Volume 112, Number 3
Winter 2012
ISSN 0042-8639

The Volta Review

Alexander Graham Bell Association for the Deaf and Hard of Hearing

Current Knowledge and Best Practices for Telepractice

Edited by

Arlene Stredler-Brown, CCC-SLP, CED

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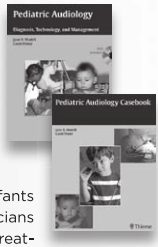

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Written by AG Bell members Elizabeth Cole, Ed.D., CCC-A, LSLS Cert. AVT, and Carol Flexer, Ph.D., LSLS Cert. AVT

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Volume 112, Number 3
Winter 2012
ISSN 0042-8639

The Alexander Graham Bell Association for the Deaf and Hard of Hearing helps families, health care providers and education professionals understand childhood hearing loss and the importance of early diagnosis and intervention. Through advocacy, education, research and financial aid, AG Bell helps to ensure that every child and adult with hearing loss has the opportunity to listen, talk and thrive in mainstream society. With chapters located in the United States and a network of international affiliates, AG Bell supports its mission: Advocating Independence through Listening and Talking!

Current Knowledge and Best Practices for Telepractice

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Editor's Preface

Arlene Stredler-Brown, CCC-SLP, CED

It has been almost 10 years since I was indoctrinated into the specialized field of telepractice. My introduction was based on a persistent need. At the time, as the director of a statewide early intervention program, I was committed to delivering the same high-quality early intervention services using the communication approach selected by each family to all children in the state irrespective of the geographic location in which the children lived. This presented a challenge as many rural communities did not have a provider with expertise in working with children who are deaf and hard of hearing (DHH). If there was a provider, the professional often had the knowledge and skills for only one communication approach. A logical way to meet these commitments was to deliver services by connecting children in rural areas with providers in distant, and often urban, areas. Little did I know that I was venturing into a field that was already of high interest in the medical community. In short order, I became aware that the field of rehabilitation, and speech-language pathology specifically, was investigating telepractice as a service delivery model.

My next opportunity to implement telepractice surfaced in 2009 when I participated in a multi-site grant to investigate the delivery of family-centered early intervention to infants and toddlers who were DHH. This grant, funded by the Colorado Clinical and Translational Sciences Institute (CCTSI), created an academic-community partnership to investigate the delivery of early intervention services through interactive video. During the 12 months of grant funding, 15 parents and professionals worked collaboratively to investigate the infrastructure needed to implement telepractice effectively with infants and toddlers with hearing loss.

During this year of grant funding, the partners were introduced to numerous programs that were using telepractice. These programs were located throughout the United States and in other countries as well. As a result, the grant-funded project participated in a timely initiative sponsored by The National Center for Hearing Assessment and Management (NCHAM) at Utah State University. The NCHAM initiative was a learning community, which brought professionals together to discuss their collective efforts to provide

family-centered early intervention to infants and toddlers who are DHH (see Behl, Houston, & Stredler-Brown, 2012, in this issue).

This monograph was created to spread the information that has been collected to date to support and advance the use of telepractice with children who are deaf or hard of hearing. The article by Houston, Stredler-Brown, and Alverson (2012) reviews the historical use of technology. A literature review (Edwards, Stredler-Brown, & Houston, 2012) summarizes recent advances that have resulted in a substantial increase in the use of telepractice and emerging research that has validated the delivery of diagnostic and therapeutic services by speech-language pathologists and audiologists.

As "early adopters" of telepractice, colleagues in Australia share their established techniques for serving the needs of children with hearing loss (McCarthy, Duncan, & Leigh, 2012). The article by Douglas (2012) describes different methods that can meet the needs of children for whom English is not the primary language spoken in the home.

As major funders of direct services, state Part C agencies can influence the rate at which telepractice evolves. Olsen, Fiechtl, and Rule (2012) describe the successful delivery of early intervention services to families whose children have a variety of developmental needs. The authors coin the term Virtual Home Visits (VHV); this is fitting terminology as it shows that telepractice complies with the requirements of the Individuals with Disabilities Education Act (IDEA) of 2004 (e.g., including the child's primary caregivers, working in natural environments).

Listening and Spoken Language Specialists (*LSLS™*) meet rigorous requirements to obtain and retain their certification. DeMoss, Clem, and Wilson (2012) propose ways in which telepractice can be used to facilitate the required mentoring relationships. Furthermore, Douglas (2012) proposes the use of telepractice to provide consultation to providers working with children living in bilingual homes.

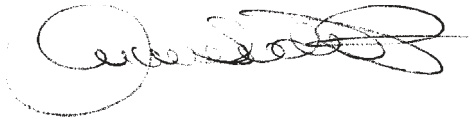
The monograph also includes two articles addressing a growing need for access to diagnostic audiology services and management of cochlear implants. Hayes, Eclavea, Dreith, and Habte (2012) describe a pilot project providing diagnostic audiological evaluations to children in Guam while the professionals conducting the evaluations reside in Denver, Colorado. A contribution by Goehring, Hughes, and Baudhuin (2012) describes a successful attempt to program cochlear implants remotely.

Comprehensive documents issued by the American Speech-Language-Hearing Association (ASHA) (available from www.asha.org/practice/telepractice) address clinical practice, licensure and credentialing, administrative considerations, connectivity issues, quality assurance, and research needs. The article by Cohn and Cason (2012) addresses the benefits, barriers, and limitations of telepractice in their discussions about current nomenclature and the complexity of ethical, privacy, reimbursement, licensure, and other policy issues.

Finally, the monograph includes 10 profiles of individual programs. The programs represented in the monograph operate in three different countries: the United States, Canada, and Australia. The experiences of these centers provide ample information to help any program interested in adopting telepractice to garner recommendations for practice.

Telepractice has recently "come of age" in our collective work with children who are DHH. The intent of this monograph is to share the background of this service delivery model and to offer insights into ways to advance its use. My personal thanks are extended to K. Todd Houston, who was a continuous collaborator and supporter during the production of this monograph, to Melody Felzien, who is an editor extraordinaire, and to the numerous professionals around the world who put forth the effort to share their knowledge, their experiences, and their enthusiasm.

Sincerely,



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The Volta Review, Volume 112(3), Winter 2012, 195–205

More Than 150 Years in the Making: The Evolution of Telepractice for Hearing, Speech, and Language Services

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Arlene Stredler-Brown, CCC-SLP, CED; and Dale C. Alverson, M.D.

For well over a century, individuals have sought new and efficient ways to communicate health-related information and provide medical services over distances. Often, this desire has sparked considerable innovation in technology and ushered in improved models of service delivery. Today, modern videoconferencing technology allows practitioners to have unbridled audio and video interactions in real time on a range of devices. For speech-language pathologists and audiologists, this allows an array of hearing, speech, and language services to be provided through models of telepractice. By fully understanding the past, practitioners can continue to shape the future and fully realize the potential of these service delivery models.

Introduction

For well over 150 years, individuals have utilized existing communication technology as a means to relay or transmit health-related information (Bashshur & Shannon, 2009). When the technology did not exist or failed to do an adequate job, innovation led to new technological advancements or the

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enhancement of devices already in use. Since the prefix "tele-" is the Greek root word meaning distant or remote, *tele*practice is simply practice over distance (Darkins & Cary, 2000). From the telegraph to the telephone through the present-day use of the Internet, web portals, transfer of images, and videoconferencing technology, a true evolution has occurred in the means by which health care, medicine, rehabilitation, and intervention can be delivered over distances.

Today, an increasing number of physicians are adapting their practices to reach more patients over long distances (known as telemedicine; Fong, Fong, & Li, 2011) Careful planning, development, and ongoing evaluation need to be implemented to develop effective and sustainable telemedicine initiatives and to ensure success and sustainability (Alverson et al., 2004). This approach includes technical, operational, business, and evaluation plans that meet the needs of the health care providers and their patients, and assures ease of use, added value, and integration of new practices into the existing workflow. In addition, careful preparation minimizes disruption of existing practice while demonstrating the advantages of telemedicine to enhance adoption (Helitzer, Heath, Maltrud, Sullivan, & Alverson, 2003). Health information technologies that incorporate electronic health records and health information exchange are also being integrated into telemedicine (Fong et al., 2011).

Likewise, speech-language pathologists and audiologists are using models of telepractice to provide diagnostic and treatment services to a range of patients with speech, language, and hearing disorders or delays. By fully understanding the past, practitioners can continue to shape the future of telepractice endeavors to fully realize the potential of these service delivery models.

The Telegraph: The Beginning of Distance Communication

Scholars continue to disagree about the origin of communication over great distances. Some have proffered that the earliest form of distance communication involved the simple messenger who walked or ran from point to point delivering news. When considering the specific communication needs of health and medical information, one of the earliest forms of communication was the lighting of bonfires to signal information about the bubonic plague during the middle ages. Similarly, the postal system could be included, but was often considered unreliable as a method to disseminate medical information in the late 1700s. By the early 1800s, the heliograph, a mirrored device that could reflect sunlight, was used widely in Europe to signal information about death rates as a result of war or famine (Zundel, 1996).

Interestingly, a health-related incident led Samuel Morse to invent the single-wire telegraph, which also enabled the widespread use of Morse Code (Bellis, 2009a, b). In 1825, Morse, a talented and respected painter, was in Washington,

DC, when he received word by horse messenger that his wife, Lucretia, was having a difficult pregnancy and was "convalescent." Terrified at the thought of losing his wife, Morse left Washington immediately to return to his home in New Haven, Connecticut. Unfortunately, by the time Morse arrived, his wife had died in childbirth and was already buried. During his time in Washington, Morse was unaware that his wife had been sick for quite some time. Feeling deep sadness and remorse over the loss of his wife, Morse eventually abandoned painting to devote the rest of his live in pursuit of a system of long distance communication.

Morse's efforts paid off in 1832 when he invented a single-wire telegraph, but it was not until 1842, after several visits to Washington to lobby for the telegraph, that he finally secured the funds to construct 38 miles of telegraph line from Baltimore, MD, to the U.S. Capitol building in Washington. On May 24, 1844, using the code that he and colleagues had developed, Morse sent the message, "What hath God wrought," from the U.S. Capitol to a receiver in Baltimore.

The use of the telegraph quickly spread, and the first functional distance technology provided more immediate communication than was previously possible. The telegraph and the growing dominance of the railroad for mass transportation and shipping are credited as important factors in the westward expansion of the United States (Dilts, 1996). During the American Civil War, the telegraph was used extensively to issue commands to troops on both sides of the conflict and to report troop movements. More importantly, it was also used to report casualty lists and to secure scarce medical supplies. While the telegraph proved to be an important technological step in the communication of medical information, it is also critical to note that Morse Code has outlived the device. Various militaries, first responders, and other civil service personnel continue to use the code to relay information in situations when other devices have failed.

While Morse perfected wired communication, a relatively unknown inventor, Mahlon Loomis, experimented with what he called "wireless telegraphy" (Timetoast, 2012). In 1866, he demonstrated his invention between two mountain peaks in Virginia. While mostly lost to history, Loomis' invention was a forerunner to the radio but it would take another three decades before the Italian inventor, Guglielmo Marconi, would be credited with its invention in 1895.

Dr. Alexander Graham Bell

In 1875, Dr. Alexander Graham Bell uttered those immortalized words, "Mr. Watson, come here, I want you!" into a rather crude transmitter after spilling acid on his leg. In the next room, Thomas A. Watson, a lab assistant, heard Dr. Bell's voice clearly through the receiver. In that moment, a new form of mass

communication was born—the telephone. The incident could also represent the first documented example of someone seeking medical specific intervention via "modern" technology (Carson, 2007).

While Bell ultimately understood the wider implications for his invention, his initial experiments focused on how to transmit speech across a wire. Bell, a noted elocutionist and teacher of the deaf, believed that children with even the most significant hearing loss could develop intelligible spoken language if given appropriate instruction. The telephone, therefore, was a product of his work with childhood hearing loss. Bell theorized that if he could transmit speech across a wire, he could make the speech louder and the children he was teaching would hear it better. In turn, they could learn to self-monitor their own voices and improve their speech intelligibility.

Bell became quite famous for the invention of the telephone. However, he believed that his photophone would be recognized as his greatest and most important invention (Carson, 2007). The photophone was designed to use a modulated light beam to transmit a person's voice over a distance. Both the transmitter and receiver consisted of a plane of mirrors and a selenium cell. The modulating light from the transmitter would be interpreted as a speech signal and would be reproduced in the receiver. The first wireless telephone transmission through the photophone occurred in April 1880.

Bell was so enthusiastic about the success of the photophone experiment, that he wrote a letter to his father, Alexander Melville Bell, stating, "I have heard articulate speech by sunlight! I have heard a ray of the sun laugh and cough and sing! I have been able to hear a shadow, and I have even perceived by ear the passage of a cloud across the sun's disk. You are the grandfather of the photophone, and I want to share my delight at my success," (Carson, 2007, pp. 77-78).

Unfortunately, Bell's wish for the photophone to revolutionize telephone communication would not be immediately realized. Because the photophone depended on bright light for signal transmission, he could not overcome the affects of inclement weather. However, the basic concepts employed by the photophone became the precursors for modern fiber optic communication, which uses light to transmit large amounts of information at extremely high speeds.

Early 1900s through the 1940s

By the turn of the century, telephones were in use and physicians were among the early adopters of its use in medical care. Gunsch (2011) observes, telemedicine began—on a limited basis—in the early 1900s when electrocardiograms were transmitted over telephone lines and physicians were able to read these test results. Within the next decade, radio communication was in place. For convenience, physicians and other medical personnel used radio to

provide consultations. As well, physicians often turned to radio to treat and counsel sailors at sea during medical emergencies. Radio continued to be the primary long-distance communication technology used in times of military engagement (i.e., World War I and II, Korean, and Vietnam conflicts) and was often used to dispatch medial teams, communicate injury reports, and order helicopters for evacuations of the injured (Zundel, 1996).

1950s and 1960s

The 1950s ushered in widespread use of black and white televisions, which were quickly becoming one of the primary mediums of entertainment and communication for the masses. In terms of medical applications, the ability to visualize a patient's condition rather than rely on an audio description greatly enhanced diagnosis and the confidence of those engaged in treatment (House & Roberts, 1977). During this time, the Nebraska Psychiatric Institute, with funding from the National Institute for Mental Health, is credited with being one of the first facilities to use closed-circuit television for health care purposes (Wurm, Hofmann-Wellenhof, Wurm, & Soyer, 2008). An interactive, closed-circuit television system was established between two hospitals that were over 100 miles apart, and doctors were able to effectively conduct interviews with psychiatric patients.

