Should All Deaf Children Learn Sign Language?

By Joanna Smith, MS, & Jace Wolfe, PhD

The July 2015 issue of *Pediatrics* featured nine experts from varied backgrounds within the areas of otolaryngology and language development who tackled the hot-button question of whether children who are born with hearing loss and receive a cochlear implant at an early age should also need and learn to use sign language (**Mellon. 136[1]:170-176**). The authors who contributed to the manuscript included proponents of both a listening and spoken language approach (LSL) and Deaf culture, as well as parents of children with bilateral cochlear implants, professors of education and linguistics, and a biomedical ethicist. Each of these professionals specifically weighed in on whether an infant born to normal-hearing parents with no knowledge of sign language should be exposed to sign language prior to receiving a cochlear implant within a few months. Additionally, they also discussed whether the child should continue to use sign language after receiving the cochlear implant. This month's installment addresses some of the most provocative arguments the group of experts made for and against the use of sign language as well as the clinical implications of these arguments for infants and young children using cochlear implants.

1. "Ninety-five percent of children with hearing loss are born to normal-hearing parents" who "desire to share their own language and culture with their child." – Nancy Mellon, MS, and John K. Niparko, MD

Most people would likely agree that hearing health care professionals should support families of children with hearing loss in making decisions that facilitate the attainment of the goals, desires, and wishes they have for their children. A family's desired outcome for their child must guide the discussion, and professionals should refrain from making assumptions about families' preferences and goals for their children. Instead, as mentioned in a previous Tot Ten installment, our first job is not to give information, but to get information (**Smith, Michael A. *The Hearing Journal* 2015;68[6]:32-36**).

We must know what the family wants to know and how to best support a family of a child with hearing loss (e.g., should we recommend the use of sign language?). We should present all modes of communication in an unbiased manner, including the advantages and limitations of each, and applying evidence-based knowledge whenever possible. We should encourage


Dr. Wolfe, left, is the director of audiology at Hearts for Hearing and an adjunct assistant professor at the University of Oklahoma Health Sciences Center and Salus University. **Ms. Smith, right,** is a founder and the executive director of Hearts for Hearing in Oklahoma City.

the family to consider all of the information and articulate goals for their child. Some families may want to optimize the bilingual proficiencies of their children, while others may wish to focus on spoken language. Ideally, the family should express their long-term goals for their child not only in the speech, language, and auditory domains, but also in the areas of educational, social, and career development. The job of hearing health care professionals is to listen well in order to understand the hopes and desires of each family and to equip families with the resources and support needed to achieve their desired goals. This may seem like an obvious statement, but it lays the foundation for the remainder of the discussion at hand.

2. Sign language, when used for a short time pre-implant, cannot hurt language development and may be beneficial. – Nancy Mellon, MS, and John Niparko, MD

Indeed, there are no peer-reviewed studies that have explored whether the use of sign language prior to early implantation benefits or limits spoken language development. There are several important considerations to keep in mind regarding this specific topic.

First, a mounting body of evidence is suggesting that outcomes are better when children receive a cochlear implant before their first birthday. Teresa Y.C. Ching, PSM, and Harvey Dillon, PhD, found that language outcomes decrease by one-half standard deviation for every six-month delay in implantation from 6 months of age (**Ching. *Int J Audiol* 2013;52[Suppl 2]:S65-8**). With findings like this in mind, astute cochlear implant teams are recommending cochlear implantation at 6-9 months of age for children who receive limited to no benefit from hearing aids. As a result, the window of time between diagnosis and implantation is quite short, and the decision of whether to supplement communication with sign language is likely of little consequence.

Second, for all infants diagnosed with hearing loss, hearing health care professionals should strive to maximize the use of any residual hearing the child possesses. Most children with severe to profound hearing loss have some aidable hearing, typically in the low-frequency range. Audibility of acoustic information in this range can convey important speech cues, including the presence and absence of sound, pattern perception, pitch and intonation, conversational turn-taking, etc., and may serve as a foundation to establish listening skills that will flourish once a better auditory signal is provided by the cochlear implant.

Third, once an infant receives a cochlear implant, caregivers should seek to create an enriching auditory lifestyle to expose the child to a robust model of spoken language. Upon diagnosis of a significant hearing loss, a Listening and Spoken Language Specialist (LSLS) who is certified as an Auditory Verbal Therapist (AVT) or a certified Auditory Verbal Educator (AVEd) should immediately support a family in the task of creating a world full of rich and plentiful intelligible speech. For families wishing to optimize their children's spoken language, the development of sign language skills should not occur at the expense of the development of an optimal model for auditory and spoken language development. Instead, the primary focus should center on ensuring the provision of early implantation (e.g., 8-9 months of age) when it is necessary for the child and in assisting the family in developing lifestyle changes that will ensure the provision of a model that is awash with intelligible spoken language.

