects). When the child can readily access auditory learning without use of visual information through sign or other visual clarifiers, he or she is described as a **big A** learner. How the child best accesses information either visually or through listening may depend on the characteristics of the listening situation.

It should be noted that even when children have the characteristics to function as **big A** learners they may still demonstrate challenges in listening that affect learning, such as difficulty understanding in background noise and at a distance; difficulty following and understanding the responses and answers of classmates; difficulty understanding the fast rate and complexity of language used in the classroom; difficulty following group discussions, the need for increased processing time to respond; and extra effort listening, which may cause fatigue and loss of focus or attention (Med El Corporation, 2008, p. 31). It is important to consider all of these issues, unique to children with cochlear implants in comparison with their hearing peers, when planning.

It is equally important to describe how children function expressively in their ability to communicate information (see Figure 1). From the expressive perspective, children may be considered a **big S** communicator, indicating that they may most comfortably and readily express themselves through sign. As the child demonstrates beginning development of spoken communication, they may move on the continuum to becoming a **big S, little O** communicator. At this stage, the child primarily uses sign to communicate and oral communication skills are emerging. Children are considered **SO** communicators when they demonstrate the potential to communicate information comfortably through either sign or spoken language. At a **Big O, little s** placement on the continuum, the child primarily uses spoken language with sign used for clarification. When children can comfortably and intelligibly communicate age appropriate language information through spoken language without the use of sign, they may be described as a **Big O** communicator.

As these continuums are incorporated into developing a student profile and an individual language and communication plan, we have found it important to emphasize the following:

- How far each child with a cochlear implant will move along the receptive continuum toward auditory learning and along the expressive continuum toward spoken language competence is not guaranteed. The rate of movement along each continuum will also vary for each child.
- Although a child may have the *potential* to become a **big A** learner or **big O** communicator, school placement and language use decisions should look beyond potential and take into consideration where a child is functioning at the time the plan is developed.
- How a child functions on either continuum may differ in varied settings (e.g., social setting, large classroom, small group or one-on-one communication, noisy environment, complicated fast-paced language use). Language use decisions should reflect a child's needs in these varied settings.
- How a child functions in receptive spoken language understanding may differ from how she or he functions in expressive spoken language use. For example, a child may be able to readily understand spoken language. However there may be other complicating factors (e.g., oral motor issues), unique to the child that may limit effective use of speech.
- Where a child falls on either continuum will affect recommendations not only in language and communication development but also in all education and social-emotional development areas.

Use of these continuums should be viewed as only one component of individualized planning. It is important to also take into consideration the multitude of other factors affecting a child's development that should be actively addressed in making decisions on school placement and language use (e.g., psychosocial factors, additional learning challenges, language use in the home, the family's and/or child's desire to be in an environment that includes sign language, the child's comfort level and confidence in using either speech or sign). As mentioned earlier, when children have other complex needs in addition to developing listening, speech, and spoken language through their implant (e.g., learning disabilities, second language used in the home, generalized language delays), it cannot be emphasized enough how important it is to also concentrate on these issues in educational planning and family counseling (Edwards, 2007).

Monitoring Progress

It is of course important to monitor the progress of children with cochlear implants in all areas of development, including spoken language growth. As spoken language skill development in sign-inclusive environments is monitored, it is recommended that available auditory, speech, and spoken language checklists and assessment tools be incorporated to document a child's progress.[16] Any potential red flags should be

16. There is a variety of checklists available to document expected auditory, speech, and spoken language progress for children with cochlear implants. It is important to

noted and considered in developing continued recommendations for a child. Decisions regarding educational placement and language use should reflect children's current auditory/speech functioning in relation to their ability to best access learning as well as future aspirations for their spoken language use. Our recommendation is that decisions regarding communication methodology and educational placement be based on comprehensive assessment and monitoring of a child's needs in all areas of development and not solely on the development of spoken language.

If the transition from a signing environment to a speaking environment is under consideration, this process should involve purposeful planning and a systematic approach to evaluating the appropriateness of this transition for the child. As transitioning is considered, keep in mind that even if a child demonstrates spoken language levels to readily access and use spoken language, the appropriateness of an oral mainstream environment should not automatically be assumed. All areas of a child's development should be considered when deciding whether a mainstream oral environment or a setting that includes sign is a more appropriate placement, even if he or she is demonstrating increasing competence as an auditory learner. If transitioning from a sign-based environment to an oral mainstream environment is under consideration, we recommend using *Children with cochlear implants who sign: Guidelines for transitioning to oral education or a mainstream setting* (Boston Center for Deaf and Hard of Hearing Children, Children's Hospital Boston, 2009) as a tool to assist in this process. These guidelines may also be helpful in monitoring children already placed in spoken language settings to ensure that they are appropriately placed or perhaps would be more appropriately served in an environment that includes sign.

Putting it all Together

Although considerations in planning for children with cochlear implants have typically been confined to oral education approaches, we are optimistic that the field of deaf education is reaching a tipping point in viewing language and communication approaches that include both signed and spoken languages for children with cochlear implants. A "tipping point" is a social phenomenon achieved when small numbers of people start behaving differently and that behavior then ripples outward until a critical mass, or tipping point, is reached (Gladwell, 2000). As more children obtain cochlear implants and the obvious diversity in the characteristics and needs of these children and families becomes increasingly apparent, it is hoped that systemic changes will occur in professional training and educational program development to

chart a child's progress using these guideposts. Checklists include *Tracking auditory progress in CI kids* (McConkey Robbins, 2005), Med El handbook for educators: *Teaching children who listen with a cochlear implant* (Med El Corporation, 2008, pp. 16–20), and *Benchmarks of performance for children with cochlear implants* (Nevins & Garber, 2005).

reflect the considerations discussed in this chapter. We hope that practices that promote linguistic, cognitive, academic, and social competence that include both spoken and sign languages as well as continued connection with the Deaf community will then ripple outward until a critical mass is reached in viewing these practices as accepted and valued recommendations for children with cochlear implants. The CIEC at the Clerc Center looks forward to being a part of this positive change.

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