By the early 1960s, the space race was in full gear as President John F. Kennedy pledged to go to the moon by the end of the decade. As a result, the National Aeronautics and Space Administration (NASA) collected physiological measures of astronauts during spaceflight, which also led to wider use of satellite technology for telecommunications. Using telemetric data transmitted from the astronauts' spacesuits, medical personnel in ground control were able to continuously monitor heart rate, blood pressure, and electrocardiograms (Wurm et al., 2008). Through the 1990s, NASA continued to support a variety of early telemedicine research projects to determine preferred practices in the remote diagnosis and treatment of a range of medical conditions. (For more information on this history, see Allan, 2006; Welsh, 1999; and Wurm et al., 2008.)

1970s and 1980s

In the early to mid 1970s, several projects around the country continued to perfect telepractice applications. One such project was led by Dr. Kenneth T. Bird of Massachusetts General Hospital in Boston, who established an interactive system using direct microwave transmission from Logan Airport to the hospital to provide medical care for travelers (Thrall, 2007).

Another project, the Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC), was developed by NASA and managed by the U.S. Indian Health Service. The project used advanced telecommunication

technology to deliver medical services on the Papago Indian reservation (Freiburger, Holcomb, & Piper, 2007). The project was active from 1973 until 1977 and proved significant by demonstrating the effectiveness of telepractice applications, as summarized by Bashshur (1980):

- NASA and the Indian Health Services demonstrated the organizational and technological capacity to provide medical care to remote populations.
- The approach to the design and implementation of this mode of care delivery was effective and holds promise for other situations.
- The project demonstrated the efficacy of remote telemetry and non-physician medical personnel in the provision of medical care.
- The cooperation and advance planning on the part of all participants in the project can serve as a model for others.

While these projects demonstrated overall effectiveness of providing medical care over a distance, the majority of these early experiments did not stand the test of time due to the high costs associated with equipment and data transmission. Additionally, the technology available at the time could not provide adequate quality, and the cost-to-benefit ratio led many of these projects to be shuddered (Wurm et al., 2008). By the end of the 1970s and well into the 1980s, the exploration of providing medical care over distance was on a decline. NASA and branches of the military continued to support some projects and other isolated programs labored on. However, in the early 1990s interest in telepractice began to grow again, spurred on by rapid advancements in information and telecommunications technology and digital data transmission, especially via the Internet (Wurm et al., 2008).

1990s Through Today

Recognizing the potential impact of telepractice, in the 1990s and 2000s Federal departments and agencies, the military, private industry, for-profit and nonprofit medical institutions, and universities increased the study of and support for telepractice and its broad applications. Likewise, the rapid proliferation of broadband Internet connections, the relatively inexpensive computing technology (e.g., laptops, table computers, smartphones), and the availability of online software and teleconferencing websites (e.g., Skype, Oovoo, Google Talk, Facetime, etc.), has allowed real-time videoconferencing to be possible, has made it widely available, and has even allowed it to become mobile.

Thus, the challenges of technology that once held back widespread adoption of telepractice applications are being eliminated in most circumstances. However, some challenges still exist in the realm of policy and funding. Current issues include limitations in reimbursement, credentialing and

privileging, interstate licensure, adequate affordable broadband connectivity to more remote sites, interoperability between systems, insurance of security, patient confidentiality, and privacy. However, resolution for some of these issues is forthcoming as multiple disciplines embrace the large-scale implementation of distance technology-based practices and care for the patients they serve. The advancement of telepractice is a means of improving access to health care services, improving outcomes, and even reducing costs through prevention of more costly complications, unnecessary use of emergency services or hospitalization, decreases in duplication of tests, and minimizing errors.

"Tele" Terminology

According to the Agency for Healthcare Research and Quality (AHRQ), "telehealth" is the use of telecommunication technologies to deliver health-related services and information that support patient care, administrative activities, and health education (Dixon, Hook, & McGowan, 2008). As noted previously, this term is a natural derivation from the Greek root word "tele" meaning distant or remote. Any word attached to "tele" thus implies that service to be provided at a distance. Thus telemedicine is defined as providing medical services over distance (Fong et al., 2011). While these definitions appear to overlap, telemedicine is often used more narrowly to describe treatment or clinical services delivered by a physician, hospital, or medical center. However, use of these terms is inconsistent. Baker & Bufka (2011) observed, "the terms are frequently used interchangeably as there is yet no universal definition or term used by legislators, policymakers, government agencies, and payers" (p. 405). Because of the confusion that exists among consumers and stakeholders, disciplines often devise their own terminology to describe the services that are being provided, including (but not limited to): telemental health, telenursing, telepharmacy, telecardiology, telepathology, teleradiology, telepsychology, telerehabilitation (i.e., a broad term typically used with allied health professions), teleaudiology (see Hayes, Eclavea, Dreith, & Habte, 2012, in this issue), telespeech, teletherapy, telepractice, and tele-intervention (see Houston & Stredler-Brown, 2012, in this issue). Bashshur, Shannon, Krupinski, and Grigsby (2011) also address this challenge of the taxonomy of telemedicine, discussing the various working definitions in hopes of clarifying the proliferation of nomenclature in telemedicine but also providing a useful guide for research and policymaking.

Telepractice

As videoconferencing technology has become more widely available, the associated equipment costs have declined and these services have become

more cost-efficient. As a result, web-based videoconferencing has been used to deliver health care through a variety of allied health disciplines. The American Speech-Language-Hearing Association (ASHA) defines this service delivery model as telepractice for practitioners in audiology and speech-language pathology (ASHA, 2005a, 2005b, 2010). Evaluating telepractice in audiology, Swanepoel and Hall (2010) reviewed related peer-reviewed literature and found that these services were both reliable and effective across ages and patient populations (see also Hayes et al. 2012). Likewise, Mashima and Doarn (2010) completed a similar review of the prevailing literature and described broad application of telepractice in speech-language pathology, including treatment of neurogenic communication disorders, fluency disorders, voice disorders, dysphagia, and childhood speech and language disorders.

Professional Issues in Telepractice

ASHA (2010) continues to detail a range of professional issues that potentially impact practitioners who are providing services through telepractice. As commented on previously, three of the most important issues concern privacy regulations, licensure, and reimbursement for services. In some settings, telepractice may not be allowed for fear of violating the Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA addresses a patient's protected health information and requires that telepractice sessions be protected from unauthorized access. However, HIPAA does not specify the method of protection. Some facilities have made reasonable accommodations by carefully selecting software and hardware that offer great protection from unwanted access through effective encryption and network security. For example, the Internet connection between the provider and the parent can be secured by establishing virtual private networks (VPNs), using enhanced firewall software on the provider's and parent's computers, and using password protection when logging into secure websites or videoconferencing services.

Licensure remains a challenge for telepractice providers in most states. According to ASHA (2010), only a small number of state licensure boards have addressed telepractice in their legislation or regulatory language. Thus, considerable variability exists among states in terminology and the specificity of existing regulations. Providing telepractice services across state lines requires securing and maintaining licensure in both states. This requirement is often cost prohibitive and requires considerable administrative support and oversight. For these reasons, providers usually limit their services to their home state. Currently, several organizations (e.g., the Federation of State Medical Boards, the American Telemedicine Association) and several national legislators are exploring and advocating systems of licensure portability that remove barriers and improve access to inter-state telepractice services.

Similarly, credentialing and privileging by proxy, when allowed by the originating site where the patient is located, is based upon reciprocity by the consultants' primary organization. This type of reciprocity facilitates the provision of telepractice services while still ensuring that the provider is appropriately qualified to deliver the service. The Centers for Medicare and Medicaid Services (CMS) has adopted this option which, it so happens, had already been implemented by The Joint Commission, the national organization tasked to approve and monitor the accreditation of hospitals throughout the United States.

Reimbursement for services continues to be a challenge for providers who are utilizing telepractice models. Romanow & Brannon (2010) describe some of these challenges and the fact that as telepractice in health care continues to grow, CMS, Medicare, and Medicaid either do not allow telepractice or restrict reimbursement for audiological and speech-language services provided through a telepractice model. While this is disheartening, some states have modified their state regulations regarding Medicaid or have passed legislation that define how reimbursement can occur. While not perfect, practitioners should investigate if and how these services have been addressed in their state as well as nationally, such as via CMS and other payers. Changes in health care-funding paradigms beyond the traditional fee-for-service model should also allow coverage for audiology and speech-language services.

Conclusion

For more than 150 years, the necessity to communicate health-related information quickly and efficiently has often been a driving force behind new technological advancements. Today, modern technology allows constant connectivity from a range of devices and the ability to see and hear others in real time, whether they are just down the street or thousands of miles away. Inevitably, the widespread availability of this technology—used in combination with the Internet—has allowed professionals to provide a range of audiological, speech, and language services through telepractice. While challenges remain, practitioners will continue to seek solutions to these and other issues. If history is our teacher, the next decade will no doubt see even more improvement in technology and service delivery models that will only enhance telepractice, and, in turn, foster better outcomes for those receiving these services.

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The Volta Review, Volume 112(3), Winter 2012, 207–226

Telepractice: A Wide-Angle View for Persons with Hearing Loss

Ellen R. Cohn, Ph.D., CCC-SLP; and Jana Cason, DHS, OTR/L

This paper presents the current status of telepractice as a service delivery model for persons with hearing loss. Telepractice can be broadly viewed as the delivery of preventative, habilitation, or rehabilitation services through telecommunications technology. Telemedicine and telehealth are closely aligned to telepractice, often with overlapping nomenclature, function, and common delivery systems. The technologies for telepractice are potentially but "a click away" for persons with hearing loss and their families. However, a full realization of this delivery model's benefits, barriers, and limitations is just beginning to emerge. On the professional side, challenges include the need for ethical, privacy, and other policy issues to keep pace with advances in technology; moreover, services provided via telepractice are not uniformly reimbursed. With the exception of federally-based practice settings, state licensure requirements do not efficiently engender inter-state license portability and reciprocity. On the consumer-side, the challenges are to recognize the power of telepractice and acquire the knowledge to become informed consumers.

Introduction

Telepractice has a role as a service delivery model for persons with hearing loss, both in the United States and internationally. Initially, telemedicine and telehealth were presented as ways to address personnel shortages in rural areas. More recently, the American Telemedicine Association (ATA) and industry leaders articulated an even wider application—to meet the health care needs of a mobile U.S. workforce (Linkous, 2012). It is advantageous to both workers and their employers to

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"virtually" treat workers during their travels and ensure continuity of care. This reasoning can also be extended to the greater flexibility of care for school-age children with working parents, and applies to persons of all ages with hearing loss.

The following statistics demonstrate the expansive nature of hearing loss across the life-span of individuals in the United States:

- Two to three of every 1,000 U.S. children (approximately 12,000 U.S. children) are born with hearing loss each year (Alexander Graham Bell Association, 2012; National Institute on Deafness and Other Communication Disorders [NIDCD], 2010).
- Seventeen of every 1,000 U.S. children under the age of 18 have hearing loss (NIDCD, 2010).
- Thirty-six million U.S. adults (17%) report some degree of hearing loss (NIDCD, 2010).
- The likelihood of hearing loss increases with age in U.S. adults. Eighteen percent of adults 45–64 years old, 30% of adults 65–74 years old, and 47% of adults 75 years old or older have hearing loss (NIDCD, 2010).

Internationally, the prevalence of hearing loss is even higher. The landmark *World Report on Disability*, co-produced by the World Health Organization (WHO) and the World Bank (2011), lists hearing loss as the most prevalent, leading health condition associated with moderate and severe disability, with 124.2 million persons affected across the life-span. The disparity published in the report between hearing loss in countries categorized as low income versus high income is striking. Low income countries have a combined total of 54.3 million persons with hearing loss who are 0–59 years old, and 43.9 million persons who are 60 years of age and older. The prevalence of hearing loss for high income countries is 7.4 million persons who are 0–59 years of age and 18.5 million persons who are 60 years of age and over.

Following the conventional wisdom that higher income countries have the most favorable ratios of rehabilitation professionals per capita, there is clearly an enormous need, internationally, for services via telepractice for persons with hearing loss in underserved countries. The WHO report states: "Where the Internet is available, e-health (telehealth or telemedicine) and telerehabilitation techniques have enabled people from remote areas to receive expert treatment from specialists located elsewhere" (WHO & World Bank, 2011, p. 118–119). Moreover, the report expresses confidence in the capabilities of telerehabilitation: "Growing evidence on the efficacy and effectiveness of telerehabilitation shows that telerehabilitation leads to similar or better clinical outcomes when compared to conventional interventions" (p. 119).

Current Nomenclature

It is important to consider the nomenclature related to this subject because it continues to undergo adjustments per the conventions adopted by professional associations, funding sources, and state licensure boards. The application of telecommunications to health care practice is relatively nascent, and these rhetorical shifts are not surprising or unexpected. However, the evolving nomenclature is causing definitional uncertainties for three major reasons. First, there is often definitional overlap among the terms. Second, while some definitions are broad-sweeping and inclusive, others include language that effectively limits the scope of telepractice, telemedicine, telehealth, and/or telerehabilitation. Third, searches of literature and available funding sources require the use of multiple search terms.

For the purposes of this paper, the authors will use the term telepractice as the over-arching term, unless quoting from another source. Telepractice will denote clinical practice that specifically relates to remote speech or audiology services, and telehealth will be used to apply to the delivery of occupational therapy services. Definitions of selected key terms follow, but are not all inclusive (i.e., e-health and other similar terms are not addressed).

Telemedicine and Telehealth

The ATA (2012a) defines telemedicine as "the use of medical information exchanged from one site to another via electronic communications" (para. 1). ATA emphasizes that telemedicine does not constitute a distinct medical specialty; instead, it refers to delivery of medical care via telecommunication-based delivery systems. Telehealth is the delivery of any health care service or transmission of wellness information using telecommunications technology (ATA, 2012a); this broader term encompasses both clinical and non-clinical health care services. "Videoconferencing, transmission of still images, e-health including patient portals, remote monitoring of vital signs, continuing medical education, and nursing call centers are all considered part of telemedicine and telehealth" (ATA, 2012a, para. 1).