3. "There are times when my son is unable to wear his implants (e.g., swimming) or is unable to hear because of excessive background noise." – Sasha Scambler, PhD

This is certainly a practical and legitimate concern for families of children with hearing loss. One should also note, however, this concern is becoming less of an issue because of recent developments in cochlear implant technology. Today, children typically use ear-level sound processors that are well-insulated from static electrical discharge. Also, a variety of effective options exist to facilitate retention of the sound processor during active use. As a result, most of the children we serve routinely use their cochlear implants during all waking hours, including playtime or on the playground. Additionally, all major cochlear implant manufacturers offer a water-proof solution for at least one of their sound processors so that children may use their cochlear implants while swimming and bathing.

Furthermore, manufacturers have developed an array of technologies that have been shown to improve hearing performance in noise, including speech enhancement and noise reduction processing, fully automatic, adaptive directional microphones, and digital remote microphone systems. Recent research studies conducted in our laboratory have actually shown that use of remote microphone technology can potentially result in better speech recognition in noise than persons with normal hearing. Of course, one would expect children with cochlear implants to typically experience more difficulty with communication in noise. Hearing health care professionals, however, should work to ensure that children with cochlear implants are equipped with contemporary noise management technologies to optimize hearing performance whenever possible and to effectively diminish the concern that a child will not be able to communicate in noisy or other challenging situations.

A wealth of large studies of children with hearing loss indicate that children who use cochlear implants typically achieve greater spoken language outcomes when families pursue a LSL approach relative to Total Communication.

4. "We, as a family, are in the process of learning sign language."– Sasha Scambler, PhD

After acknowledging the communication hardship that occurs when his son cannot use his cochlear implants, Dr. Scambler notes that he, his son, and his family are in the process of learning sign language, which he said also feels is important so that his son has "access to sign language as a deaf person." Scambler's son is 5 years old with age-appropriate oral and aural language. He attends a mainstream primary school classroom with normal-hearing peers. As a school-aged boy who received cochlear implants at an early age, Dr. Scambler's son had sufficient access to a robust model of intelligible speech, and from that experience, his auditory nervous system development has allowed for the attainment of spoken language within the critical period of speech and language development. As such, Dr. Scambler's son is in a favorable position to develop a second language without any concern for compromising his spoken language aptitude, particularly if he also continues to listen and talk throughout the day.

Some of the children we serve have embarked upon similar journeys. They received appropriate early intervention that resulted in age-appropriate spoken language development during the first few years of life, and they are now successfully learning sign language as a second language. One of our long-term patients who has excellent spoken language skills,

in fact, is taking a sign language course in his freshman year of college. In short, the development of spoken language will only occur if the child consistently uses spoken language during the first few years of life. However, once spoken language is firmly established, sign language may certainly be learned as a second language later in life.

5. "A speech-only approach risks linguistic deprivation at a crucial period of development." – Christian Rathmann, PhD, and Gaurav Mathur, PhD

We find this statement to be troubling for a variety of reasons. It implies that children who have severe-to-profound hearing loss will not have access to a sufficient model for language development if they use cochlear implants. Actually, the overwhelming majority of children with cochlear implants should have ample access to intelligible speech with the use of appropriately programmed, modern cochlear implant technology. The use of objective measures, such as the electrically evoked compound action potential (e.g., NRT) and the electrically evoked stapedial reflex threshold, may be used to ensure that a child's cochlear implants are providing stimulation that will make speech and environmental sounds audible. Recent research has indicated that the NRT response is present in more than 95 percent of cochlear implant recipients, so the programming clinician should be well aware of stimulation levels that are necessary to provide sufficient stimulation of the auditory system.

Furthermore, children who are at risk for possessing an inadequate response to a cochlear implant are often easily identified early in the implant process. Magnetic resonance imaging is now the gold standard imaging procedure of choice and may be used to determine whether a viable cochlear nerve exists. The cochlear implant team may be more inclined to recommend the family supplement spoken language with sign language in the rare event in which a child has deficient cochlear nerves for both ears. Alternative forms of technology, such as an auditory brainstem implant, may be considered as well.

