Providing Services to Children with Cochlear Implants in the Public Schools: Results of a Survey of Speech-Language Pathologists

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The purpose of this study was to obtain information from speech-language pathologists employed in the public schools about their involvement with children using cochlear implants, their knowledge base in assisting children using such devices, and available audiological support within their work settings. Results showed that most of the respondents had not worked with children using implants. In addition, few indicated a great deal of knowledge about cochlear implant technology and (re)habilitation procedures.

Introduction

Numerous studies have demonstrated that many hearing impaired children are able to use cochlear implants to improve speech perception, speech production, and language skills (Geers & Moog, 1994; Meyer, Svirsky, Kirk, & Miyamoto, 1998; Miyamoto, Svirsky, & Robbins, 1997; Tomblin, Spencer, Flock, Tyler, & Gantz, 1998). These results are based on both descriptive studies and clinical research trials that have compared implant users to children who use other types of assistive listening devices. However, communication outcomes for children using cochlear implants are quite variable (National Institute of Health, 1995). Factors such as age of implantation, type of device used, communication mode, amount of time device is used per day, and chronological age have all been shown to affect communication outcomes of the users (Meyer et al., 1998).

The amount of benefit children receive from using implants can also be influenced by variables inherent to the habilitation program (Geers & Moog, 1994). The 1995 NIH Consensus Statement on Cochlear Implants states that language acquisition of implanted children is influenced by the "nature and intensity of habilitation" (p. 10). Buckler and Siebert (1996) also reported that intensity of (re)habilitation and training in the auditory/oral method of communicating are two critical variables associated with successful use of cochlear implants by children.

Two related areas of development can be used to measure successful implant use. First, the acquisition of spoken communication has often served as the benchmark for determining effectiveness of any assistive listening device (Miyamoto et al., 1997). Second, Koch, Wyatt, Francis, and Niparko (1997) suggested that achievement of educational independence is also a significant factor in determining the value of receiving an implant. That is, the more time implanted children spend in inclusive classrooms and the sooner use of support services is reduced (i.e., speech-language, interpreters, instructional assistants, tutors), the greater is the cost/benefit ratio for receiving the implant. Koch et al. (1997) also stated that often the degree to which an individual child has developed spoken language affects his or her ability to function successfully within inclusive classrooms.

The importance of developing good speech and language skills by implant users cannot be overstated. Not only is the development of oral communication an important measure of achievement for children using cochlear implants, but language skills are also important for academic achievement. Although children using implants will be assisted by a team of professionals, it is often the primary responsibility of the speech-language pathologist (SLP) to develop and deliver an appropriate program for acquisition of speech and language skills. The responsibilities of the SLP include pre-implant assessment of communication needs and abilities, implementation of individualized educational programs that consider appropriate communication partners and activities, monitoring progress in development and use of communication skills across settings, and assisting with regulating appropriate function and use of the device (Dyar, 1994). In addition, the SLP may also need to provide individualized lessons for speech and auditory training to better meet the needs of each child.

The SLP also needs to work collaboratively with classroom teachers to help implant users achieve maximum benefit within the classroom setting. For example, Fryauf-Bertschy and Kirk (1992) recommend that communication goals and academic goals be combined as much as possible, so that lessons presented in the classroom may be used to help develop speech, language, and auditory training skills. In order to provide such optimal programming for implanted children, "...the speech-language pathologist must understand what information is normally

available in the speech signal, how a hearing loss can affect the use of this information, and which speech cues are available through the implant" (p. 37) (Fryauf-Bertschy & Kirk, 1992).

Children using cochlear implants provide unique challenges to speech-language pathologists. To provide effective instruction for these children, the SLP must be knowledgeable about the mechanism of the cochlear implant itself, as well as effective management techniques to allow implanted children to develop auditory, speech, and language skills to their fullest potential. In the absence of an educational audiologist they may also need to provide input regarding maintenance and troubleshooting of the device. And, as stated earlier, the SLP will need to work with other members of the educational team and family, to help create consistent environments that allow children using implants to improve communication skills.