Telerehabilitation and Telepractice

Rehabilitation professions also recognize the power of telecommunication technologies to improve access to health-related services. The types of professionals who share this interest include, but are not limited to, assistive technology practitioners, audiologists, dieticians and nutritionists, educators, health information managers, neuropsychologists, occupational therapy practitioners, physiatrists/rehabilitation physicians, physical therapy practi-

tioners, speech-language pathologists, rehabilitation counselors, psychologists, social workers, and disability policy specialists.

ATA's Telerehabilitation Special Interest Group (TR-SIG) is a multidisciplinary group that focuses on the application of telecommunication technologies to rehabilitation (ATA, 2012b). A recent TR-SIG task force authored a *Blueprint for Telerehabilitation Guidelines* (Brennan et al., 2010). The blueprint notably crafted a broad definition:

> Telerehabilitation refers to the delivery of rehabilitation services via information and communication technologies. Clinically, this term encompasses a range of rehabilitation and habilitation services that include assessment, monitoring, prevention, intervention, supervision, education, consultation, and counseling. Telerehabilitation has the capacity to provide service across the lifespan and across a continuum of care. Just as the services and providers of telerehabilitation are broad, so are the points of service, which may include health care settings, clinics, homes, schools, or community-based worksites. *(p. 31)*

Though this definition encompasses a range of rehabilitation and habilitation services by a variety of disciplines, this paper will focus on terminology and professional issues associated with the use of telepractice by speech-language pathologists, audiologists, and occupational therapy practitioners.

Teleintervention

Teleintervention is an emerging term used to describe early intervention (EI) services for children birth through 3 years of age who have been identified as having a developmental delay or risk for disability. EI services are mandated by the Individuals with Disabilities Education Act (IDEA; 2004). The term teleintervention captures the educational focus of EI services provided by a variety of health and nonhealth professionals (i.e. teachers of the deaf or hard of hearing, behavior specialists, and developmental specialists). The National Center for Hearing Assessment and Management (NCHAM) coined teleintervention and created a practical guide for the use of teleintervention in providing listening and spoken language services for infants and toddlers who are deaf and hard of hearing (NCHAM, 2012).

Professional Association Definitions

American Speech-Language-Hearing Association

The American Speech-Language-Hearing Association (ASHA) officially adopted the term telepractice to describe the use of a remote service delivery

model by speech-language pathologists and audiologists. ASHA (2012a) defines telepractice as "the application of telecommunications technology to delivery of professional services at a distance by linking clinician to client, or clinician to clinician, for assessment, intervention, and/or consultation" (para. 1). Speech-language pathologists and audiologists can utilize a telepractice delivery model to overcome barriers of access to services such as distance, transportation challenges, and personnel shortages.

American Occupational Therapy Association

The American Occupational Therapy Association (AOTA, 2011) defines occupational therapy as "a science-driven, evidence-based profession that enables people of all ages to live life to its fullest by helping them to promote health and prevent—or live better with—illness, injury, or disability" (para. 5). AOTA officially recognizes telepractice as an appropriate service delivery model within the profession and adopted the term telerehabilitation in 2005 to describe the use of telecommunications technology to deliver occupational therapy services. However as a result of adjustments in nomenclature, it is expected that AOTA will adopt the term telehealth with the publication of its next position paper on the topic (anticipated to be published in December 2012). Telehealth is a broader term that better describes the full scope of occupational therapy practice including health and wellness, prevention, habilitation, and rehabilitation services.

Technology and Telepractice

Synchronous Technologies

Synchronous technologies enable practitioners and clients to interact in real time. Examples of synchronous technologies include commercial and Internet-based videoconferencing devices and software, analog telephones and videophones, virtual reality systems, and specialized remote audiology devices. In general, rehabilitation professionals use videoconferencing technologies with audio and video to deliver services via telepractice. Remote audiological services can be accomplished using audiology systems interfaced to personal computers. Practitioners have a range of technology options to choose from, thus warranting consideration of the pros and cons associated with each.

Internet-based videoconferencing using a computer with web-camera and voice over the Internet protocol (VoIP) software (e.g., Skype, Facetime) is becoming increasingly ubiquitous in society. Several studies demonstrate the efficacy of these technologies for delivering habilitative and rehabilitative services (Baharav & Reiser, 2010; Hermann et al., 2010; Kelso, Fiechtl, Olsen, & Rule, 2009; Verburg, Borthwick, Bennett, & Rumney, 2003). Similarly,

videophones operating on an analog telephone line (e.g., landline) have been shown to provide adequate video and audio for the delivery of select therapeutic services including recommendations for adaptive strategies, assistive technology, and environmental modifications (Hoenig et al., 2006; Sanford et al., 2007). Traditional analog telephones enable remote hearing screening (Krumm & Vento, in press). Commercial videoconferencing systems (e.g., Tandberg, Polycom) afford high quality audio and video and assure Health Insurance and Portability Accountability Act (HIPAA; 1996) compliance; however these systems are usually associated with health organizations and state-designated telehealth networks due to equipment and connectivity costs. There is potential for rehabilitation professionals to leverage these systems.

Virtual reality systems are an emerging technology used by rehabilitation professionals within a telepractice delivery model. Virtual reality systems create computer-generated environments, and computer-based virtual gaming systems (e.g., XBOX-360 Kinect, Sony PlayStation Eye Toy, and Nintendo Wii); these are low cost alternatives to high-end commercial virtual reality systems. While not considered telepractice technologies as designed, remote monitoring of performance and live interactions with a remote practitioner to enhance performance and therapeutic outcomes would constitute a synchronous telepractice application. Specialized remote audiology devices enable remote intra-operative monitoring and remote programming of cochlear implants (Ramos et al., 2009; Shapiro, Huang, Shaw, Roland, & Lalwani, 2008); measurement of otoacoustic emissions (OAE) (Krumm, Huffman, Dick, & Klich, 2008; Schmiedge, 1997); pure-tone assessment (Givens & Elangovan, 2003; Givens et al., 2003); pure tone hearing screening (Lancaster, Krumm, & Ribera, 2008); speech audiometry (Ribera, 2005); and video-otoscopy (Eikelboom, Atlas, Mbao, & Gallop, 2002).

While research on the efficacy of telepractice using synchronous technologies is promising, practitioners must be aware of potential limitations of these technologies—notably issues related to security, privacy, and confidentiality. Watzlaf, Moeini, and Firouzan (2010) provided a checklist to assist practitioners in conducting a risk analysis for HIPAA compliance when using 'off the shelf' devices and Internet-based VoIP software. VoIP software platforms designed for telepractice exist and their use assures HIPAA compliance through the use of private servers with restricted access and encryption of all data (Cason, 2012; Watzlaf, Moeini, Matusow, & Firouzan, 2011).

Asynchronous Technologies

Asynchronous technologies enable remote evaluation, intervention, monitoring, or consultation between a client and practitioner or between a practitioner and remote expert via recorded data (e.g., video, digital photographs, electronic communications). Telepractice applications using asynchronous technologies

may be referred to as 'store and forward' as data is stored electronically and then forwarded to the remote practitioner. Asynchronous technologies have been used to counsel new hearing aid users and to deliver cognitive-behavioral therapy for tinnitus treatment (Smits, Kaptey, & Houtgast, 2004).

Hybrid Delivery and Technology Considerations

Hybrid delivery incorporates in-person, synchronous, and/or asynchronous technologies. An example of a hybrid delivery model is tympanometry, which involves in-person testing with results (recorded data) sent to a remote audiologist for interpretation (Krumm & Vento, in press). When determining the appropriate telepractice delivery model and technologies, professionals should consider:

- Desired client outcomes and how these align with the delivery model and technology selection.
- The technology accessibility features and usability by persons with disabilities.
- End-user (practitioner and client) experience and comfort with the technology.
- Interoperability of devices.
- Technology resources including previously acquired technologies and existing technology infrastructure.

Regardless of the technology selected, professionals must be cognizant of ethical and legal considerations associated with technology selections including compliance with HIPAA and/or other federal and state regulations.

Telepractice and Service Delivery

There are three telepractice service delivery models that have high relevance to persons with hearing loss: teleaudiology, telespeech, and teleintervention (e.g., delivery of EI services).

Teleaudiology

Teleaudiology can effectively be used to deploy a broad range of audiological services at a distance in a live, synchronous manner. Clinical practice and research have demonstrated that teleaudiology can be accomplished using audiological systems interfaced to personal computers, interactive video, remote computing applications (requiring an Internet connection or wide area network), and high speed-networks (see citations below). An exception to this is tympanometry, which typically requires a hybrid approach (i.e., local testing with results sent to the audiologist at a distance for interpretation via store-and-

forward methods). Krumm and Vento posit that with further development of computer-based tympanometry, synchronous impedance testing via tele-audiology will soon become a reality (Krumm & Vento, in press).

Most clinical audiology procedures can now be accomplished remotely via synchronous teleaudiology:

- Auditory brainstem testing: Krumm et al., 2008; Towers, Pisa, Froelich, & Krumm, 2005.
- Remote intra-operative monitoring of cochlear implants: Shapiro et al., 2008.
- Remote programming of cochlear implants: Ramos et al., 2009.
- Hearing aids: Fabry, 1996; Ferrari & Bernardez-Braga, 2009; Wesendahl, 2003.
- OAE measurement: Krumm et al., 2008; Schmiedge, 1997.
- Pure tone assessment: Givens & Elangovan, 2003; Givens et al., 2003.
- Pure tone hearing screening: Lancaster, Krumm, & Ribera, 2008.
- Speech audiometry—Hearing in Noise Test (HINT): Ribera, 2005.
- Video-otoscopy: Eikelboom et al., 2002.

Low technology teleaudiology applications have also been reported (Smits et al., 2004). Email communication (an electronic form of the store-and-forward method) has been used to counsel new hearing aid users and to deliver cognitive-behavioral therapy for tinnitus treatment. Telephone hearing screening has also been used in England and Australia (Krumm & Vento, in press). Computer-based self-assessment procedures have not been as successful since, according to Krumm (n.d.), they "suffer from questionable calibration, poor validation, and the lack of control over environmental noise levels" (para. 4).

While almost the full range of audiology services can be delivered via teleaudiology (including aural rehabilitation), Krumm and Vento (in press) describe several challenges. The behavioral assessment of infants often requires close proximity to the infant. An onsite assistant will need to assist with hearing aid assessment and impedance testing. Equipment expense and Internet connectivity may also pose difficulties.

Finally, wise selections must be made to ensure that clients and their families are good candidates for teleaudiology services. An ASHA Technical Report (2005a) includes client characteristics that while not exclusionary, may affect the success of teleaudiology. These include the capacity to demonstrate the physical endurance and attention required to remain seated in front of a monitor, without extraneous movements that might compromise image resolution; the ability to hear, understand, and follow directions; the ability to see and possibly read materials on a computer monitor; intelligible speech; and the motor ability to operate a keyboard, if necessary. The client and family should be willing to participate in the teleaudiology process. If cultural/

linguistic differences exist, the availability of an interpreter should also be explored. And finally, there must be an available telecommunications network.

Telespeech

Because hearing and speech disorders often co-exist across the lifespan, it is relevant to address the current status of telespeech. Much like teleaudiology's success in delivering most audiology procedures, telespeech can be used effectively to deploy a broad range of speech-language pathology interventions at a distance in a live, synchronous manner. Theodoros (2011), in a comprehensive review of the telespeech literature, cited evidence to support telespeech management of articulation, language, and literacy disorders in children, adult neurogenic communication disorders (aphasia, dysarthria, apraxia of speech), voice disorders, stuttering, dysphagia, and laryngectomy. The use of telepractice to deliver EI programming for infants and toddlers with a disability (e.g., hearing loss) and/or developmental delay often requires the involvement of multiple disciplines, and is therefore featured in the next section.

Telepractice for EI Services—Teleintervention

IDEA Part C (2004) mandates EI programming for children birth through 3 years of age who are identified as having a disability or developmental delay. EI services are designed to promote the development of skills in infants and toddlers who are experiencing a disability or developmental delay, build capacity within families to care for their child with special needs, and enhance the quality of life for children and families participating in IDEA Part C services (Cason, 2011). Currently, all 50 U.S. states, the District of Columbia, and five jurisdictions (American Samoa, Guam, Northern Mariana Islands, Palau, and Republic of the Marshall Islands) provide EI services under IDEA Part C (National Early Childhood Technical Assistance Center, 2010).

Several studies demonstrate the efficacy of telepractice within EI programming. High parent and interventionist satisfaction with services delivered using a telepractice model was reported by Cason (2009) and Kelso and colleagues (2009). In both studies, videoconferencing technologies were used to connect a remote practitioner with caregivers and children participating in EI services. Similarly, Heimerl and Rasch (2009) utilized a telepractice model to provide remote EI services (occupational therapy, physical therapy, speech-language pathology, and psychology) with children and their families, and consultative services with local developmental generalists. The researchers also reported a high level of satisfaction with a telepractice model (224 encounters total) among parents and providers.

Telepractice may also be an effective model for training EI providers. In contrast to service provision with children and families, Vismara, Young, Stahmer, Griffith, and Rogers (2009) demonstrated the efficacy of using

videoconferencing technology to train EI providers remotely. This study demonstrated that remote technology was as effective as in-person instruction in teaching EI providers to use the Early Start Denver Model (ESDM), an evidence-based intervention for infants and toddlers with autism spectrum disorders (Vismara, Colombi, & Rogers, 2009).

These studies suggest that telepractice may be an effective service delivery model to facilitate evaluation, follow-up, and therapeutic interventions, as well as consultation and training with local EI providers to support therapy outcomes for children and families receiving EI services (Cason, 2011). This model mitigates the impact of personnel shortages in underserved areas, increases access to EI services for children who qualify, reduces isolation, and builds capacity among the local therapists and families participating in EI programming.

Professional Responsibilities

Before delivering services via telecommunications, professionals must exercise due diligence to ensure that they are practicing in a legal and ethical manner. Specifically, professionals need to become cognizant of state laws governing licensure and telepractice; federal laws (e.g., HIPAA); inter-state practice issues (licensure requirements both in the state where the practitioner is located and in the state where the patient/client is located); and ethical issues, including practice competency using a telepractice model, cultural sensitivity, patient/client informed consent, and safety. Professionals should also be cognizant if and how telepractice is reimbursed by third parties. Finally, professionals should be aware of whether their malpractice insurance applies to services delivered via telepractice.

