Preparation of Speech-Language Pathologists to Provide Effective Services for Children with Cochlear Implants in New Hampshire Public Schools

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Preparation of Speech-Language Pathologists to Provide Effective Services for Children with Cochlear Implants in New Hampshire Public Schools

Carolyn Babeu

Faculty Advisor: Dr. Stephen Calculator

Senior Honors Thesis 2015-16

University of New Hampshire
Introduction

It can be devastating for families to be told for the first time, “Your child is deaf.” Many parents subsequently ask, “What does it mean? What did we do wrong? Will he ever speak?” (Stokes, 1999, p. 1). Grief, fear, and uncertainty for what the future may hold are all common feelings families experience after first learning about the diagnosis of their child. About 90% of deaf children are born to hearing parents, and the child is often the first deaf person the parents have ever known (Compton et al., 2008, p. 142). Parents are catapulted into an unfamiliar world, and they become key figures in advocating for appropriate assistance and services for their child to develop communication and language skills. While coping with a whole new world of ideas and terms, one of the most difficult decisions confronting the parents of a recently diagnosed deaf child is the choice of a communication approach (Stokes, 1999, p. 98). All children, both deaf and hearing, have a typical human capacity to develop language, but a deaf child that does not have access to the speech of others can lack the opportunity to acquire language. Each communication option available for children with severe to profound hearing loss requires a commitment of time and resources by the parents and intervention professionals (Stokes, 1999, p. 99). For parents choosing to implant their child and enter the mainstream school setting, appropriate intervention and support services for the child is essential in order to maximize his or her potential to succeed both academically and socially. For children who qualify, parents may choose a cochlear implant for their child and provide the opportunity for him or her to communicate within the hearing world. A child with a cochlear implant may lack specific communication skills and face educational challenges that directly affect the development of an intervention plan. To provide the appropriate support and intervention for children with cochlear implants, an optimal learning environment must be created, developmental framework needs to
be addressed, and the main educational challenges for these children need to be targeted in therapy.

Many hearing families hope their child will be able to communicate using spoken language (Eisenberg, 2009, p. 17). According to the National Center for Hearing Assessment and Management, every state and territory in the United States has now established an Early Hearing Detection and Intervention Program (EDHI). Every child born with a permanent hearing loss is identified before three months of age and provided with timely and appropriate intervention services before six months of age. Newborn hearing screenings and early intervention have provided children with profound hearing impairments access to sound at a very early age (Bodner-Johnson & Sass-Lehrer, 2003, p. 100). A child who suffers from a severe to profound sensorineural hearing loss and cannot receive benefits from hearing aids may be eligible to receive a cochlear implant. A cochlear implant is a sensory device that bypasses damaged or missing hair cells in the cochlea and electrically stimulates the auditory nerve to partially restore hearing (Winter & Phillips, 2009, p. 18). In order to qualify for a cochlear implant, the individual must possess a sufficient enough hearing loss so that implants are expected to produce a better outcome than hearing aids. Children must use hearing aids for a trial period around three to six months of age while therapy services are administered to maximize auditory development. A qualifying candidate would not show significant benefit from the use of hearing aids alone. A child must also have no medical contraindications, must have access to appropriate therapy services and education, while the parents should maintain reasonable expectations and dedication to the habilitative process of their child (Eisenberg, 2009, p. 3). A careful consideration involving children with cognitive development delays and behavior disorders is necessary. When a child is being considered, the multidisciplinary cochlear implant team assesses different aspects of a child’s development as well as potential for auditory-oral growth. For children with cochlear
implants, “of all the influences known to impact linguistic outcomes, parental involvement and intervention services parents receive are the most controllable factors in how well children will succeed” (Winter & Phillips, 2009, p. 18). The development of cochlear implants has given children the opportunity for severe to profound deaf children to learn alongside their hearing peers, but these children will require intensive listening and spoken language facilitation to maximize his or her potential academically and socially (Compton et al., 2008, p. 143).

Since about 90% of children with hearing loss are educated in public schools settings, adequate support services in schools are essential for a child with a cochlear implant to develop the same range of speech as typically hearing children (Compton et al., 2008, p. 142). Educational considerations and accommodations for children with implants must be evaluated within the academic system. As speech and hearing professionals collaborate to provide the best possible educational outcomes for children with hearing loss, the child’s auditory inclination and learning trajectory must be considered. Auditory inclination is a child’s own responsiveness to spoken language output, and it essentially “drives the pace of movement through an auditory skills hierarchy” (Eisenberg, 2009 p. 498). A child that has excellent auditory inclination has a strong prognosis for auditory comprehension compared to a child with limited auditory inclination. The rate of movement through the auditory skills curriculum is conceptualized as a line referred to as a learning trajectory (Eisenberg, 2009, p. 499). It can be defined as steep, indicating rapid progress, medial, or shallow, which indicates slow progress. The learning trajectory is a dynamic parameter that continuously changes over time. Evaluating a child’s learning trajectory and auditory inclination is an important aspect in creating a complete profile for the child with a cochlear implant. In addition, information regarding a child’s age at implantation, duration of severe to profound deafness, duration of implant use, and current level
of auditory skill development are key factors in creating an individualized habilitative plan for the child (Bodner-Johnson & Sass-Lehrer, 2003, p. 416).