It appears then that the SLP plays a vital role in the habilitation process for the young implant user, and thus may be a significant factor in the overall success of implant use. It was the intent of this study to explore a variety of aspects related to SLPs' experience, knowledge, and comfort level in working with children using cochlear implants. Previous research has indicated that many SLPs "lack minimal skills in the area of hearing aids" (Woodford, 1987), and knowledge regarding oral communication development in children with hearing impairment was described as "fragmented and inconsistent" (Otis-Wilburn, 1992). In addition, it has been shown that most individuals responsible for the daily educational services for children with hearing loss are undertrained or uninformed in the area of assistive listening devices (Blair, EuDaly, & Benson, 1999; Luckner, 1991; Moseley, Mahshie, Brandt, & Fleming, 1994).

It was hypothesized that SLPs' knowledge base regarding services for children using cochlear implants would parallel similar investigations of professionals providing services to hearing-impaired children; however, that specific issue has not been explored. A survey was developed and distributed to SLPs employed in public school settings to ascertain a better understanding of their knowledge regarding cochlear implant technology and (re)habilitation practices. The availability of audiological support was also explored.

Methods

Development of the Survey

Survey items were developed based on a review of the literature and consultations with audiologists who practice in educational settings. Audiologists and speech-language pathologists working in the public schools reviewed drafts of the survey. After appropriate revisions were made, the final survey was developed. The survey consisted of 20 questions, posed in a closed-question or forced-choice format. Topics that the survey included were: (a) characteristics of the SLPs and their work settings, (b) experience with children using cochlear implants, (c) knowledge and comfort level with cochlear implants, (d) opinions regarding professional areas of responsibility associated with cochlear implant (re)habilitation, (e) training received regarding cochlear implants, and (f) availability of audiological personnel at their work setting.

Procedure

One thousand surveys were mailed to SLPs employed in public school settings in Michigan, Ohio, Illinois, Indiana, Wisconsin, and Minnesota. Recipients were randomly selected from the American Speech-Language-Hearing (ASHA) 1997 database from those indicating employment in public schools. Three hundred and ten surveys (31%) were returned; however only 256 (25.6%) could be entered into the database. The remaining surveys could not be used because of missing information or because respondents indicated they were not currently working in the public schools.

Variable	Number (and %)
Highest Degree	
Bachelor's	1 (0.3%)
Master's	250 (97.7%)
Doctoral	5 (2.0%)
Average year highest degree conferred	1985
Average Caseload Size	53.21
Average # of years in school setting	10.67
Cochlear implant recipients on caseload	
0	177 (69 %)
1-5	68 (26.5 %)
6-10	6 (2 .6%)
>10	5 (1.9%)

Table 1. Characteristics of respondents, their work settings, and experience providing services to cochlear implant recipients (n=256).

Results

Characteristics of the SLPs, Work Settings, and Experience Working with Implants

Characteristics of the respondents and their work settings are displayed in Table 1. As shown, almost all (97.7%) held Masters degrees. The average number of years the group had been working in school settings was 10.67 years, with a range of 1 to 32 years. The average caseload size was 53 students, with a range of 25 to 120. Table 1 also shows the experience these SLPs had working with implanted children. A majority of the group (69%) had not worked with a cochlear implant recipient, with 26% indicating working with between 1 and 5 implanted children. Only 11 (4.2%) of the clinicians had worked with six or more children who used implants.

Knowledge of Cochlear Implants

Respondents rated their knowledge of various aspects of cochlear implant technology, candidacy, and (re)habilitation issues on a five-point scale. The scale and results are depicted in Table 2. Most respondents ranked their knowledge of this information as "none" or "minimal." However, examination of these data does show that experience with providing services to children with cochlear implants as associated with increased self-ratings. Areas that received especially low ratings by the group, even those with experience, included knowledge of how to troubleshoot malfunctioning implants, how the implant functions, mapping the system, and knowing the similarities and differences between a cochlear implant and a hearing aid.