Many professional associations have or are in the process of addressing these important issues. For example, per ASHA's (2005b) position statement:

> The use of telepractice does not remove any existing responsibilities in delivering services, including adherence to the Code of Ethics, Scope of Practice, state and federal laws (e.g., licensure, HIPAA), and ASHA policy documents on professional practices. Therefore, the quality of services delivered via telepractice must be consistent with the quality of services delivered face-to-face. *(para. 2)*

Similarly, AOTA's (2010) position paper states:

> AOTA asserts that the same ethical and professional standards that apply to the traditional delivery of occupational therapy services also apply to the delivery of services received via telerehabilitation. . .Occupational therapy practitioners are to abide by the licensure and regulatory requirements in the state where they live and the state

where the client is located in order to provide services...Occupational therapy practitioners are to abide by HIPAA regulations to maintain client confidentiality of all records and interactions, including the use of telerehabilitation to send or receive data. *(pp. 4–5)*

Telepractice and Ethics

Denton (2003) wrote one of the earliest essays on the ethical and legal issues related to telepractice. His major points of discussion included: state licensure, privacy and confidentiality, risk management and malpractice, professional competence, informed consent, and use of assistants. Denton, a trained speech-language pathologist and attorney, provided commentary on a series of hypothetical ethical and legal telepractice scenarios, along with the caution "in the areas of law and ethics however, reasonable minds may differ" (2003, p. 314). Cohn (2012) recently provided additional perspectives on ethics, including a *Telepractice Bill of Rights for Consumers*.

State Licensure

Unless the state wherein the client is located has exemption provisions within its licensure laws, a professional cannot practice without a license from that state. According to current legal practices, *it is the location of the client* that determines the state in which the professional must be licensed. Although not all states regulate the performance of telepractice, a regulatory board receiving a complaint about a professional practicing remotely who does not hold a license in their jurisdiction could possibly fall back on the 'operating without a license' penalty provision that exists in every state (Cason & Brannon, 2011).

Some states have consultation and licensure exemption provisions that enable practitioners to work in another state without a license for a specified period of time. For speech-language pathology and audiology, a professional must hold a license from another state that has equivalent licensure requirements and must provide services in cooperation with a speech-language pathologist or audiologist who is licensed within the state where the temporary practice will occur. There are similar provisions for occupational therapy in some states. Although this exemption exists, it remains untested for use with services provided via a telepractice service delivery model (Cason & Brannon, 2011).

Licensure portability within the U.S. Department of Defense (DOD) and the Veterans Health Administration has been achieved through passage of the Service Members Telemedicine & E-Health Portability (STEP) Act (H.R. 1832; 2011). This legislation enables health care professionals (DOD civilian employees and personal services contractors) to use telemedicine and e-health applications to treat service members where they are located, including in their homes, without being required to obtain additional state licenses (Thompson, 2012).

State Laws

States have differing laws regarding the use of telepractice. ASHA and AOTA have written model practice act language for states to consider when crafting laws and policies related to telepractice. States may use all or parts of the model practice act language (Cason & Brannon, 2011). Currently, among the state boards overseeing speech-language pathologists and audiologists, 14 states and the District of Columbia have some provision, statutes, regulations, or policy regarding the use of telepractice (ASHA, 2012b), though not all are favorable. For example, Delaware significantly limits the use of telepractice within their state for speech-language pathologists and audiologists by expressly disallowing the use of telepractice as the sole means of service delivery, though it can be used to supplement in-person services (Cason & Brannon, 2011).

Professionals should read their state's practice act, board regulations, and any relevant board opinions to determine if there are requirements or restrictions that apply to telepractice. This principle also applies to the client's state of residence when different from that of the professional. When a state does not mention telehealth/telepractice in their practice act, nor has any published opinions or positions on the topic, professionals should contact the state board for further guidance (Cason & Brannon, 2011). Professionals must also be aware that scope of practice laws and regulations vary by state. It is the responsibility of the professional to abide by the laws and regulations for the states in which they render services (Cason & Brannon, 2011).

Privacy and Confidentiality

Professionals rendering services via telepractice must comply with the same regulations (federal, state, and institutional) that apply to services delivered in person, especially those that protect security and privacy of electronic health information. When states have differing requirements for privacy, security, and informed consent, it is prudent for professionals to adhere to the most restrictive laws and regulations (especially when the greatest restrictions occur where the client is located) (Cason & Brannon, 2011).

Watzlaf and colleagues (2010, 2011) underscore the value of employing robust encryption when engaging in telepractice. They further recommend that professionals and their organizations conduct risk analyses for privacy, security, and HIPAA compliance when they employ VoIP to conduct telepractice (Watzlaf et al., 2010, 2011).

Risk Management Strategies

Professionals who deliver rehabilitation services should carry adequate professional liability insurance. Denton (2003) advises that professionals who

engage in telepractice "should not take for granted that their current coverage is adequate" (p. 317) and warns that coverage will be jeopardized if the clinician violates the policy's terms and conditions. For example, three potential scenarios come to mind: (1) a clinician engages in telepractice, but that service delivery method is disallowed; (2) a clinical encounter is narrowly defined as constituting an in-person encounter; or (3) the policy explicitly prohibits treatment solely by correspondence. Denton (2003) furthermore cautions that "because of the geographical reach of telepractice, it is imperative that speech-language pathologists have coverage in every state and jurisdiction where their telepractice takes them" (p. 317).

Site Specific Issues

The conduct of telepractice in different sites (e.g., deployed within homes, educational settings, medical settings, and prisons) can produce site-specific considerations. ASHA offers guidance on the conduct of telepractice in school settings via the work of Juenger (n.d.).

Role of Consumers

Consumers (i.e., patients or clients) can potentially emerge as influential shapers of the future of telepractice—simply by expressing their interest in receiving services via telepractice to prospective rehabilitation professionals and health insurers. Affected consumers might also articulate the negative impact of state licensure restrictions on their ability to receive services during travel, or from a professional located out-of-state.

In addition to recognizing the power of telepractice, consumers will need to acquire the knowledge to become informed consumers of the associated technology. As one example, they will need to become sophisticated evaluators of the privacy policies posted by their Internet carriers and software providers so that they can weigh risks and benefits (Watzlaf et al., 2010).

Summary

Telepractice—the delivery of preventative, habilitation, or rehabilitation services through telecommunications technology—represents a promising service delivery model for persons of all ages with hearing loss. This paper provides an introduction to telepractice technologies and an overview of its current use in speech-language pathology (i.e., telepractice) and audiology (teleaudiology) as well as for EI services to infants and toddlers with developmental delays and/or a disability, as mandated by IDEA Part C (2004).

Telepractice has numerous applications with more to be discerned. This service delivery model can be deployed in numerous types of locales, including

home, work, and educational settings; health care facilities; and even sequestered or remote environments. Telepractice can enable clients/patients to engage in therapy when they travel for work or for leisure. Telepractice will be able to virtually bring parents who are at home or at work into the medical, preschool, or school setting so they can keep abreast of their children's progress. Using smartphone and other wireless technologies, professionals will be able to establish a supportive therapeutic presence as their clients engage in everyday routines and interact with others in authentic community settings. The benefits, limitations, and barriers associated with telepractice are just beginning to emerge. On the professional side, challenges include the need for ethical, privacy, and other policy issues to keep pace with advances in technology; moreover, services provided via telepractice are not uniformly reimbursed. Consumers, too, will need to become fully apprised of the benefits of telepractice as well as the potential costs and risks (e.g., potential breaches of privacy and confidentiality if third party telecommunication vendors are involved in the process). Appendix A offers a list of telepractice-related online resources that will allow professionals to keep abreast of developing practices.

With regard to the use of telepractice for persons with hearing loss, there are three compelling factors that suggest this service delivery model is poised for expansion. First, there is a large population of persons across the life-span who have hearing loss and could benefit from these services. The need appears to be great in rural and other underserved U.S. communities, and internationally in countries classified as low income. Second, proof of concept has been established for a wide range of teleaudiology, telespeech, and EI services. Third, since telepractice and audiology both rely heavily on the use of instrumentation and assistive technologies, persons with hearing loss and their practitioners may already possess knowledge and skills that will generalize to telepractice technologies and facilitate the use of a telepractice service delivery model. However, it cannot be assumed that all such persons will be well suited or favorably predisposed to engage in telepractice. This is an area that warrants further exploration.

Acknowledgments

This paper was supported in part by the RERC on Telerehabilitation at the University of Pittsburgh, funded by NIDRR Department of Education, Washington DC, Grant #H133E090002.

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Appendix A
Telepractice Related Online Resources

Disability

World Report on Disability, World Health Organization:
http://whqlibdoc.who.int/publications/2011/9789240685215_eng.pdf

Licensure Reports
HRSA. (2010). Telehealth Licensure Report. Special report to the Senate Appropriations Committee. http://www.hrsa.gov/healthit/telehealth/licenserpt10.pdf

Office for the Advancement of Telehealth. HRSA. (2003, June). Telemedicine licensure report. http://www.hrsa.gov/ruralhealth/about/telehealth/licenserpt03.pdf

Licensure Boards/Resources

Physical Therapy:
American Physical Therapy Association –
http://www.apta.org/Licensure/StatePracticeActs/

Psychology:
Association of State and Provincial Psychology Boards –
http://www.asppb.org/HandbookPublic/before.aspx

Telemental Health Standards and Guidelines Working Group –
http://www.zurinstitute.com/ethicsoftelehealth.html

Speech-Language Pathology and Audiology:
National Council of State Boards of Examiners for Speech-Language Pathology and Audiology:
Telepractice – http://www.ncsb.info/Default.aspx?pageId=969084
Licensure Board websites – http://www.ncsb.info/resource

Online Journals

International Journal of Telerehabilitation, (open access): http://telerehab.pitt.edu

Journal of Telemedicine and Telecare, an official journal of the American Telemedicine Association (online access by subscription):
http://www.americantelemed.org/i4a/pages/index.cfm?pageID=3747

Telemedicine and e-Health, an official journal of the American Telemedicine Association, (online access by subscription):
http://www.americantelemed.org/i4a/pages/index.cfm?pageIDa=3747

Professional Organizations

Occupational Therapy:
American Occupational Therapy Association – http://www.aota.org (Search term: "Telehealth")

Physical Therapy
American Physical Therapy Association – www.apta.org (Search term: "Telehealth")
Physical Therapy Practice Acts by State –
http://www.apta.org/Licensure/StatePracticeActs/

Speech-Language Pathology and Audiology
American Speech-Language-Hearing Association – www.asha.org/telepractice
Contains a current compendium of policy documents, model licensure language, FAQs on licensure and reimbursement; state licensure telepractice provisions; and articles about telepractice

Research Centers

National Institute of Disability Rehabilitation Research (NIDRR), U.S. Department of Education, Rehabilitation Engineer and Research Center on Telerehabilitation, University of Pittsburgh: http://www.rerctr.pitt.edu/

Telehealth Associations

American Telemedicine Association: http://www.americantelemed.org/
Updated links to other organizations:
http://www.americantelemed.org/i4a/pages/index.cfm?pageID=3309#related

The Volta Review, Volume 112(3), Winter 2012, 227–242

Expanding Use of Telepractice in Speech-Language Pathology and Audiology

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Recent advances in videoconferencing technology have resulted in a substantial increase in the use of live videoconferencing—referred to here as telepractice—to diagnose and treat speech, language, and hearing disorders. There is growing support from professional organizations for use of this service delivery model, as videoconferencing technology can alleviate the effects of distance on access to care. As telepractice becomes a standard mode of conducting diagnostic and treatment services in speech, language, and hearing disorders, it is essential to assure that research supports its application in the field. Search criteria were established to identify publications, primarily in peer-reviewed journals, from 1995 to 2011. These studies generally validate the delivery of diagnostic and therapeutic services through telepractice when compared to traditional services delivered in a face-to-face clinical setting. Most studies examined adults and school-age children. The search was then expanded to identify diagnostic and treatment services for infants, toddlers, and young children. The existing literature compels professionals to conduct more research related specifically to the effectiveness and efficacy of telepractice.

Introduction

The U.S. Department of Health and Human Services (DHHS) supports the use of "electronic information and telecommunications technologies in the

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provision of long-distance clinical health care, patient and professional health-related education, public health, and health administration" (DHHS, 2009). The technologies most commonly employed today include live videoconferencing, the Internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications (DHHS, 2009).

The use of telecommunications in the delivery of medical and rehabilitative treatment to patients is a relatively new phenomenon. New technological advances in videoconferencing equipment, coupled with improved options for connectivity, allow professionals to reach patients in remote and rural settings as well as patients who are physically or geographically unable to attend face-to-face clinical appointments (DHHS, 2009; Mashima & Doarn, 2008). Technology has been used in medical practice to evaluate, treat, and monitor health conditions including heart disease, diabetes, and psychiatric problems (Jami & Danski, 2008) as well as dermatological disorders (Bowns, Collins, Walters, & McDonagh, 2006; Leggett et al., 2004; Loane et al., 2000, 2001; Oztas et al., 2004).

Numerous national and international agencies and professional organizations have endorsed the use of live videoconferencing as an appropriate model of service delivery (American Telemedicine Association, 2010). More recently, professional organizations associated with nonmedical treatments recognize this delivery model, known as telepractice, as an appropriate mode of intervention (American Occupational Therapy Association, 2010; American Speech-Language-Hearing Association [ASHA], 2012).

Telepractice in Speech-Language Pathology and Audiology

ASHA officially adopted the term telepractice to describe the use of a remote service delivery model by speech-language pathologists and audiologists (ASHA, 2012). In its position statement, ASHA (2005a) states, "Telepractice is an appropriate model of service delivery for the profession of speech-language pathology. Telepractice may be used to overcome barriers of access to services caused by distance, unavailability of specialists and/or subspecialists, and impaired mobility. Telepractice offers the potential to extend clinical services to remote, rural, and underserved populations and to culturally and linguistically diverse populations." ASHA (2005b) also published a similar position statement for audiologists.