Chute and Nevins identify five main educational challenges for children with cochlear implants consisting of acoustic, academic, attention, associative, and adjustment challenges. Speech and language professionals working with these children in the mainstream setting should have “an understanding of these challenges, how they impact a child’s performance, and what can be done to mitigate them” (Eisenberg, 2009, p. 505). Acoustic challenges for children with cochlear implants need to be assessed in regards to the classroom environment and the individual performance of the child using the device. In order to provide a child with an optimal classroom environment, factors such as the size of the room, the number of students in the room, and the proximity to environmental noise either from the hallways or outside the school, must be carefully considered (Chute & Nevins, 2003, p. 58). The individual perceptual abilities of the child can impact his or her input that is being received, affect the ability to localize speech, and make it difficult for a child to follow a teacher’s instructions. If a child is only receiving unilateral input, the individual is placed at an even greater disadvantage in academic activities such as a class discussion or lectures. The device itself does not restore a child’s hearing, and the child will still have learning challenges (Eisenberg, 2009, p. 505). For many children, the use of Frequency Modulated (FM) systems and sound field amplification is necessary in order to provide a child with maximal language input. Professionals need to be prepared to address these environmental and perceptual challenges in order to improve overall signal delivery and reception necessary to succeed in a school setting. In addition to acoustical challenges, many children with cochlear implants experience academic difficulties. These academic challenges usually encompass English language development and literacy development (Eisenberg, 2009, p. 505). If a child experiences a lack of development in either of these areas, it will have a negative
impact on one’s learning. It is important for children to effectively use language in order to learn language (Eisenberg, 2009, p. 506). One’s literacy abilities depend on a strong language system in order to aid in comprehension, and children can use their reading skills to further promote learning. It is possible for a deaf child who receives a cochlear implant to perform on par with hearing age-mates but there is also no guarantee that a child will be able to perform on this level (Eisenberg, 2009, p. 506). Early implementation and intervention can drive this child in the right direction towards success in the mainstream setting.

A child with a cochlear implant has the potential to face attention challenges, and according to research, students with hearing loss often have short-term memory deficits (Chute & Nevins, 2003, p. 63). For children with hearing loss, extracting speech in the presence of high levels of background noise reduces the child’s ability to mentally rehearse what was heard and remember it later on (Anderson, 2015, p. 28). When a child expends his or her energy to listen, there is limited capacity left to perform additional tasks. Deciphering phonemic cues that hold important meaning for an individual with hearing loss requires additional energy that may be expended quickly or even absent at the onset (Chute & Nevins, 2003, p. 64). Since working memory controls a vast number of cognitive processes, literacy skills, attention, and information processing, it is important for children to have access to speech reading and improve memory capacity to promote overall academic success (Anderson, 2015, p. 28). A wide range of attention behaviors can be exhibited based on a child’s age, interest in topic, and physiological status. Younger children may express a lack of interest in the topic or have an increased interest in another topic, compromising the child’s language development and expansion of vocabulary and syntax. A child may show more interest in a topic when more auditory cues are readily available. Cochlear implants allow the child to have access to spoken language with less effort in speech reading compared to children without implants, but competing acoustic noise can still interfere
with the effective transmission of a message. Physiological implications can also negatively affect language learning if there is stress, medical complications, or fatigue present. As a speech pathologist, one must understand the possible attention deficits that a child has and provide accommodations to support the child when necessary.