Proactive cochlear implant teams are adept at identifying other exceptional factors that may be associated with poorer outcomes, such as bacterial meningitis with cochlear ossification, severe cochlea anatomical abnormalities, etc., and then adjusting intervention to recommend sign language and/or alternative forms of hearing technology as needed.

Additionally, numerous studies have shown that better outcomes for children with hearing loss are associated with greater exposure to maternal and paternal spoken language (Ching. *Int J Audiol* 2013;52[Suppl 2]:S65-8). As a result, to arrest the potential of linguistic deprivation during a crucial period of development, professionals should focus on practices that increase a child's exposure to intelligible speech rather than introducing manual communication at the expense of spoken language. Audition-based therapy is imperative for families of children with hearing loss, because it serves as a constant reminder of and guide for the importance of full-time use of optimized hearing technology and the creation of a lifestyle rich in complex, intelligible speech. Clinicians must ensure that the most appropriate technology is available to the child, including a well-programmed cochlear implant MAP, contemporary remote microphone systems, and noise management technologies. Verification should be conducted routinely to ensure a child has excellent access to low-level sounds, and validation, in the form of norm-referenced, standardized questionnaires (e.g., LittlEARS, PEACH) should be administered to confirm that functional hearing development is satisfactory. Also, audiologists and LSL specialists who are Cert. AVT or Cert. AVEd professionals should communicate consistently to ensure that a child is making adequate progress in spoken language development. Finally, data logging is an excellent tool available to hearing health care professionals and should be monitored frequently to make certain that hearing technology is being used during all waking hours. To summarize, the overwhelming majority of today's pediatric cochlear implant recipients will be at a greater risk of linguistic deprivation if families are not supported in the task of ensuring the child has optimal access to intelligible spoken language.

Some families may want to optimize the bilingual proficiencies of their children, while others may wish to focus on spoken language.

6. "Bilingualism is beneficial." – Christian Rathmann, PhD, and Gaurav Mathur, PhD

This statement is true when considered in the same context as described in the fourth item. Once optimal development of the auditory nervous system has been achieved following audition-based intervention throughout the first several years of life, then it is perfectly suitable to pursue the development of sign language as a complement to spoken language. For infants and toddlers, however, this statement must be considered within the context of how it relates to families' goals and desires for their children. A wealth of large studies of children with hearing loss indicate that children who use cochlear implants typically achieve greater spoken language outcomes when families pursue a LSL approach relative to Total Communication. Dr. Ching and colleagues, for example, studied approximately 460 children with hearing loss and found early communication mode to be one of the strongest predictors of spoken language outcomes at 5 years of age (*Cochlear*

Implants Int 2014;15 [Suppl 1]:S27-9). Likewise, Ann E. Geers, PhD, and colleagues evaluated 112 children with cochlear implants and also found that children who used LSL exclusively during early childhood years achieved better language outcomes when compared to children who used spoken and sign language (*J Speech Lang Hear Res* 2013;56[2]:643-55). Further, the effect of better outcomes associated with a LSL approach persisted into the participants' teenage years. Without a doubt, recent peer-reviewed research shows an overwhelming trend toward better speech and language outcomes for children who primarily used LSL during early childhood relative to those who used Total Communication. Of note, the better outcomes associated with a LSL approach are often particularly evident for speech production, spoken language, and speech recognition.

7. "Sign language development correlates positively with written and spoken language." – Christian Rathmann, PhD, and Gaurav Mathur, PhD

This statement may mislead professionals, as it may seem to suggest that children who are deaf and communicate via sign language are more apt to develop better written, literacy, and spoken language skills. As mentioned, the majority of recent peer-reviewed studies unequivocally associate better spoken language outcomes with a listening and spoken language approach during early childhood. Historically, research has suggested that children who are born deaf and do not have access to cochlear implantation typically develop a third-grade literacy aptitude at the time of high school graduation. The challenge is eloquently described by Dana Suskind, MD, in her book *Thirty Million Words*:

For all infants diagnosed with hearing loss, hearing health care professionals should strive to maximize the use of any residual hearing the child possesses.

"Imagine, if you read only English, having to learn words you don't know, written in Chinese characters. In the same way, deaf children are being asked to recognize letters on a page, combine them for words, and understand the meanings of those words without ever having heard them. The word "cat," for example; easy, right? You know the "ka" sound of C, the "a" sound of A, and the "t" sound of the T. And you immediately equate the combination of those sounds to a little furry animal that says "meow." But what if you'd never heard the sounds of the letters C, A, T, either individually or strung together? What would those symbols mean to you? Even though you can sign for the animal "cat," seeing C-A-T means nothing. That is the arduous road that a deaf child has to go through to learn to read."