Two technical reports issued by ASHA (2005c, d) outline current models for connecting entities in two locations through telepractice for speech-language pathologists and audiologists. These connections may vary to include: hospital to hospital, hospital to health care facility, health care facility to client's home, health care facility to student's school, school to client's home, and clinician's office to client's home. ASHA has also specified parameters for standards of practice that are consistent with its prevailing code of ethics (ASHA, 2010).

As speech-language pathologists and audiologists continue to expand services through the telepractice model, it is essential to determine the efficacy of conducting services in this remote format. The purpose of conducting this literature search was to collect, synthesize, and summarize the existing research pertaining to the use of telepractice in the diagnosis and treatment of communication disorders in adults and children.

Methods for Literature Search

A preliminary search was conducted using the following databases: Google Scholar, Medline, PubMed, and EBSCOhost. Search topics included: telepractice/speech-language pathology, telerehabilitation/speech therapy, home/telepractice/speech-language pathology, telepractice/voice, telepractice/stroke, telepractice/fluency, telepractice/language disorders, telepractice/hearing loss, telepractice/audiology, and telepractice/cochlear implants. A second search was conducted to explore, in more detail, articles focusing on services to infants, toddlers, preschoolers, and school-age children. Articles that are currently in preparation were included to report on the most current trends working with infants and toddlers.

Articles meeting the following criteria were included in this summary of the literature: (1) Articles published, or in the process of being published, between 1995 and the present time; (2) Studies comparing diagnostic assessment procedures in face-to-face and remote conditions; or (3) Studies investigating treatment outcomes in these two conditions. Articles were excluded when the remote service delivery platform was not synchronous or did not use live videoconferencing (e.g., telephone consultation, asynchronous consultation). Articles that met inclusion criteria are organized according to the type of the disorder.

Summary of Relevant Studies

The articles from the field of audiology focus on diagnostic procedures, hearing aid fitting, and MAPping of cochlear implants for adults and children. Studies related to speech and language services include diagnostic procedures and treatment. In general, studies with sufficient levels of evidence to yield confident findings were conducted on adult populations and focused on four disorders: neurogenic communication disorders, voice disorders, dysphagia, and fluency. While these articles focus mostly on adults, they make a compelling argument for the success of telepractice as an alternative to traditional face-to-face therapy. The findings on adults are used to make some generalizations to children, as this is the population of interest in this monograph.

Remote audiological service is also endorsed by the American Academy of Audiology (2008). Remote technology can be used to conduct screening tests, diagnostic procedures, and treatment (e.g., hearing aid fitting or cochlear implant MAPping). Most studies, to date, have been conducted on adults.

Audiological Screening and Diagnostic Procedures

Nine research studies examined the feasibility and efficacy of conducting hearing screenings or diagnostic assessments using telepractice. The studies were conducted on adult and some pediatric populations (Choi, Lee, Park, Oh, & Park, 2007; Givens & Elongovan, 2003; Givens et al., 2003; Krumm, Huffman, Dick, & Klich, 2008; Krumm, Ribera, & Klich, 2007; Lancaster, Krumm, Ribera, & Klich, 2008; Ribera, 2005; Swanepoel, Kockemoer, & Clark, 2010; Towers, Pisa, Froelich, & Krumm, 2005).

Two studies reported on hearing screening procedures. Krumm and colleagues (2007) compared the use of Automated Auditory Brainstem Response (AABR) and Distortion Product Otoacoustic Emissions (DPOAE); these procedures are used to screen young children for hearing loss. Thirty infants participated in the study. Results demonstrated exact agreement for these two procedures in both settings. A study by Lancaster and colleagues (2008) conducted hearing screenings using otoscopy and pure tone audiometry, finding no significant difference when testing was conducted in face-to-face and telepractice conditions.

Seven studies compared the use of audiological diagnostic procedures in face-to-face and telepractice conditions; four studies used a pure tone testing procedure (Choi et al., 2007; Givens & Elangovan, 2003; Givens et al., 2003; Swanepoel et al., 2010), one study used Auditory Brainstem Response (ABR) (Towers et al., 2005), one study used Otoacoustic Emissions (OAE) (Krumm et al., 2007), and one study used the Hearing in Noise Test (HINT) (Ribera, 2005).

The four studies using pure tone testing procedures conducted standard air conduction and bone conduction tests on adult patients (Choi et al., 2007; Givens & Elangovan, 2003; Givens et al., 2003; Swanepoel et al., 2010). There were 30–45 participants in each study, and no significant differences were identified based on the testing condition in three studies (Givens & Elangovan, 2003; Givens et al., 2003; Swanepoel et al., 2010). The study by Choi and colleagues (2007) reported that results conducted through telepractice showed an error of greater than 5 dB sound pressure level (SPL) in approximately 11% of the participants.

Towers and colleagues (2005) examined the reliability of ABR testing. This study was performed on individuals with hearing thresholds within typical limits. The results showed no significant difference between testing conditions. Krumm and colleagues (2007) also tested adults with typical hearing

thresholds using OAEs. Results of this study also showed no significant differences between the two testing conditions.

Twenty adults were tested using the HINT to validate test administration through telepractice (Ribera, 2005). Judges in local and remote locations rated patient responses to the stimuli. Results showed high interjudge and intrasubject reliability.

Audiological Treatment

For the purposes of this review, audiological treatment refers to hearing aid fitting and cochlear implant MAPping. Three studies investigated audiological treatment protocols (Ferrari & Bernardez-Braga, 2009; Hughes et al., in press; Ramos et al., 2009). The study conducted by Ferrari and Bernardez-Braga (2009) verified hearing aid fittings in the two testing conditions using probe microphone measurements on 60 adult hearing aid users. Results for all test parameters showed clinically-acceptable variability, and the results were comparable in the two testing conditions.

Ramos and colleagues (2009) examined the efficacy of MAPping cochlear implants remotely. Five adult cochlear implant recipients received 12 MAPping sessions in each treatment condition. Results comparing face-to-face and remote testing conditions showed no significant difference on any test procedure. Most recently, Hughes et al. (in press) examined the reliability of various cochlear implant measures performed using telepractice across a relatively large number of recipients (n=29) with at least one year of experience with their cochlear implants. The results from this study showed no significant differences for electrode-specific measures conducted remotely versus face-to-face for all but one measure. In general, the results were consistent with those from the study conducted by Ramos and colleagues (2009).

Neurogenic Communication Disorders

Aphasia

A study by Brennan, Georgeadis, Baron, and Barker (2004) assessed 40 patients with brain injuries. Results of the study indicated that there was no significant difference in outcomes when participants were tested in face-to-face and remote treatment conditions. There was high agreement (93%) between the two conditions across all subject variables (e.g., age, gender, and experience with technology). The authors reported that while the potential to assess clients with brain injuries using telepractice is promising, more research is necessary to corroborate their results.

Palsbo (2007) assessed 24 clients with aphasia in face-to-face or telepractice conditions. There was 92% to 100% inter-rater agreement using the Functional Communication Measure (FCM) derived from the National Outcomes

Measurement System (NOMS) (ASHA, 2003). Results indicated that clients' functional communication could be assessed reliably using telepractice.

A study by Hill, Theodoros, Russell, Ward, and Wootton (2009) examined the severity of aphasia (e.g., mild, moderate, severe) on a client's ability to participate in a language assessment. Thirty-two patients were grouped according to the severity of their disability. Patients were randomly assigned to the face-to-face and telepractice conditions. Two speech-language pathologists were randomly assigned to one of the two assessment conditions. Results of the investigation indicated inter-rater agreement to be, in most cases, above 90%. One exception was for clients with severe aphasia; this indicated that the severity of the condition may affect a patient's ability to obtain accurate assessments through telepractice.

Apraxia

Hill, Theodoros, Russell, and Ward (2009a) studied the validity and reliability of assessing apraxia of speech using telepractice (n=11). Assessments administered face-to-face and through telepractice were scored simultaneously by two therapists; one worked remotely and the other worked in the face-to-face condition. Results of this study indicated no significant differences between subtest scores for the two environments. The speech-language pathologists reported that assessment was more difficult with patients with severe apraxia of speech. While considering the small sample size, the authors suggested that reliable and valid assessment of apraxia was feasible using telepractice.

Dysarthria

Hill, Theodoros, Russell, and Ward (2009b) administered assessments to 24 patients with dysarthria. Results of this study indicated clinically-acceptable inter-rater agreement of 80% to 100% between evaluators working in the face-to-face and telepractice conditions with high intra- and inter-rater reliability for test items. The authors suggested that assessment of dysarthria using telepractice was feasible and cautioned that more research is warranted.

One case study investigated the treatment of a patient who had a stroke and received speech-language therapy using telepractice (Clark, Dawson, Scheideman-Miller, & Post, 2002). The patient received 62 sessions with outcomes evaluated by comparing pre- and post-treatment scores on a standardized measure. The client demonstrated improvement in all skills following treatment.

Voice Disorders

A proof-of-concept study compared the outcomes of 51 individuals receiving voice treatment in the two conditions (Mashima et al., 2003). Clients

were randomly assigned to either face-to-face or telepractice conditions. Patients were rated using instrumental acoustic analyses and perceptual judgments of the clinicians. Results indicated that there were no significant differences in voice quality based on either analysis.

Three studies investigated the feasibility and validity of providing voice treatment using telepractice with patients diagnosed with Parkinson's Disease (PD) (Constantinescu et al., 2011; Howell, Tripoliti, & Pring, 2009; Theodoros et al., 2006). In the earliest study (Theodoros et al., 2006), 10 patients with PD received 16 sessions through telepractice. The data for these patients showed statistically-significant improvements in vowel prolongation, reading, conversational monologue, and pitch range. The results of this study were corroborated by Howell and colleagues (2009). Their study focused on the treatment of three individuals with PD. Each client received three telepractice sessions and one face-to-face session. Patients demonstrated significant progress over time for sustained phonation, reading, and conversational speech in both conditions. A recent study (Constantinescu et al., 2011) conducted a randomized controlled trial of 34 patients with PD. The data for pre- and post-treatment measures showed significant progress with no significant difference between outcomes for participants assigned to face-to-face and telepractice conditions.

Dysphagia

Three studies examined the feasibility of conducting assessments of swallowing function through telepractice. A study by Perlman and Witthawaskul (2003) used an Internet system that allowed for a remote, real-time, interactive assessment between hospital-based equipment and a remote site. Results showed that the synchronous video display was adequate for the specialist at the remote site to direct the procedure being used for treatment.

A study conducted by Ward and colleagues (2009) compared the assessment of 11 patients post-laryngectomy in face-to-face and telepractice conditions. All treatment parameters were evaluated in both settings. Results indicated clinically-acceptable agreement for most measures. One identified challenge was the quality of the remote audio and video signals, although the authors reported that these factors did not interfere with the assessment process.

A recent pilot study conducted by Ward, Sharma, Burns, Theodoros, and Russell (2011) examined the validity of conducting assessments with 40 clients diagnosed with dysphagia using telepractice. The results indicated acceptable clinical agreement in both face-to-face and remote conditions. While the authors supported the validity of conducting assessments through telepractice, they cautioned that complex diagnostic conditions should be evaluated in a traditional face-to-face setting.

Fluency Disorders

Two studies used telepractice to conduct stuttering treatment. One feasibility study included 6 children and adolescents and compared pre- and post-test measures (Sicotte, Lehoux, Fortier-Blanc, & Leblanc, 2003). There was an overall decrease in stuttering behaviors following treatment.

Early Childhood and School-Age Children

The search criteria for articles using telepractice with young children, birth to 3 years of age, were expanded to accumulate evidence of the nascent efforts in this field. Early applications of videoconferencing technology in Australia served as a partial proof of concept for telepractice (McCarthy, Duncan, & Leigh, 2012, in this issue). Some of the articles related to children do not meet the original inclusion criteria; they are not comparative studies of one procedure delivered systematically in two conditions. Because this pediatric population is of prime interest, the criteria for articles in this section were knowingly adapted for inclusion. This section reviews studies on early intervention with infants and toddlers, diagnostic speech-language procedures, and treatment delivered by speech-language pathologists.

Early Intervention for Infants and Toddlers with Disabilities

Early intervention services to young children with disabilities and their families are governed by Part C of the Individuals with Disabilities Education Act (IDEA; 2004). These services are family-centered; a family-centered approach includes families in collaborative decision-making, goal setting, and treatment of their children's disabilities (Hanft, 1988). The law, and associated federal rules and regulations, state that early intervention services are to be provided in natural environments to the maximum extent appropriate. A natural environment is defined as a setting that is natural or typical for an infant or toddler without a disability, such as a home and a variety of community settings. A few studies focusing on early intervention for infants and toddlers are just now being published (Cason, 2009; Heimerl & Rasch, 2009; Kelso, Fiechtl, Olsen, & Rule, 2009). There is also growing evidence that personnel shortages are limiting access to early intervention services for some families (Forducey, 2006).

Service delivery models for children, especially infants and toddlers enrolled in early intervention, differ from those used with the range of adult populations. Early intervention services are both developmentally-focused and rehabilitative in nature depending on the specific learning and communication needs of the child. For children with hearing loss, intervention typically targets foundational listening, speech, and language skills, which, in turn, enable the child to reach appropriate developmental milestones. For

telepractice models with this population to be effective, parent coaching becomes a key component of the service delivery. That is, the practitioner is interacting with, coaching, and guiding the parent in activities that reinforce the child's developmental, communicative, or learning needs. (For a more complete description of this service delivery model, see Houston & Stredler-Brown, 2012, in this issue.)

Virtual Home Visits

Kelso and colleagues (2009) and Olsen, Fiechtl, and Rule (2012, in this issue) developed and investigated the delivery of early intervention services during a 2-year project. The Virtual Home Visit Project (VHV Project) evaluated the feasibility of using videoconferencing to conduct home visits, thereby connecting early interventionists with families of children under the age of 3 years. The providers working in the VHV Project represented a variety of disciplines, including physical therapy, occupational therapy, speech-language pathology, child development, and special education. Early interventionists interacted with parents and caregivers and taught them strategies to address the goals in each child's Individual Family Service Plan (IFSP). The results of the VHV Project indicated that remote visits can accomplish the mission of early intervention—to support learning within the child's natural environment, to use daily activities and routines, and to address the intervention to those living with the child with disabilities. It was necessary to provide training and technical support to the families and to the providers. Early intervention staff identified VHVs as an acceptable alternative service delivery model.