Children with cochlear implants often experience associative challenges related to self-esteem, socialization with peers, social maturity, and cultural identity, which may not be addressed by professionals since they are not directly related to education (Eisenberg, 2009, p. 507). These aspects of a child’s self-image and confidence can have an impact on one’s willingness and motivation to communicate with others. For a lot of children, “the more compromised the communicative ability, the greater risk for decreased confidence” (Eisenberg, 2009, p. 507). Learning the subtleties of social behavior can be a challenge, and speech pathologists and others professionals working with the child are encouraged to provide the child with “obvious, direct, and systematic instruction” (Chute & Nevins, 2003, p. 65) in order to encourage the development of social exchanges and relationships with peers. As school-aged children progress into adolescence, this transition can pose difficulties in regards to establishing a secure personal identity. Individuals may choose to explore deaf culture, and may feel unsure of which world they are a part of. Meeting other children with cochlear implants can offer the child social validation and shared experiences, assisting in this transitional period. Lastly, adjustment challenges persist for a child with a cochlear implant throughout his or her lifetime as a result of receiving this device (Chute & Nevins, 2003, p. 65). This process begins from the initial switch-on of the device to the constant changes in technology that requires a child to relearn strategies and efficient ways to process sound. Children may eventually feel they exist within three worlds, including the hearing world, the deaf world, and the world of the implant recipient (Chute & Nevins, 2003, p. 65). Professionals working with these children should help
develop a child’s self-advocacy skills. The implant user must eventually become an advocate for himself in order to engineer the listening environment and create optimal environments to foster interactions.

The development of oral communication as well as language skills are important for academic achievement, and it is often the primary responsibility of the speech-language pathologist (SLP) to develop and deliver an appropriate program to foster the acquisition of speech and language (Watson & Martin, 1999, p. 1). The knowledge of the nature of hearing disorders and different assistive technologies to facilitate listening are included in the American Speech-Language Hearing Association 2005 standards (ASHA 2005 Standard III-C). Although the knowledge of hearing disorders and its impact on speech and language is an ASHA standard, little information exists concerning the level of competency required of school-based therapists to effectively treat individuals with hearing disorders. Since speech-language pathologists play a vital role in the habilitative process for a young child with a cochlear implant, it is important to address the knowledge and preparedness of SLPs providing therapy for young implant users. The experience, knowledge, and comfort level of speech-language pathologists regarding cochlear implant technology and (re)habilitation practices has been investigated in previous studies. In one study, Watson and Martin at Central Michigan University distributed a survey to SLPs employed in public school settings in six states of the Western U.S randomly selected from the ASHA database. This study received 256 survey responses and based on rating scales completed by participants, there was an overall lack of knowledge about cochlear implant technology, limited training, a perceived inability to assist children using implants to improve communication skills, and limited audiological support within school settings (Watson & Marie, 1999, p. 4). Another study led by Compter, Tucker, and Flynn at the University of North Carolina Greensboro examined the level of preparedness of North Carolina speech-language
pathologists who serve school-aged children with cochlear implants. The survey received 190 responses and revealed that 79% of participants felt they had little to no confidence in managing CI technology or in providing services to children with CIs (Compton, Tucker, & Flynn, 2008, p. 1).

In my research study, I plan to focus on the capability of speech-language pathologists to address the five main challenges in the educational setting that confront children with cochlear implants consisting of acoustic, academic, attention, associative, and adjustment challenges. Through this study, I aim to answer the following question: How prepared are speech-language pathologists to provide effective therapy and meet educational challenges of children with cochlear implants in New Hampshire public schools? As speech-language pathologists continue to work with young implant users in mainstream settings, it is important for clinicians to be knowledgeable about the needs of these children so that modifications in intervention, environment, and interaction can be effectively implemented. Speech-language pathologists who have an understanding of the potential of the implant and the educational challenges these children face will be most equipped in providing the necessary support to maximize one’s individual success in a mainstream setting.

Method

Participants

A specially designed questionnaire was created through Qualtrics, an online survey software program, and was distributed to members of the New Hampshire Speech Language and Hearing Association (NHSLHA). The questionnaire was completed by thirty-seven ASHA certified speech-language pathologists. Thirty-five participants were female and two were male. Participants were classified into four age ranges: 22 to 35 years (3%), 36-45 years (11%), 46-60
years (76%), 61+ years (11%). Out of the thirty-seven respondents, seven participants held additional Master’s degrees in fields other than speech-language pathology, two of those consisting of Education Master’s degrees. The respondents indicated the speech pathology graduate program they attended, including the most participants (24%) who graduated from the University of New Hampshire. The majority (59%) indicated over twenty-one years of experience post graduation.

**Materials**

Survey items were developed based on a review of the literature and previous studies conducted on the preparedness of speech-language pathologists working with children with cochlear implants in school settings. After composing the Qualtrics survey, it was submitted to the Institutional Review Board at the University of New Hampshire for approval. This is required in order to conduct research studies including the involvement of human subjects. Following slight modifications to confirm confidentiality of all participants, the proposed research paradigm was approved. The final survey consisted of twenty questions, consisting of multiple choice, close-ended questions, and Likert-type scales. The time it took to complete the survey ranged from one minute to ten minutes. Multiple choice and close-ended questions were used to collect information regarding demographics, caseload profiles, availability of resources, and professional experience/education with cochlear implants. Likert-type scales were more prevalently used in the second section of the survey consisting of questions relating to SLP competency in direct/indirect service delivery roles, cochlear implant technology/troubleshooting, and addressing educational challenges of children with cochlear implants. When participants reached questions 9 and 10 of the survey, they were asked to indicate whether they are currently employed in a New Hampshire public school and whether
they have worked with a child with a cochlear implant within the past three years. If participants answered “No” to either question, the survey ended. If participants answered “Yes” to both questions, participants were directed to answer more in-depth questions regarding their experience and competency levels. Out of thirty-seven participants who completed the first section of the survey, twenty-eight (76%) indicated they worked in New Hampshire public schools and six (21%) of them have worked with a child with a cochlear implant within the past three years. Six participants completed the second half of the survey relating to competency levels working with children with cochlear implants in New Hampshire public school settings.