	Entire group	No experience	Experience: 1-5 children	Experience: 6-10 children	Experience more than 10 children
Number of respondents	256	177	68	5	6
Knowledge of benefit received from hearing aids for cochlear implant candidacy	0.62*	0.80	2.04	3.00	3.40
Knowledge of degree of hearing loss for candidacy	1.12	0.91	2.26	3.00	3.34
Knowledge of evaluation procedures for candidacy	0.25	0.49	1.63	3.00	3.00
Knowledge of surgical procedures involved with receiving a cochlear implant	1.00	0.71	1.64	2.00	3.00
Knowledge of internal and external hardware of an implant	0.75	0.63	1.83	2.50	3.20
Knowledge of rehabilitation and therapy focus	1.00	0.89	2.35	2.50	3.00
Ability to troubleshoot malfunctioning implant	0.25	0.12	.94	1.50	2.00
Knowledge of how cochlear implant functions	1.12	0.76	1.67	2.5	2.80
Knowledge of cochlear implant assessment team members	0.35	0.58	1.70	2.50	3.00
Knowledge of creating optimal listening environment for implant users	0.75	0.65	1.84	3.00	3.20
Knowledge of setting appropriate sensitivity levels (mapping the implant)	0.25	0.21	0.98	1.50	1.80
Knowledge of similarities and differences between a cochlear implant and a hearing aid	1.00	0.80	2.00	2.50	2.80

**0=no knowledge, 1=minimal knowledge, 2=slight knowledge, 3=moderate knowledge, 4=good knowledge, 5=complete knowledge*

Table 2. Averages of self-ratings of knowledge across (re)habilitation issues for the group and by amount of experience working with children using cochlear implants.

Improvement of Communication Skills

Using the same five-point scale, respondents were also asked to rate their ability to help a child with a cochlear implant improve various aspects of communication. Those responses are shown in Table 3. Responses for the entire group were fairly similar across categories. Again, level of experience was associated with higher self-ratings across these communication skill areas. Ability to improve speech and ability to improve language skills were rated highest by those respondents with experience, followed by ability to improve speech reading skills. Ability to improve auditory skills received the lowest rankings by those SLPs with any amount of experience.

	N	Improving Speech Skills	Improving Auditory Skills	Improving Speech Reading Skills	Improving Language Skills
All respondents	256	1.37*	1.29	1.34	1.5
Level of Experience:					
None	177	1.08	0.87	0.93	1.24
1-5 Children	68	2.63	2.25	2.23	2.70
6-10 Children	5	3.00	2.50	3.00	3.00
> 10 Children	6	3.60	2.80	3.20	3.40

**0=no knowledge, 1=minimal knowledge, 2=slight knowledge, 3=moderate knowledge, 4=good knowledge, 5=complete knowledge*

Table 3. Mean level of respondents' self-ranking of ability to improve the communication skills of children using cochlear implants.

Role of Various Professionals

Respondents were also asked their opinion regarding the role various professionals should play when working with implanted children. One question asked respondents to choose one professional that should be primarily responsible for the educational programs of children using cochlear implants. Forty-five percent of this group of SLPs felt that the "Teacher of the hearing impaired" should have this responsibility, while 26% chose "educational audiologist." Only 4.9% indicated that the SLP should be in charge of the educational program.

In addition, various habilitation areas were listed on the survey, and respondents were asked to choose the one professional that should have primary responsibility for each area. Those results are shown in Table 4. Most chose the audiologist as being responsible for troubleshooting equipment. The SLP was selected most often as responsible for the development of speechreading skills. The SLP was chosen most often (60%) by these respondents as primarily responsible for the development of vocabulary, although 37% of the respondents indicated that the teacher should have this responsibility. Choosing the professional who should be most involved with "improving auditory skills" resulted in the most variability of responses from the group. Responses were fairly equally divided between the SLP and the audiologist as responsible for improving the auditory skills of implant users, although both the teacher and teacher consultant for the hearing impaired were seen as having a strong role in this area by some of the SLPs.

	SLP	Audiologist	Classroom Teacher	Teacher Consultant
Troubleshooting Equipment	3%	86%	4%	7%
Auditory Development	39%	37%	15%	9%
Speech Reading Training	74%	7%	13%	6%
Vocabulary Development	60%	1%	37%	2%

Table 4. Respondents' association of a specific professional with rehabilitation area.

Training and Audiological Support

The remaining questions addressed training levels (formal classes or inservices), as well as availability of audiological support within the work setting. Forty-seven percent of the SLPs indicated having taken a class that included information on cochlear implants, and 31% indicated attending an inservice on the subject. Of the 79 (30.8%) respondents that had provided speech-language services for implant users, only 11 (13.9%) reported not having either a class or an in-service on implants.