Pediatric Speech and Language Services

Several studies supported telepractice delivered by speech-language pathologists to children in the United States (Forducey, 2006; Madsen & Rollings, 2005; McCullough, 2001) and in other countries (Glykas & Chytas, 2004; Rose et al., 2000). Forducey (2006) studied school-age children in Oklahoma with speech and hearing disorders. McCullough (2001) provided services to five preschool-age children and Madsen and Rollings (2005) provided articulation and language therapy to children in North Dakota. Efforts in Greece and the United Kingdom were provided to nursery school and school-age children (Glykas & Chytas, 2004; Rose et al., 2000). All of these published reports support the feasibility of telepractice.

Diagnosis of Speech and Language Disorders

The feasibility and validity of conducting diagnostic evaluations of speech and language disorders using telepractice were examined in three studies. Waite, Cahill, Theodoros, Russell, and Busuttin (2006) evaluated 6 children

with speech disorders. Clinicians in both face-to-face and remote locations scored the same test protocols. The results showed high agreement (91%–100%) between clinicians' scores on different speech tests. In addition, the authors achieved high inter- and intra-rater agreement for all measurements that were scored online. This same group of researchers (Waite, Theodoros, Russell, & Cahill, 2010a) compared administration of a language test, the Clinical Evaluation of Language Fundamentals, 4th Edition (CELF-4; Semel, Wiig, & Secord, 2003), with 24 children in two testing conditions. There was no significant difference between the raw scores on individual subtests when scored in the two conditions. Again, inter- and intra-rater agreement was high for scores analyzed remotely. A subsequent study by the same authors (Waite, Theodoros, Russell, & Cahill, 2010b) used a similar study design to administer three standardized literacy measures. Twenty children were tested in face-to-face and remote conditions with no significant difference in outcomes.

Treatment of Speech and Language Disorders

Children with speech and language disorders living in rural and remote areas seem to be at a disadvantage when trying to access services from a speech-language pathologist (Mashima & Doarn, 2008). Challenges include distance, inclement weather, hard-to-access communities, and shortages of trained pediatric providers (Olsen et al., 2012). Two studies, one in the United States (Grogan-Johnson, Alvares, Rowan, & Creaghead, 2010) and one in Australia (Waite et al., 2006), reported on comparative studies between face-to-face therapy and telepractice for school-age children.

Articulation

Two studies examined the treatment of articulation disorders in preschool and school-age children. Waite and colleagues (2006) treated children with speech articulation disorders in Australia. A comparison of treatment outcomes found a high level of agreement between these two treatment conditions. Another study, conducted in the United States, corroborated these results. Grogan-Johnson and colleagues (2010) evaluated the performance of two groups of children with articulation disorders before and after treatment. Students from both groups, those treated in a traditional face-to-face condition and those treated through telepractice, made significant progress. The authors concluded that telepractice was a viable approach to deliver services to children with articulation disorders in a public school setting.

Early Intervention Services

Three studies used telepractice to deliver early intervention to infants and toddlers with disabilities (Cason, 2009; Heimerl & Rasch, 2009; Kelso et al.,

2009). Cason (2009) reported on children receiving occupational therapy. Heimerl and Rasch (2009) and Kelso and colleagues (2009) employed occupational therapists, physical therapists, speech-language pathologists, and psychologists. Each study engaged a small sample of children living in rural areas. All of the results supported efficacy of services delivered through telepractice. While Heimerl & Rasch (2009) reported this service as a viable alternative to face-to-face encounters, they did not suggest it as a replacement to traditional therapy. The other studies were more liberal in their support of services delivered remotely. They reported high satisfaction from providers and parents, and considered telepractice to be a useful method for delivering services either instead of, or in addition to, face-to-face treatment (Kelso et al., 2009). Cason (2009) emphasized the need for larger research projects that access services from multiple rehabilitation disciplines.

Conclusion

The purpose of this review was to summarize the existing literature pertaining to the application of telepractice in the fields of speech-language pathology and audiology. Targeted studies that utilized live synchronous videoconferencing in the diagnosis and treatment of communication delays and disorders were reviewed. In order to incorporate a focus on infants, toddlers, and young children, the search criteria were expanded to include articles related to the feasibility and satisfaction of telepractice; these studies may not have included controlled trials or comparative outcomes. The common theme was to present evidence to advance telepractice as a potential service delivery platform.

All of the studies represented telepractice as an effective way to diagnose and treat adults and children. All studies were based on the extant need to provide equitable services to clients irrespective of the location in which they live. In general, the outcomes reflect high agreement between telepractice and services delivered in a traditional, face-to-face setting. Some studies noted limitations based on the characteristics of the technology (e.g., quality of the audio and/or video signals) and limitations based on the severity of the clients' disorders.

Almost every study reinforced a common theme—there is a substantial need for further research measuring outcomes of treatment delivered through telepractice. This "call to action" will take the rehabilitation professional well into the next decade. One clear limitation of the studies on children is the absence of randomly-controlled trials with appropriately large sample sizes investigating client outcomes. Moving forward, it will be vital for researchers to address this issue.

Telepractice has been successful in the medical field. Furthermore, there are reports of the effectiveness of telepractice for adult clients receiving diagnostic measures and treatment for speech, language, and hearing disorders. This

beckons one to investigate the applicability of telepractice to the pediatric population, especially children with hearing loss who are listening and using spoken language. Parent coaching models delivered through telepractice should also be studied in an effort to ensure that children with hearing loss are, in fact, obtaining speech, language, and listening outcomes comparable to their peers with typical hearing. Services to children with hearing loss have been revolutionized, in part, because of the success of newborn hearing screening. Now is the time to assure these early-identified children have access to well-qualified professionals, irrespective of where their families may live. Telepractice service delivery models may provide families with access to programs or skilled professionals who are not available in their communities and ensure that more children with hearing loss receive the intervention they require in a more timely and efficient manner.

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The Volta Review, Volume 112(3), Fall 2012, 243–253

From Colorado to Guam: Infant Diagnostic Audiological Evaluations by Telepractice

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This manuscript describes a pilot project in which infants in Guam who refer on newborn hearing screening receive diagnostic audiological evaluation conducted by audiologists in Colorado over the Internet (telepractice). The evaluation is completed in real time using commercially-available software and personal computers to control the diagnostic audiological equipment remotely, and videoconferencing with support personnel and the family. Test results for 9 infants, all of whom received complete diagnostic assessment by auditory-evoked potentials and otoacoustic emissions, are described. Further elaboration is provided on steps to establishing the project and how regulatory, privacy and confidentiality, and professional practice issues in telepractice are addressed.

Introduction

Early hearing detection and intervention (EHDI) programs are systems of services that diagnose infants who are deaf and hard of hearing by 3 months of age and enroll identified infants in early intervention by 6 months of age (Centers for Disease Control [CDC], 2012; Healthy People 2020, 2012; Joint Committee on Infant Hearing [JCIH], 2007). Component steps include newborn hearing screening (NHS), diagnostic audiological evaluation (DAE), medical/otologic assessment, and early intervention. NHS is well-

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established in the United States and its territories. Summary of 2009 CDC EHDI data (CDC, 2009) demonstrated that of 47 states and 3 territories responding, more than 97% of infants born in those states and territories were screened for hearing loss at birth. However, more than 45% of infants in this data set who referred for further testing are categorized as either lost to follow-up (LTF) or lost to documentation of follow-up. In total, more than 25,000 infants who referred on NHS either did not have diagnostic audiological evaluations or diagnostic results were not reported to the jurisdictional EHDI program.

LTF substantially hinders public health and public education efforts to improve language and academic outcomes for children who are deaf and hard of hearing. Delayed confirmation of hearing loss in infants who are deaf and hard of hearing increases their risk for delayed speech and language development (Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998). For some families, especially those in remote or rural areas, LTF occurs when infant DAE services are unavailable in close proximity. In these cases, travel costs, geographic or weather-related travel barriers, loss of work time, and/or other family commitments may prevent infants from receiving timely services (Shulman et al., 2010).

LTF became increasingly problematic for the Guam EHDI program between 2009 and 2011. Guam, a U.S. island territory in the western Pacific, has a robust NHS program for infants born in the island hospital or birthing center (infants born on the U.S. naval base are not reported in Guam EHDI program statistics). During the period of 2009–2011, 99% of infants born in these facilities received NHS. In addition, Guam EHDI introduced a two-stage NHS program where infants who referred on inpatient otoacoustic emission (OAE) screening received outpatient automated auditory brainstem response (ABR) screening after discharge. The two-stage screening process reduced the percentage of infants who referred for DAE from almost 15% (442/2953 infants) to less than 5% (125/2732 infants) in 2011. During this same period, however, LTF for infant DAE increased from 7% in 2009 to almost 35% in 2011.

Lack of an audiologist on-island to provide extensive infant DAE services was the principle reason for the increase in LTF. This compromised infant enrollment in early intervention services. Without a diagnosis from a licensed professional, infants could not be confirmed as eligible for Individuals with Disabilities Education Act (IDEA) Part C services and could not be enrolled in an early intervention program. Part C provides financial assistance to states and U.S. territories to develop and implement a comprehensive system that provides early intervention services, including speech-language pathology and audiology services, for infants and toddlers with disabilities and their families (IDEA, 2004).

Many of the options available to address the lack of on-island infant DAE services were either not feasible or cost prohibitive. These included: recruit an audiologist with infant DAE experience to Guam, train an on-island audiologist in this specialty, fly the infant and family off-island for testing, or

fly an audiologist to Guam for periodic testing services. Conducting infant DAE over the Internet in real time offered a potential solution to this dilemma.

To test this model, Children's Hospital Colorado (Children's Colorado) and the University of Guam–CEDDERS (Guam EHDI host institution) entered into an agreement for a pilot project to develop Internet-based infant DAE services (telepractice). Under the proposed pilot project, infants who referred on NHS would be offered a DAE on-island within 2–3 months of birth. The evaluation would be conducted by an experienced Children's Colorado audiologist who would operate the Guam diagnostic equipment remotely over the Internet and provide counseling and feedback to the family and primary health care provider following testing. Infants with confirmed hearing loss would be referred to the appropriate on-island provider for medical/otologic follow-up, hearing (re)habilitation services (including fitting of hearing aids), and early intervention. Children's Colorado services are funded by a grant and provided free-of-charge to both the Guam EHDI program and the infant's family.

Infant DAE consists of a battery of test procedures typically conducted while the baby is in natural sleep. Specific components of the test battery include: (1) otoscopy; (2) acoustic immittance measures, including tympanometry and middle ear muscle reflexes; (3) frequency-specific auditory evoked potential measures, typically ABR and/or auditory steady-state response (ASSR); and (4) OAEs. Previous research has demonstrated the feasibility and reliability of conducting many of these measures remotely online, including remote testing of infants and children. In a study of auditory evoked potentials, Towers, Pisa, Froehlich, and Krumm (2005) demonstrated the reliability of click-evoked and frequency-specific ABR using remote technology. In their study, ABRs were obtained from subjects by both a local examiner and an examiner hundreds of miles away using remote Internet technology. Statistical analysis revealed that results obtained by the remote examiner were equivalent to results obtained by the local examiner. Krumm, Huffman, Dick, and Klich (2008) collected automated-ABR and distortion product OAE data using remote technology on 30 infants who referred on NHS. They reported that essentially equivalent results were obtained by remote technology when compared to those obtained at the local site. These studies demonstrate that auditory-evoked potentials and OAEs for evaluating infants or children may be conducted via telecommunications and achieve results equivalent to conventional onsite testing.

Method: Steps to Infant DAE Via the Internet

Conducting infant DAE over the Internet requires significant collaboration, coordination, and onsite planning. The following actions were taken to establish the Children's Colorado–Guam EHDI telepractice pilot project:

1. Memorandum of Understanding (MOU): A simple document describing the responsibilities of each party was drafted, reviewed, and

approved by the legal departments at each institution. Responsibilities for personnel, equipment and supplies, and space were clarified in this document. No financial terms were included in the MOU because each site was responsible for its own expenses.

2. Licensure: To comply with local requirements for professional licensing, two Children's Colorado audiologists obtained an audiologist license to practice in Guam.
3. Personnel: Guam-EHDI collaborated with the Guam Department of Education to obtain the assistance of department audiometrists for telepractice. As audiometrists, these para-professionals were skilled in otoscopy, tympanometry, and hearing screening using behavioral techniques. For the project, they were trained by the Colorado Guam-licensed audiologists to prepare the infant for testing, including otoscopy, tympanometry, electrode application and coupling, probe placement, earphone (insert or circumaural) and bone conductor placement, electrode removal, infection control, infant calming, and family support.
4. Hardware: Guam-EHDI hardware requirements included: (a) an otoscope; (b) PC-based equipment to conduct infant DAE, specifically a Bio-Logic® Navigator® PRO (NavPRO) system for ABR, ASSR, and OAEs; (c) GSI TympStar and Interacoustics Titan to test for tympanometry and middle ear muscle reflexes; and (d) a laptop computer for videoconferencing. Children's Colorado hardware requirements included (a) desktop or laptop computer for remote control of Guam-EHDI NavPRO and (b) laptop computer for videoconferencing.
5. Software: Software requirements for the pilot project included remote control software for Children's Colorado audiologists to "take control" of Guam-EHDI diagnostic equipment (NavPRO) and videoconferencing software. All software met contemporary standards for privacy, security, and confidentiality of infant-protected health information. The Children's Colorado information technology (IT) department approved Netop® Remote Control as meeting requirements for encryption and security of data transmission. Children's Colorado purchased a license for Netop® Remote Control "Guest" to be installed on the audiologists' desktop PCs. Guam-EHDI purchased a license for Netop® Remote Control "Host" to be installed on the NavPRO. The University of Guam (host site for Guam-EHDI) had previously purchased Nefsis® for secure videoconferencing. This software uses end-to-end SSL encryption and password protection to ensure security of all transmitted audio and video. Guam-EHDI ("Host") runs the Nefsis® application on their videoconferencing laptop, and Children's Colorado ("Guest") joins the conference using a web browser to link to the URL provided by the host. To further ensure privacy of infant and family information, the Guam-EHDI number, issued and stored only in Guam, is used as the

identifier for data streamed over the Internet. The infant's name was not shown on the desktop during testing.