Procedure

The President of the New Hampshire Speech Language and Hearing Association distributed the survey to members. The e-mails explained the purpose of the study and provided the link to direct participants to complete the survey. Currently, there are 114 members in NHSLHA. Out of this participant pool, forty-one members agreed to participate in this study and complete the survey. This study received an approximate 36% response rate. Unfortunately due to incomplete information on four surveys, only responses from thirty-seven members could be entered into the database and used for data analysis. Confidentiality was confirmed through the coding of each survey by a random numeric identifier, and Internet Protocol (IP) addresses were not collected from participants. Survey responses were analyzed through Qualtrics using quantitative statistical analysis.

Results

SLP Education and Experience with Cochlear Implants

Following the general demographic information established at the start of the survey, participants were asked to indicate if they have had any formal training on cochlear implants
through means such as formal education, continuing education, online resources or in-service training. Participants were able to choose more than one answer. Of the thirty-seven participants, 43% (n=16) of SLPs indicated that they have had formal training on CIs through continuing education and 43% (n=16) indicated they have had no formal training on CIs throughout their educational and professional careers. As shown in Figure 1, only 19% (n=7) of participants received formal CI training through a graduate course and 8% (n=3) indicated having an undergraduate course on CIs. A cross tabulation of results shown in Table 1 shows that out of the nine SLPs who graduated from the University of New Hampshire Speech Pathology Masters Program, only one indicated having a formal course on cochlear implants during graduate school. This cross tab was created by comparing two survey questions which included the graduate program each participant attended and the extent of formal training on CIs that each participant indicated.

**Figure 1**

![Bar Chart: Formal Training by SLPs on Cochlear Implants](image)
Table 1

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When asked how frequently one refers to and utilizes resources available when treating children with cochlear implants, 50% of the SLPs never use these resources and 36% rarely use them. Three participants indicated they sometimes use these resources and two participants often use CI resources. Next, participants were asked if they have worked with a child with a cochlear
implant in graduate school, in professional practice as an SLP, or if they have never worked with a child with a cochlear implant. A little more than half (53%) have never worked with an implanted child, 39% have worked with a child with a cochlear implant in professional practice, and 17% have worked with a child with an implant in graduate school. Out of thirty-seven participants who initially started the survey, there were six SLPs who were currently employed in a New Hampshire public school and have worked with a child with a cochlear implant within the past three years. These six participants were directed to the second half of the survey to answer more in-depth questions regarding caseload profiles and competency levels in general cochlear implant technology, providing effective therapy in schools, and addressing the main educational challenges of children with implants.

**School-based SLP Caseloads and CI Competency Levels**

Six speech-language pathologists were prompted with questions regarding their caseload profiles including the ages of clients, number of clients, and number of those with cochlear implants currently in one’s caseload. All of the participants (100%) indicated they are currently working with elementary aged children ranging from kindergarten to fifth grade. Half of the participants also indicated working with middle school students in addition to elementary aged children. Fifty percent of individuals indicated their caseloads to be between 21-30 students, and the remaining participants had current caseloads of 41 and even some extending beyond 50 clients. These numbers signify the speech pathologists’ current caseload numbers at the time in which they took the survey, but this number is likely to fluctuate in a dynamic school setting. Only one speech pathologist indicated currently having a child with a cochlear implant in their caseload.
Since all six participants have had a child on their caseload within the past three years, individuals were asked to share the primary educational placement of their students with cochlear implants. Eighty percent of participants reported the primary placement of these students to be a general education classroom, while the Speech room and Resource room were also utilized for children with implants but were not as commonly used. When asked which professionals the speech-language pathologists were in consistent contact with regarding the child’s academic success in school, 67% of SLPs are in direct contact with the general education teacher, audiologist, and parent(s). Fifty percent of SLPs have direct contact with a special education teacher and a consultant on a regular basis. One participant indicated having no contact with any professionals in or outside school regarding the child’s academic progress.