Of all the respondents, only 13% reported having an educational audiologist on their staff, with 51% reporting having access to an audiologist via consultation. It should be noted, however, that the extent of the services provided by consultant audiologists was not explored. Thirty-seven percent of all respondents had no access to audiological services within their work environment. Twenty-six percent of those indicating experience working with implanted children also reported not having any type of audiological support at their work setting.

Discussion

The purpose of this investigation was to ascertain the knowledge base regarding various aspects of cochlear implant technology and (re)habilitation issues among school-based SLPs. A number of concerns are raised based on the results of this study. Primarily these include: respondents' self-reported of lack of knowledge about cochlear implant technology and (re)habilitation issues, limited training, a perceived inability to assist children using implants to improve communication skills, and limited audiological support within school-based settings.

Lack of Knowledge of Cochlear Implant Technology and (Re)habilitation issues

As a group, most respondents rated their knowledge of cochlear implant technology and (re)habilitation issues as "none" or "minimal." This information may be tempered somewhat by the lack of direct experience working with implant users that was reported by 69% of the group. Although experience was associ-

ated with increased self-ratings, very few SLPs rated their knowledge as "good" or "complete" across (re)habilitation areas. As the population of implanted children increases, it is probable that speech-language services will be provided by SLPs who feel their knowledge is limited regarding cochlear implant habilitation issues and who lack experience providing services to implant users.

The respondents' lack of confidence in their own ability to adequately serve the needs of implanted children is understandable. Although the number of cochlear implant recipients is increasing rapidly, the group is still very much a low-incidence population. Indeed, only 31% of this group reported any experience in providing services to implanted children. A national survey of SLPs conducted by ASHA showed that children with hearing disorders only represents 1% of the caseload of school-based clinicians, and providing aural rehabilitation services also only accounts for 1% of their workload (Peters-Johnson, 1998). Currently, few SLPs practicing in the public schools have needed to develop skills and strategies for working with children using cochlear implants.

Cochlear Implant Training

Training in the area of cochlear implants was explored in this study by ascertaining if respondents had classroom and/or inservice training on cochlear implants. More than half of the group indicated not having either one of the training options. Lack of formal classroom instruction on cochlear implants is not surprising since, on average, the group received their highest educational degree in 1985. Experimental trials on cochlear implants have been conducted since 1967, but FDA approval for implantation of adults and children did not occur until 1984 and 1990 respectively (Clark, 1997). Thirty-one percent of the respondents indicated having received inservice training on the subject; however, the extent and nature of such training was not explored. It was encouraging to note, however, that only 13.9% of those with experience working with children using implants had not received some type of training. The results of this study demonstrate the need for SLPs to advocate strongly for additional education and support to allow them optimally to serve the needs of implanted children when the need arises.

Lack of appropriate training has also been presented as an important issue by others who have conducted investigations of personnel providing services to hearing impaired children (Moseley et al., 1994; Otis-Wilborn, 1992; Woodford, 1987). More than ten years ago, Woodford raised concerns that ASHA standards for training SLPs in the areas of hearing impairment and aural rehabilitation were lacking. Although these ASHA standards have not changed, the scope of practice regarding assistive listening devices has changed tremendously. Certainly additional training may improve skills and allow SLPs to feel more confident in working with children using any type of assistive listening device; however, these data indicate that direct experience was strongly associated with increased confidence in handling various clinical issues with this population.

Communication Skill Training

Most disconcerting were the generally low ratings the group gave themselves regarding ability to improve the communication skills of implanted children. Although the implant allows the reception of auditory information across the speech frequencies, intervention will be necessary to assist most implanted children to develop speech and language skills through use of audition (Cooper, 1991; Galvin, Sarant, & Cowan, 1997; Sommers, 1991). With appropriate support and training, children using cochlear implants should be expected to develop their language system within a normal developmental progression (Barker, Dettman, & Dowell, 1997; Stark, 1991). Although cochlear implants present unique challenges for SLPs, normal speech and language development should provide the framework for a comprehensive language habilitation program for young implant users. Archibald and Tait (1994) emphasize that point by stating "... one needs to make the normal happen, i.e., provide situations which are known to facilitate the development of spoken language in both hearing and deaf children" (p. 166).