6. Site visit: One of the most important steps prior to launching the Internet-based infant DAE was a week-long site visit to Guam by Children's Colorado project leaders. The purpose of the visit was to: (a) meet in-person with Guam-EHDI leadership, referring providers, early intervention specialists, and other parties interested in the project; (b) evaluate the proposed site of infant testing as suitable from acoustic, environmental, and privacy viewpoints; (c) set-up and test diagnostic equipment; (d) meet and provide initial training to Guam-based technicians who would assist with testing; and (e) develop joint procedures for scheduling and testing infants, reporting test results, tracking project outcomes, and discussing options for sustaining the project following the pilot phase.
7. Test/retest hardware and software: Following the site visit, remote control and videoconferencing software were tested multiple times to identify potential problems and troubleshoot solutions. Initially, Children's Colorado proposed using the videoconferencing feature of Netop® Remote Control to run both remote control and videoconferencing (audio and video) applications on the same computers. However, simultaneous operation of these two applications slowed transmission of the data stream to an unacceptable rate, possibly related to bandwidth requirements of the videoconferencing application. The issue was resolved by setting up separate computers (laptops) at each location for videoconferencing utilizing the Nefsis® software available at the University of Guam.
8. First test: To ensure a successful test, a Guam-licensed audiologist from Children's Colorado returned to Guam for 1 week before the first baby was scheduled. During this week, the audiologist refreshed technician training on otoscopy, tympanometry, electrode application, probe placement, infection control, infant calming techniques, family support, and other activities relevant to their role as onsite support for infant DAE services. The audiologist was present for the first infant test to take control of testing should a technical issue prevent telepractice. The first test was successfully accomplished by telepractice with the second Guam-licensed audiologist located in Colorado instructing the assistant by videoconferencing and controlling the Guam NavPRO remotely.

Results

Through August 10, 2012, 9 infants have received infant DAE via telepractice. Testing of 2 additional infants was attempted; however, these babies were not sufficiently quiet to complete the test battery. One of these 2

infants received evaluation by a Children's Colorado Guam-licensed audiologist while she was on-island for a second site visit. The other infant has been referred off-island for additional medical testing and follow-up DAE. Finally, 1 infant was scheduled but did not attend the test session.

Of the 9 infants who completed DAE, all were between the ages of 2 to 3 months. They each received a test battery consisting of tympanometry, click ABR, frequency-specific ASSR, and distortion product OAEs. Results were obtained on each ear of every baby by air-conduction and, if needed, bone conduction. Masking was employed when appropriate to obtain ear-specific measures. All infants received complete ASSR evaluation at four frequencies (500, 1000, 2000, and 4000 Hz) in both ears, allowing the audiologist to estimate their pure-tone audiograms.

Results in 3 infants were consistent with typical hearing sensitivity in both ears; these infants were discharged from follow-up. Two infants were identified with a mild hearing loss and middle ear dysfunction by tympanometry. These infants were referred to the primary care provider for follow-up. Four infants were identified with permanent, unilateral hearing loss and were referred for medical/otologic follow-up and Guam early intervention services. Two of these infants had a unilateral conductive hearing loss secondary to ear canal atresia, 1 infant had a unilateral sensorineural hearing loss, and 1 infant was identified with unilateral auditory neuropathy.

Professional Considerations

The American Speech-Language-Hearing Association (ASHA; 2005, 2010) has identified several professional issues associated with delivery of audiology or speech-language pathology services via remote technology. This project was developed to address these professional issues, including personnel, equipment, liability and malpractice, privacy and confidentiality, clinical standards, candidacy criteria, client and clinician satisfaction, and reimbursement.

Personnel

Professional audiological services must be provided by a licensed audiologist who is competent to perform the specific services by virtue of their education, training, and experience. Licensed audiologists may be supported in service delivery by appropriately trained assistants who are under the audiologist's direction and supervision (American Academy of Audiology, 2010). In this model, Colorado-based, Guam-licensed audiologists with extensive experience in infant DAE conduct the remote testing. These audiologists are assisted in service delivery by onsite Guam audiometrists, who were trained by the licensed audiologist for infant otoscopy, tympanometry, electrode application and coupling, probe and earphone placement, infection control, and other services needed to assist the infant and family. The

audiometrists are present throughout testing and under direct supervision of a Guam-licensed audiologist for all services provided.

Equipment

Image and sound quality of the transmission for telepractice should be of sufficient quality for the clinical application. This project addressed image, sound quality, and data transmission rate by using two separate computers at each site. One computer at each site is dedicated to videoconferencing. The second computer in Guam is the PC-based diagnostic audiological equipment, which is controlled by the second computer in Colorado, a desktop PC. By separating the functions of videoconferencing and diagnostic data collection and transmission, project leaders achieved appropriate image and sound quality and rapid data transmission rate.

Liability and Malpractice

Families should receive the same standard of practice in services delivered via telepractice as in-person service delivery. In this project, families are fully informed about services that their infant will receive via telepractice and sign informed consent forms prior to receiving services. In addition, the Children's Colorado audiologists' job description includes specific language stating that their duties include delivery of services via the Internet. This ensures that the audiologists are covered by the hospital's malpractice insurance in the delivery of services.

Privacy and Confidentiality

Federal regulations (e.g., the Health Insurance Portability and Accountability Act [HIPAA], 1996) require that providers maintain privacy and confidentiality of patient health information. The unique attributes of telepractice, such as electronic transmission of patient data and images over the Internet and the remote distance between professional and patient, must be addressed in a manner to protect patient privacy and ensure security. To meet this standard, project leaders use only software solutions considered secure by industry experts and limit patient identifying information to the baby's Guam EHDI number. This number is recorded only in Guam and is not associated with the infant's name or other identifying information on any record at Children's Colorado.

Clinical Standards

Telepractice must meet all standards required for in-person services. In this project, the diagnostic protocol for infant DAEs delivered by telepractice to

infants in Guam is the same as that used at Children's Colorado for in-person services and complies with JCIH (2007) recommendations for infant DAE. The Colorado-based audiologists identify degree, frequency-specific configuration, and nature of hearing loss for each ear using appropriate test signals, techniques, and signal delivery (e.g., air conduction, bone conduction) methods. Families receive counseling on test results and a written report with recommendations for follow-up services.

Candidacy Criteria

Only candidates appropriate for remote services should be offered this option. In this project, candidates for infant DAE by telepractice are infants who refer on the Guam EHDI NHS and who can be reasonably tested in natural sleep (e.g., age 6 months and younger).

Client Satisfaction

To assess family satisfaction with telepractice service, Guam EHDI is conducting follow-up surveys with families. Six surveys have been returned to date. Families report being "satisfied" or "highly satisfied" with the service. However, families could not identify the professional who provided the diagnostic hearing tests as an audiologist. To improve family understanding of infant DAEs and reduce potential anxiety about testing, project leaders are developing a brief, 5-minute video about the procedure. The video introduces the Colorado-based audiologist(s), shows how videoconferencing is used to connect family with audiologist, and demonstrates testing with a 3 month old "volunteer" baby.

Clinician Satisfaction

Clinician and administrative support for telepractice is important for success of these services. Children's Colorado audiologists have enthusiastically embraced telepractice as an opportunity to provide services to infants and families in underserved areas. They intend to expand to other aspects of telepractice in the future, including cochlear implant MAPping, hearing aid programming, family consultation, and early intervention services. Children's Colorado administration, through their Telemedicine Advisory Committee, is unreservedly supportive of these efforts.

Reimbursement

Through a generous grant to Children's Colorado, services are provided free-of-charge to families and Guam EHDI. This pilot project is scheduled for completion in 18–24 months from its inception in July 2011. Opportunities for

sustaining the service beyond the project period are being discussed with Guam EHDI, recognizing that reimbursement for professional services will be required for ongoing infant DAE services via telepractice.

Limitations

Technological and logistical problems can thwart best-laid plans for telepractice. To date, Children's Colorado has experienced technical problems with Internet connectivity during only one test session. During that session, connectivity between Guam and Colorado was lost three times, each time for 2 minutes or less. Children's Colorado re-established connectivity of both remote control and videoconferencing very promptly and did not suffer any data loss that degraded test results. During another session, videoconferencing audio quality degraded and Children's Colorado was unable to counsel the family using this technology. In this case, video was streamed between sites but landline and cell phones were used for voice communication. Because this project connects two major institutions, a hospital and a university, project leaders benefit from well-established IT support. Before launching a telepractice program, testing/re-testing Internet connectivity during periods of peak Internet traffic and establishing backup communication options are essential for success.

Logistical problems include scheduling challenges given the time zone difference (16 hours), infants who do not sleep for testing, and families who do not come to the scheduled appointment. The time zone issue required program leaders to schedule infant testing at 8:00 or 9:00 a.m. Guam time, which was 4:00 or 5:00 p.m. (the previous day) Colorado time. (For example, 8:00 a.m. Thursday in Guam is concurrently 4:00 p.m. Wednesday in Colorado.) Early morning hours are typically not optimum for infant sleeping; fortunately, the infants successfully tested slept for the duration of the test session. The families had been instructed to keep their babies awake and withhold feeding until they arrived at the test location to facilitate sleep after feeding. To date, only 1 family has failed to attend the scheduled test session. Project leaders anticipate that because infant DAE services are now readily available after an infant refers on NHS, families will be motivated to keep the appointment.

Conclusion

Telepractice for infant audiological services must be delivered within the context of a complete EHDI system to ensure seamless integration of NHS, DAE, and early intervention. To stimulate effective collaboration, project leaders scheduled site visit(s), which proved to be one of the most important project components. These visits allowed Children's Colorado audiologists to understand and make suggestions about the environment where testing would

occur, train the audiometrists who would support the family and facilitate testing, meet the staff associated with the Guam-EHDI program and referring providers, and interact with early intervention providers and the dispensing audiologist who would provide follow-up care to identified infants.

Over the next 12–18 months, project leaders anticipate testing 20 to 30 additional babies. These additional test sessions will help identify any potential problems that have not yet emerged, obtain feedback from families and referring providers, and evaluate impact of the project on the Guam EHDI program's LTF statistics. To continue this service beyond the pilot phase, Children's Colorado will assist Guam EHDI in developing a request for funding for telepractice infant DAE services. Appropriate reimbursement for services will be addressed at that time.

This project demonstrates that telepractice for infant DAEs can be successfully accomplished using hardware and software applications readily available on the commercial market. Ultimately, it is the authors' experience that family acceptance of telepractice for infant DAEs will determine its role in EHDI programs in rural or remote communities.

Acknowledgement

This project was supported in part by a grant from Daniels Fund to Children's Hospital Colorado to establish the Bill Daniels Center for Children's Hearing. Significant support for this project is provided by Ericka Schicke in Colorado, and Sean Lizama, Bobbie Maguadog, J. J. Mendiola, Ron Nochefranca, Laurie Soto, Vickie Ritter, and David Zeiber in Guam.

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The Volta Review, Volume 112(3), Winter 2012, 255–265

Evaluating the Feasibility of Using Remote Technology for Cochlear Implants

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The use of remote technology to provide cochlear implant services has gained popularity in recent years. This article contains a review of research evaluating the feasibility of remote service delivery for recipients of cochlear implants. To date, published studies have determined that speech-processor programming levels and other objective tests (electrode impedance and electrically evoked compound action potentials) are equivalent to those obtained in the face-to-face condition. Despite these promising findings, speech perception using remote technology has proven to be more challenging. Previous investigations have evaluated speech perception with recipients of cochlear implants using videoconference (Polycom) equipment in nonsound-treated rooms (due to lack of access to audiological sound booths in rural areas). Results have revealed poorer speech perception scores using remote technology compared to face-to-face results. Additionally, it has been shown that Polycom transmission of a speech stimulus does not cause significant compression for adequate evaluation; rather, poorer results are due to testing performed in nonsound-treated environments. Based on the literature, telepractice is a feasible option for cochlear implant service delivery. Barriers to the widespread use of remote services for recipients of cochlear implants include a uniform system for the evaluation of speech perception, validation of services for pediatric recipients and initial activations, license reciprocity, and reimbursement for services.

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Introduction

Individuals who receive cochlear implants (CIs) must spend a significant amount of time learning how to use the new sound offered by the CI. This (re)habilitation includes programming the device, formal assessments, and counseling, and requires at least 8-10 appointments during the first year of activation. CI clinics are typically located in larger metropolitan areas. Multiple trips to the clinic can be difficult for patients due to transportation costs and the time needed away from work/school. These barriers become even greater for individuals who live far from the clinic or who do not have the financial means to attend the necessary appointments. Telepractice could potentially increase access to hearing health care and improve patient outcomes.

Several health care-related fields have adopted remote technology to increase access to services (Fricton & Chen, 2009; Geoffroy et al., 2008; Reynolds, Vick, & Haak, 2009). Despite this growing support, issues such as multistate licensure and reimbursement for services have prevented the widespread use of remote technology across all health care domains (Denton & Gladstone, 2005). Guidelines outlining proper procedures and technical aspects should be developed to help guide clinics as they implement remote services. Additionally, telepractice should only be provided if the quality of services is equivalent to those conducted face-to-face (American Speech-Language-Hearing Association [ASHA], 2005). Thus, research is needed to assess the equivalency of CI service delivery via remote technology to service provided in the traditional face-to-face setting.

Review of the Literature

Few studies have assessed the use of telepractice for CI service delivery (Franck, Pengelly, & Zerfoss, 2006; Goehring et al., 2012; Hughes et al., 2012; McElveen et al., 2010; Ramos et al., 2009; Shapiro, Huang, Shaw, Roland, & Lalwani, 2008; Wesarg et al., 2010). Franck and colleagues (2006) were one of the first groups to describe their experiences with CI programming via remote technology at the Children's Hospital of Philadelphia. The authors detailed the steps and basic issues involved with programming via remote technology, which was described as a successful process for experienced CI users at their clinic. Similarly, Shapiro and colleagues (2008) described their experiences with remote access for intraoperative electrophysiological testing during CI surgery. That study focused on the time-saving aspect, which showed that remote testing was considerably more time efficient for the clinician. However, the authors did not provide results comparing electrophysiological data obtained in the remote versus standard conditions. While these articles provided valuable information regarding the feasibility, advantages, and limitations of telepractice, neither provided outcome data

that allowed empirical comparison to results obtained in the traditional face-to-face setting.