In the following question leading up to the competency rating scales, participants were able to choose more than one answer when asked where their level of competency in cochlear implants primarily comes from. Options included experience, independent research, formal education, online resources, and workshops/professional development. Most of the participants (80%) indicated their level of competency came from workshops/professional development. Other responses were spread out amongst experience, online resources, and research. None (0%) of the participants reported that formal education has contributed to their competency in cochlear implants. For the competency rating scale questions, data was collected through Qualtrics by assigning numeric values for each answer choice in order to allow for statistical analysis. The scale used in rating competency levels was rated as follows: “Strongly competent” was assigned as a 1, “Moderately competent” was assigned as a 2, “Minimally competent” was assigned as a 3, and “Not competent” was assigned as a 4. The closer to “1” the mean is calculated to be in each question, the stronger the competency levels were by SLPs in that particular area. The
standard deviation, or how far individual responses vary from the mean, is also presented in the tables for each question.

Under the category of general CI knowledge, participants were least competent in cochlear implant candidacy. All SLPs that answered this section of the survey (n=6) identified themselves as minimally competent or not competent in this area. Table 2 displays the calculated mean of 3.67 in cochlear implant candidacy, showing a significant lack of knowledge in this area. For the other areas, Figure 2 shows the participants’ had a variable distribution of competency levels regarding current cochlear implant technology, evidence-based practices (EBP) for CIs, and providing direct services for children with CIs. In all three areas of expertise, 50% (n=3) of speech-language pathologists felt strongly/moderately competent while the other 50% (n=3) felt minimally/not competent.

**Figure 2**

Levels of SLP Competency in General Knowledge/Services of Children with Cochlear Implants

<table>
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<th>General Knowledge/Services</th>
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</tr>
<tr>
<td>Evidence based therapy practices for children with CIs</td>
<td>1</td>
</tr>
<tr>
<td>Providing direct speech and language services for children with CIs</td>
<td>2</td>
</tr>
</tbody>
</table>

Legend:
- Strongly competent
- Moderately competent
- Minimally competent
- Not competent
The next question addressed competency levels when performing indirect service roles for the following tasks: interpreting/reading audiology results, using assistive devices with children with CIs, troubleshooting CIs/making acoustical changes in classroom, and providing consultative services with teachers of children with CIs. Overall, speech-language pathologists felt moderately competent completing these roles with students with CIs in a public school setting. As shown by the means, SLPs felt the most competent in troubleshooting the device and making acoustical changes in the classroom (m=1.83).
The last competency question focused on the knowledge of SLPs to effectively address the five main educational challenges identified for children with cochlear implants. These five educational challenges consist of academic, acoustic, attention, associative, and adjustment challenges as discussed previously. The overall data showed that SLPs felt moderately confident in addressing these challenges with children in therapy. The area in which speech-language pathologists felt most competent in addressing was academic challenges related to language and literacy (m=2.00). Of all five educational challenges, SLPs felt the least competent in attention challenges (m=2.50) referring to short-term memory deficits that many children with hearing loss often experience.
The last question of the survey asked the six participants who have had recent experience working with children with cochlear implants if there is a need for more expertise and knowledge in this area. As displayed in Figure 5, 100% of participants strongly agreed/agreed that more training is necessary for speech-language pathologists working with children with cochlear implants.
Discussion

This study was designed to explore several aspects of speech-language pathologists’ roles and confidence levels in treating children with cochlear implants in New Hampshire public schools. It was created to evaluate: (a) the educational and clinical preparation of New Hampshire employed speech-language pathologists to provide effective services to children with cochlear implants; (b) the level of competency school-based SLPs have in general knowledge of cochlear implants, providing direct/indirect services to children with CIs, addressing educational challenges for children with CIs; and (c) if speech-language pathologists currently working in public schools feel there is a need for more expertise and training on cochlear implants.