Further, since the cochlear implant was designed to improve hearing, the development of speech perception skills represents an important measure of successful cochlear implant use. However, most implanted children will need to receive training in how to use the processed signal to develop communication skills (Tye-Murray, 1992). In the present investigation, ability to help children improve auditory skills was ranked very low by these respondents, even those with experience working with implanted children. That result is somewhat complicated by the fact that many of these SLPs did not define auditory training as a primary area of responsibility for themselves when working with implanted children. Although teachers of the hearing impaired traditionally have assumed responsibility for auditory training, most hearing impaired children are placed in regular education classrooms and are not being taught by teachers knowledgeable about the needs of hearing impaired children (Blair, EuDaly, & Benson, 1999).

The primary concern is that the development and implementation of a program to improve auditory skills needs to be conducted by someone knowledgeable about hearing loss and cochlear implant technology. As implanted children spend more time in regular education classes, effort must be taken to ensure that those environments allow for optimal use of the implant. This may be accomplished by having those professionals most knowledgeable about hearing loss, amplification, and (re)habilitation serve as consultants, and collaborate with the rest of the child's educational team in order to provide appropriate services within regular classroom settings (Otis-Wilburn, 1992). To circumvent the lack of staff members knowledgeable about hearing loss and (re)habilitation, one person at each local school could receive additional training on hearing loss and then serve as a resource person (Blair et al., 1999).

Availability of Audiological Support

Numerous concerns about serving the needs of children with hearing loss within school settings have been raised, including lack of audiological support, poor communication between audiologists and educational personnel, and regular educators who are not knowledgeable about hearing loss (Blair, et al; English, 1996; Otis-Wilburn, 1992). The results of this survey do not shed new information on this topic, but instead reinforce the concern. The lack of audiological support found in the present study is coupled with respondents' lack of experience in providing services to implant users, and low self-ratings of knowledge about various aspects of cochlear implant habilitation. Although the nature and focus of habilitation for implant users vary, typically a strong auditory/oral program is recommended (Archbold & Tait, 1994). Children who have previously been unable to hear will now benefit from services that emphasize the development of auditory skills. Although the audiologist may have the most training in aural rehabilitation, it is usually school personnel such as regular education teachers and SLPs will be expected to provide auditory training.

Useful strategies for providing better audiological support in school settings, and improving communication among educational team members were presented in the previous section. In addition, it is recommended that considerations for educational and (re)habilitation programming be explored as the child is considered for implant candidacy. Appropriate staff members within the school setting should receive the necessary training to ensure optimal habilitation programs for implanted children are in place before the child enters the school environment. Other avenues of information can also be used, including direct contacts with SLPs experienced with cochlear implant habilitation.

Clinical Implications

It appears from these data that many SLPs practicing in school settings lack knowledge and experience with providing services to children using cochlear implants. These results add to the growing body of literature indicating that many educators are not skilled in handling the challenges of children with hearing loss in regular educational settings. However, it is imperative that children with implants receive appropriate educational programs in order to maximize the benefits of the implant. The SLP should play a significant role in that endeavor, both through the provision of direct services as well as helping classroom teachers.

As more and more children receive implants, care must be taken to ensure that personnel with experience and knowledge about the educational needs of implanted children take an active part of each child's educational team. Educational preparation of such personnel, as well as the provision of continuing education to teachers and SLPs, is needed. One strong implication from the results of this study is that university training programs must continue to be diligent in their efforts to provide the appropriate coursework and clinical experiences to better prepare their students to work with this population. Training programs can also function as a resource for continuing education of those professionals needing information about cochlear implants and appropriate (re)habilitation techniques.

The use of consultative and collaborative service delivery models may also prove successful when working with children who use cochlear implants. For example, SLPs with experience providing services to such children may serve as a resource to others. Appropriate lines of communication among the individuals responsible for the child's education should be established as the child's implant candidacy is considered. Thus potential strengths and weaknesses of the educational program can be anticipated, and appropriate training can be provided as needed.

Conclusion

Within the professions of speech-language pathology and audiology, new technologies are continually developed in an effort to better serve the needs of communicatively impaired individuals. It is inevitable that mismatches between available technologies and professionals skilled in their use will occur. Professionals must actively seek information and request continuing education and support when expected to provide services for clients who present unique challenges.

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