It should be noted that the same areas in the brain that are active when we read and spell words are the same areas that are active when we listen to intelligible speech. As a result, a focus on the consistent audibility of intelligible speech serves as the underpinning for the development of spoken language and literacy skills. Finally, it is well known that the grammar, morphology, and syntax of American Sign Language differ substantially from that of spoken language, a fact that complicates the process of developing conventional written and literacy skills. In truth, the physiologic bases underlying literacy and spoken language development as well as the results of recent studies overwhelmingly indicate better written and spoken language outcomes for children who receive a cochlear implant and use LSL relative to those who use sign language.

8. "All deaf children should be taught a sign language as soon as their hearing status is determined, in conjunction with training in spoken language." – Donna Jo Napoli, PhD, and Theresa Handley

At the risk of sounding like a broken record, if a family's goal is optimizing their child's spoken language abilities, then the primary focus of early intervention should be the provision of a lifestyle rich in complex, intelligible speech. Dr. Suskind's *Thirty Million Words* highlights the landmark Betty Hart, PhD, and Todd Risley, PhD study, which has significant implications for language development of children with hearing loss (***Meaningful Differences in Everyday Experience of Young American Children*. Baltimore, MD: Brookes Publishing, 1996**). Drs. Hart and Risley were two sociologists who conducted a study aimed to identify the reasons for why the vocabulary levels of school-aged children from affluent families have far exceeded that of children from impoverished homes, and found that children from homes with caregivers who had professional occupations were exposed on average to approximately 45 million words by their fourth birthday, while children living in homes whose caregivers qualified for welfare assistance were exposed to approximately 13 million words during the same time period.

These findings confirm that language development is predicated upon exposure to complex, intelligible speech. Congenital hearing loss places a child at risk for not being exposed to 45 million words during the first three years of life. To counter this risk, children who are born deaf must receive cochlear implants as early as possible. Their cochlear implants must be programmed appropriately, and we as hearing health care professionals must do everything in our power to inform families of the importance of creating an auditory lifestyle that will

enhance the likelihood that their child will hear 45 million intelligible words during the critical period of auditory nervous system, speech, and language development.

It may be difficult, however, to reach 45 million words through the use of sign language. For instance, a website for American Sign Language video dictionaries and quizzes offers instruction in more than 7,000 signs in American Sign Language. Contrastingly, Webster's Third International Dictionary lists 348,000 entries in English spoken language. Families must be certain that they aren't limiting the spoken language they model for their child in an attempt to mirror their spoken words with their restricted sign vocabulary.

9. "Raising a deaf child strictly orally requires daily training in vocalization and speech-reading throughout childhood, which certainly understands as much effort as learning to sign..." – Donna Jo Napoli, PhD, and Theresa Handley

We also find this statement to be very troubling. In short, this is simply not the reality for children who are born deaf today. Early identification and intervention along with the availability of modern hearing technology have largely eliminated the need for intensive training in vocalization and speech-reading. Over the past 20 years, we have personally served hundreds of children with hearing loss and have yet to provide daily training in vocalization and/or speech-reading to a child who received early intervention. Modern hearing technology restores audibility for speech across the speech-frequency range. Children speak as they hear, so when technology is provided appropriately, they typically develop age-appropriate spoken language abilities consistent with their non-verbal aptitude. Their vocal quality is similar to that of their normal-hearing peers, and their speech is intelligible to strangers. They may use speech-reading to complement their auditory abilities, but to at least some extent, so do persons with normal hearing. Regardless of the extent to which they rely on speech-reading across given listening environments or situations, the speech-reading skills of the children we serve are spontaneously developed throughout their everyday lives without the need for specialized training.

10. "Children need to learn language." – John D. Lantos, MD

We whole-heartedly agree. Hearing health care professionals must support families in ensuring the basic need of language development is met. To meet this need, the first step is to determine the goals and desires of the family, including the mode in which the family wishes to communicate with their child as well as the mode they desire their child to use in social, educational, and occupational settings. If a child's family wishes to optimize his or her spoken language, then that goal is best met through the provision of appropriate hearing technology and the creation of an auditory lifestyle packed full of intelligible speech with the goal of providing the child with access to 45 million intelligible spoken words during the first three years of life.