Educational and Clinical Preparation

It was observed that 43% of respondents indicated having CI training through continuing education while 43% indicated having no formal training on CIs throughout their education or
careers. Only 8% of individuals had formal education on CIs through an undergraduate course and 19% had formal education on CIs through a graduate course. These findings reinforce the importance of incorporating education and coursework into undergraduate and graduate speech pathology programs. As technology continues to increase, children who are born deaf and hard of hearing are given the opportunity to learn alongside typically developing peers in a classroom setting and potentially perform at the same rate as other hearing peers with the appropriate therapy and intervention (Compton et al., 2008, p. 143). The likelihood that a speech-language pathologist is going to have a child with a cochlear implant in his/her caseload in a public school setting is increasing. According to the National Institute of Communication Disorders and Deafness, roughly 40% of children who are born profoundly deaf now receive a cochlear implant, which is a 25% increase from five years ago. By providing an educational course on the general technology required for cochlear implants as well as specific challenges a child may face in an academic setting and effective therapy approaches, professionals will have a better understanding of the functional needs of a child with cochlear implants. The American Speech Language and Hearing Association (ASHA) require speech-language pathologists entering the field to be competent in a variety of areas ranging across the life span. Generally speaking, many two-year Masters programs may not have the available time to require students to take an entire course on cochlear implants and hearing assistive technology. An entire course devoted to learning more about this expanding population would be ideal but with respect to time and other required courses that must be taken, it would still be beneficial to devote a portion of a course to teaching this topic to students. Educational preparation on CIs for speech-language pathologists is extremely important considering many professionals may not have the time to seek out continuing education and workshops if they receive an implanted child on their caseload during their professional career. For school-based SLPs who begin to work with a young child with
cochlear implants, there will be little room for error. It is a critical time to implement effective and evidence-based therapy approaches to fully maximize the child’s potential to succeed in school.

Looking more specifically at the University of New Hampshire Speech Pathology Masters program, of the nine UNH graduates, only one indicated having taken a graduate level course on cochlear implants. This lack of formal classroom instruction from the UNH program is not surprising since greater than 75% of respondents were between the ages of 46-60. There is a possibility that individuals could have completed their Master’s degree in speech pathology at an older age, but considering the majority of respondents indicated over fifteen years of experience in the field, it is more likely that cochlear implants were not as prevalent during the extent of their graduate studies. Experimental trials on cochlear implants have been conducted since 1967, but cochlear implants did not receive approval from the U.S. Food and Drug Administration (FDA) until 1984 for adults and not until five years later in 1990 for use in children (Clark et. al, 1997, p. 29). However, it is now estimated that 90% of children with hearing loss are currently educated in public school settings, and graduate students should receive more education and clinical exposure to working with children with cochlear implants. Future research on the educational preparation of speech-language pathologists in treating children with cochlear implants might attempt to investigate the recent cochlear implant training coursework being implemented in graduate programs within the last ten years.

**Competency Levels**

This investigation shifted to a more in-depth examination of competency levels of six speech-language pathologists currently working in a New Hampshire public school and having recent experience working with a child with a cochlear implant within the past three years.
Included in the general knowledge of cochlear implants, SLPs considered themselves to be minimally competent or not competent in cochlear implant candidacy. This is concerning that professionals working one-on-one with these children do not have a general understanding of what the eligibility requirements for a cochlear implant are and why certain individuals can benefit more than others from implantation. Having a general awareness of cochlear implant candidacy will allow a speech-language pathologist to gain a more thorough understanding of a child’s case history and background. Competency levels regarding knowledge of current cochlear implant technology, evidence-based practices (EBP), and direct speech and language services for children with CIs were equally divided with 50% indicating moderate/strong competence and 50% indicating minimal/no competence in these three areas. Since these speech pathologists have recently worked with at least one child with a cochlear implant, having minimal to no competence in the basic components and operation of cochlear implants or no knowledge of EBP techniques is detrimental for a child’s academic and social development.

Evidence-based practice has emerged as an important principle in the delivery of speech-language pathology and audiology services in the past decade. According to ASHA, evidence-based practice is defined as the “integration of research evidence with practitioner expertise and client preferences and values into the process of making clinical decisions” (“Evidence-Based Practice…”). Without adequate competence in the area of EBP, high-quality professional services may be compromised for that child. Since there has been an increasing awareness of the importance of using EBP in recent years, the lack of knowledge regarding EBP therapy for children with cochlear implants may be due to the overall respondents’ ages and number of years since completing their graduate degrees.

When prompted to indicate the level of competency when performing indirect service roles including interpreting audiology results, using assistive technology with children with CIs,
troubleshooting/making acoustical changes in classroom, and providing consultative services for
teachers, the calculated means showed that the majority of SLPs were moderately competent in
these areas. Of the six participants who completed this second portion of the survey, 80%
indicated that their knowledge on cochlear implants was primarily from workshops/professional
development. This poses a possible limitation of this investigation. The design of this survey was
created in order to receive responses from New Hampshire employed speech-language
pathologists. When e-mails were distributed stating the purpose of the study, some individuals
who completed this study may have had a heightened interest in cochlear implants and working
with this population. Their specialized expertise and interest in this area may have impacted the
results. In addition, the survey was only distributed to one organization within one state in the
U.S., limiting this investigation to a small sample size. Generalizability of this study might be
increased with a larger sample size to create a broader representation of cochlear implant
competency levels of speech-language pathologists working in public schools.

The last competency question presented to respondents was centered on the five main
educational challenges of children with cochlear implants. Overall, respondents indicated a
moderate level of competence in addressing these challenges with children in therapy. Speech-
language pathologists felt the strongest level of competency in providing services for academic
challenges for children with CIs (m=2.00), consisting of a strong focus in language and literacy
development. With a mean of 2.50, speech-language pathologists felt the least competent out of
all five educational challenges in addressing problems related to attention. A child with a
cochlear implant is susceptible to short-term memory deficits related to the hearing loss. As
discussed earlier, short-term memory deficits are usually caused by the additional energy a child
with hearing loss must expend in order to hear in the presence of background noise, leaving little
energy available for other tasks (Anderson, 2015, p. 28). This can have a direct impact on the
ability of a child to learn and process new language skills. Having an awareness of this possible deficit for children with hearing loss allows speech-language pathologists to design therapy plans to teach children how to effectively compensate in that area. Children with implants are a unique group because they are able to actively participate in a hearing world but still remain vulnerable to a host of auditory, academic, attention, associative and adjustment challenges that remain after implantation (Chute & Nevins, 2003, p. 66). Eighty percent of respondents pursued workshops/professional development, and therefore, professionals may have felt better equipped to handle these common educational challenges of children with cochlear implants. Since only six respondents were able to complete this second section of the survey, a larger sample size may produce different results.

**Need for More Expertise and Training**

The last question of the survey asked the six respondents, who have all worked with a child with a CI within the past three years, if they felt there is a need for further knowledge and expertise for SLPs working with individuals with cochlear implants. All (100%) of the speech-language pathologists agreed or strongly agreed that more knowledge in this area is necessary. Since cochlear implants are a relatively new technology approved for use in individuals approximately thirty years ago, accessibility to reliable sources is needed for professionals working with this population. Online resources offer some extent of information but in order to provide the best possible services, more classroom and in-service training on cochlear implants must be available for speech-language pathologists. Lack of appropriate training has also been presented as an important issue by others who have conducted similar investigations of professionals working with hearing impaired children (Watson & Martin, 1999, p. 5).
If training becomes more accessible to speech-language pathologists working with children with cochlear implants, there is still the possibility that not all professionals will take advantage of this training to enhance their therapy services. To overcome the lack of knowledge about hearing loss, cochlear implants, and (re)habilitation, one speech-language pathologist at each public school could receive additional training on cochlear implants and hearing loss in order to serve as a resource person (Blair et al., 1999). As more children with cochlear implants are being included in general education classrooms, there are many school personnel who will be interacting with these children throughout the day. This designated resource person could serve as an accessible and reliable source of information for others and would benefit all staff members who have consistent contact with a child with a CI in a school setting.

**Future Research**

The current study provides a small sample of results regarding the overall preparation of speech-language pathologists to provide services for children with cochlear implants. The main educational challenges that children with cochlear implants face in an academic setting requires more extensive research to further elucidate results. An investigation with a larger sample size may be helpful to allow for more generalization of results, as well as a qualitative portion to this research. A qualitative study may include face-to-face and/or telephone interviews with speech-language pathologists to gain a better understanding of the knowledge or lack thereof in this area.

Future investigators might also choose to focus on interviewing recent SLP graduate students in order to assess their level of competency on cochlear implants. This may provide a more accurate representation of the educational preparation graduate students are currently receiving. This study found that there was a lack of formal education on cochlear implants when the respondents attended graduate school, but the majority of individuals averaged about twenty
years since graduate school. It may also be helpful to research the graduate programs directly to determine the courses and availability of electives offered on cochlear implants.

A more advanced understanding of cochlear implant technology and candidacy, evidence-based therapy approaches, and educational challenges of children with cochlear implants can greatly enhance the therapy that is provided for these children in school systems. Future research would be beneficial in this area in order to fully maximize a child with a cochlear implant’s ability to succeed in the classroom.

**Conclusion**

This study examined the preparation of speech-language pathologists working in New Hampshire public schools to provide effective services for children with cochlear implants. Speech-language pathologists must be knowledgeable about the needs of children using cochlear implants in order to make the appropriate intervention and environmental modifications to maximize each child’s potential. Findings of this study revealed an oversight in the undergraduate and graduate preparation of SLPs and a need for more resources and training in this area. The number of young children receiving cochlear implants is increasing, and there is a need for the inclusion of CI coursework in speech-language pathology educational programs. It is crucial that SLPs have easy access to resources and training necessary to provide effective services for this growing population of children. Preparing speech-language pathologists to feel strongly competent when working with children with implants will also be helpful for other professionals working with that child in a school setting. If educators and school professionals are able to gain a better understanding of cochlear implants from a speech-language pathologist, the child’s entire educational team will be better equipped to address the child’s needs. Until CI training becomes more prevalent in SLP preparation programs, it is the responsibility of
professionals to actively seek information and request support when required to provide services for children with cochlear implants. Further research in this area is needed in order for the importance of intervention services for children with cochlear implants to be realized.
References


Appendix

Survey: Preparation of SLPs to Meet Educational Challenges of Children with CIs in NH Public Schools

Q1 What is your age?
- 22-35
- 36-45
- 46-60
- 61+

Q2 What is your gender?
- Male
- Female

Q3 If applicable, indicate other field(s) (other than speech pathology) in which you hold a Master's degree or higher:
- Education
- Deaf Education
- Physical Sciences
- Psychology
- Linguistics
- Other
- None

Q4 What speech pathology graduate program did you attend?
(all U.S. speech pathology Masters programs were listed, option to check “Other” was also included for programs outside of the U.S.)

Q5 Number of years work experience post graduation:
- 1-5
- 6-10
- 11-15
- 15-20
- 21+

Q6 Please indicate if you have had formal training on cochlear implants through any of the following. Check all that apply.
- Undergraduate course
- Graduate course
- Doctorate level course
- Continuing education
- Online resources
- In-service training
- None
Q7 Indicate your answer below.

<table>
<thead>
<tr>
<th></th>
<th>Never (1)</th>
<th>Rarely (2)</th>
<th>Sometimes (3)</th>
<th>Often (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you utilize/refer to resources available for treating individuals with cochlear implants?</td>
<td>⬜️</td>
<td>⬜️</td>
<td>⬜️</td>
<td>⬜️</td>
</tr>
</tbody>
</table>

Q8 Please check any applicable experience.
- I have worked with a client with a cochlear implant in graduate school
- I have worked with a client with a cochlear implant in professional practice as an SLP
- I have never worked with a client with a cochlear implant

Q9 Are you a speech-language pathologist currently working in a public school in the state of New Hampshire?
- Yes
- No

Q10 Have you worked with a client with a cochlear implant within the past 3 years?
- Yes
- No

Q11 What age children are you currently working with? Check all that apply.
- Elementary (grades K-5)
- Middle School (grades 6-8)
- High School (grades 9-12)

Q12 How many clients do you currently have in your caseload?
- 1-9
- 10-20
- 21-30
- 31-40
- 41-50
- 51+

Q13 How many clients with cochlear implants are currently in your caseload?
- 0-1
- 2-4
- 5-7
- 8+

Q14 Please indicate the primary educational placement(s) of your student(s) with cochlear implants. Check all that apply.
- General education classroom
- Special education classroom
- Resource room
- Speech room
- Other
Q15 Please indicate professionals in or outside school with whom you have direct contact with regarding the child with CI's academic success in school? Check all that apply.
- Special education teacher
- General education teacher
- Consultant
- Audiologist
- Parent(s)
- Other
- None

Q16 Where does your level of competency in cochlear implants primarily come from? You may check more than one.
- Experience
- Independent research
- Formal education
- Online resources
- Workshops/professional development
- Other

Q17 Please indicate what you believe to be your level of competency in the following general areas.

<table>
<thead>
<tr>
<th>Area</th>
<th>Strongly competent (1)</th>
<th>Moderately competent (2)</th>
<th>Minimally competent (3)</th>
<th>Incompetent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cochlear implant candidacy</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Current cochlear implant technology (basic components and operation)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Evidence based therapy practices for children with CIs</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Providing direct speech and language services for children with CIs</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q18 Please indicate what you believe to be your level of competency in the following indirect service roles.

<table>
<thead>
<tr>
<th>Role</th>
<th>Strongly competent (1)</th>
<th>Moderately competent (2)</th>
<th>Minimally competent (3)</th>
<th>Incompetent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpreting/reading audiology results</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Using assistive devices with children with CIs (i.e., sound field systems, F.M. systems)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Troubleshooting device and making acoustical changes in classroom</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Providing consultative services with CI client's teachers</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Q19 Please indicate what you believe to be your level of competency in addressing the following areas in direct therapy with children with cochlear implants.

<table>
<thead>
<tr>
<th>Area</th>
<th>Strongly competent (1)</th>
<th>Moderately competent (2)</th>
<th>Minimally competent (3)</th>
<th>Incompetent (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social/emotional needs of children with CIs</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Listening skill development for children with CIs</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Academic challenges related to language and literacy</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Short-term memory deficits related to hearing loss</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Adjustments to new curriculum, teacher, and environment</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Q20 Indicate your opinion below.

<table>
<thead>
<tr>
<th>There is a need for further knowledge and expertise for speech-language pathologists working with individuals with cochlear implants</th>
<th>Strongly Agree (1)</th>
<th>Agree (2)</th>
<th>Disagree (3)</th>
<th>Strongly Disagree (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
</tbody>
</table>