Most empirically-based studies have focused on measures of speech-processor programming levels. Speech processor settings (MAPs) are adjusted for recipients of CIs at regular intervals using U.S. Food and Drug Administration-approved commercial software. These adjustments include setting behavioral threshold levels (T-level), where the recipient first perceives the stimulus, and maximal comfort level (M- or C-level), where the stimulus is comfortable or comfortably loud (depending on the manufacturer-specific guidelines). Ramos and colleagues (2009) performed remote programming for 5 adult recipients of Advanced Bionics (AB) HiRes 90K CIs using a split-half design. Subjects had 4–15 weeks experience with the CI and took part in both remote and standard (face-to-face) programming sessions. Subjects were randomly assigned either the remote or standard program to use during a 3-month interval. Sound field thresholds and speech-perception measures using an open set of recorded disyllabic Spanish words were conducted in the traditional face-to-face setting following the 3-month interval; the programming and evaluation process was repeated two to three times over the course of 6–9 months. No significant differences were found across subjects for MAP M-levels, sound field thresholds, or speech perception between MAPs created in the remote and standard conditions. While the results of this early study were promising, only the MAPping procedures were conducted using remote technologies; sound field thresholds and speech perception were performed in the face-to-face condition.

McElveen and colleagues (2010) evaluated remote programming for 14 recipients of Cochlear Nucleus System CIs. Preoperative pure-tone averages (PTAs), postoperative aided speech processor PTAs, and pre-and postoperative speech perception scores were compared across two groups (7 programmed face-to-face at the CI center and 7 programmed remotely at a satellite clinic). The groups were matched based on duration of hearing loss. Speech perception was evaluated using the Hearing in Noise Test (HINT) sentences and Consonant Nucleus Consonant (CNC) words presented in quiet. Results revealed no significant difference in preoperative PTAs or speech perception scores obtained at 3- and 6-month intervals between the groups; however, there was a significant difference in postoperative aided PTAs. The authors attributed differences in postoperative PTAs (which were approximately 10 dB) to differences among the audiologists' programming techniques. As in the Ramos et al. (2009) study, speech perception outcome measures were obtained in the standard face-to-face setting.

A larger study of 69 recipients of the Cochlear Nucleus System from four centers was conducted by Wesarg and colleagues (2010). In that study, MAP T- and C- levels were compared for remote versus face-to-face fittings, and subjects and programming audiologists completed a questionnaire upon conclusion of the study. Results showed no significant differences in T- or C-

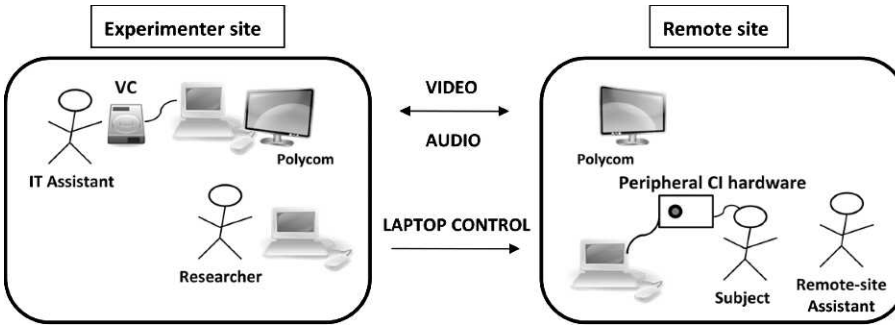

Figure 1. Graphic illustrating 2-way audio and video communication and equipment set-up for the remote visit. VC = visual concert. (Figure reprinted from figure 1 in Hughes et al. (2012). Use of telehealth for research and clinical measures in cochlear implant recipients: A validation study. *Journal of Speech, Language, and Hearing Research, 55,* 1112–1127, http://jslhr.asha.org.)

levels between the two fitting methods; however, there was a statistically significant effect among centers. Possible reasons for the center differences were not detailed by the authors. Overall, subject and audiologist feedback was positive; 85.5% of subjects were satisfied with the new remote program compared to 93% with the local fitting. Audiologists rated the remote session as equally comparable to face-to-face programming for 64% of the sessions. Speech perception outcome measures were not evaluated in the study.

More recently, Hughes and colleagues (2012) examined the reliability of various CI measures performed remotely for 29 pediatric and adult recipients of either AB or Cochlear Nucleus System CI devices. This prospective study used an A–B–A design, in which the first visit (A) occurred in the traditional face-to-face setting in a laboratory, the second visit (B) in a small conference room at a remote site (i.e. a rural hospital or university), and the third visit (A) in the same face-to-face setting. All three visits were completed within an average of 2 weeks. Specific tests were completed twice at each visit and included electrode impedance, speech processor programming levels (T- and C- or M-levels), electrically evoked compound action potential (ECAP) thresholds, and speech perception tests. In this study, the speech perception tests were conducted using remote technologies, whereas the speech perception outcomes for the aforementioned studies were conducted in the face-to-face condition (McElveen et al., 2010; Ramos et al., 2009).

Remote testing was completed using Polycom videoconferencing technology (for 2-way audio and video). Figure 1 shows a schematic of the communication directionality and equipment setup between the experimenter and remote site (from Hughes et al., 2012, figure 1). Control of a far-site laptop for electrode-specific measures was performed through the use of a Secure Socket Layer Virtual Private Network (SSLVPN). An examiner at the local site

administered all electrode-specific measures via the remote-site computer. A visual concert was interfaced with the local-site Polycom system to control the presentation of speech stimuli (.wav files) from a laptop at the local site. Speech perception stimuli originated at the local site, but were presented through the speakers of the Polycom system at the remote site. Calibration of speech perception stimuli via the Polycom system was performed at the start of each session using a digital sound level meter by a designated support person (which was similar to face-to-face calibration). Sound levels for the speech perception stimuli were adjusted via the master volume output of the local-site computer from which the .wav files originated. Subjects were tested in a sound booth at visits one and three in the laboratory; however, sound-treated booths were not available at the remote sites. Instead, testing was completed in the room where the videoconference equipment was housed.

Results revealed no significant differences for impedance, programming levels, or ECAP thresholds between the traditional and remote conditions; however, there was a significant difference for speech perception. Mean scores for CNCs (scored as percent correct for words and phonemes), HINTs (sentences presented in quiet), and the Bamford-Kowal-Bench Sentences in Noise (BKB-SIN; scored as signal-to-noise ratio for 50% correct) are shown in Figure 2 (adapted from Hughes et al., 2012, figure 8). For CNCs, mean scores were 14% (words) and 10% (phonemes) poorer at visit two (remote site) compared with the average for visits one and three. For HINT sentences, mean scores for visit two were 19% poorer than the average for visits one and three. Finally, for the BKB-SIN, mean scores for visit two were 3.1 dB poorer than the average for visits one and three. Results revealed unfavorable background noise levels and reverberation times at the remote sites when compared to testing conducted in the local-site sound booth. Despite these results, it was not clear whether poorer results for visit two were due to poor noise levels, possible compression or distortion of the speech signal through the videoconference system, or a combination of both.

To further investigate differences in speech perception scores across visits, Goehring and colleagues (2012) explored the effects of environment and test systems on speech perception using remote technology. Two different audio presentation systems (Polycom and a Hybrid system developed for the study) were used across two different test environments (quiet office and sound booth) for a total of four listening conditions. The Hybrid system, which was designed to eliminate compression issues associated with transferring speech stimuli across a videoconference system, allowed the examiner to play uncompressed stimuli from a speaker at the subject's site. Each subject's speech perception was evaluated using the same assessments as in Hughes et al. (2012). Background noise and reverberation measurements were also assessed for each environment. Results revealed a significant effect of environment, with better performance measured in the sound booth compared to the office. There was no significant difference in test system (Polycom or

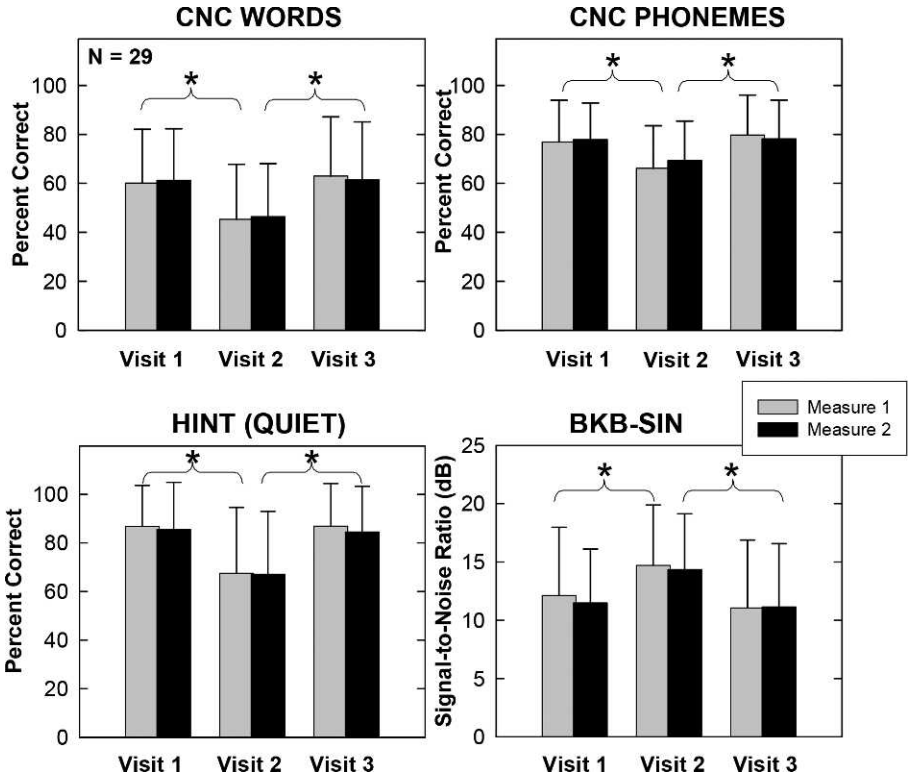

Figure 2. Bar graphs illustrating speech-perception scores for all recipients across visits and measures.Top: CNC results scored for percent of words correct (left) and percent of phonemes correct (right). Bottom: HINT scores for sentences in quiet (left; scored as percent correct) and BKB-SIN scores (right; scored as signal-to-noise ratio for 50% correct). Asterisks denote significant differences for visit two mean scores across the four speech-perception tests when compared to the mean scores at visits 1 and 3. (Adapted from figure 8 in Hughes, et al. (2012). Use of telehealth for research and clinical measures in cochlear implant recipients: A validation study. *Journal of Speech, Language, and Hearing Research*, *55*, 1112–1127, http://jslhr.asha.org.)

Hybrid) for speech in quiet. For speech in noise, subjects performed slightly poorer with the Polycom system in the quiet office, suggesting that the Hybrid system was better for dealing with the effects of background noise and reverberation.

Figure 3 (adapted from Goehring et al., 2012, figures 2 and 3) displays background noise and reverberation results for the test environments from both the Hughes and Goehring studies. As expected, the sound booth had significantly lower background noise levels than the quiet office and the remote sites in Hughes et al. (2012, figure 3, top). Reverberation results were also

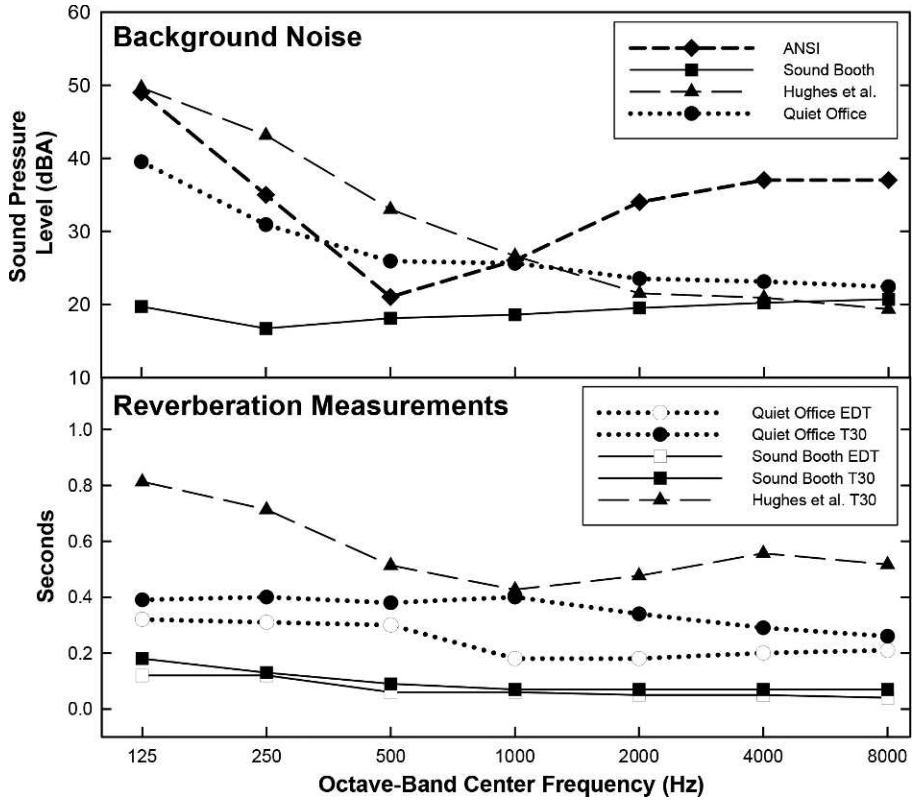

Figure 3. Octave-band and reverberation measurements. Data are plotted for a sound-treated booth, a quiet office, remote-site average from Hughes et al. (2012), and ANSI (1999) recommendation for audiometric test rooms. T30 = reverberation time (time required for sound to decay by 60 dB); EDT = early decay time (first 10 dB of decay for T30). (Adapted from figures 2 and 3 in Goehring et al. (2012). The effect of technology and testing environment on speech perception using telehealth with cochlear implant recipients. *Journal of Speech, Language, and Hearing Research*, *55*, 1373–1386, http://jslhr.asha.org.)

significantly different across all three environments with the sound booth as most favorable, followed by the quiet office, and then the remote sites from Hughes et al. (2012; figure 3, bottom). The sound booth was the only environment that yielded measurements better than the American National Standards Institute (ANSI) recommendation for audiometric test rooms (ANSI, 1999). These results confirm that poorer speech-perception performance for remote testing in Hughes et al. (2012) was likely due to poorer room acoustics and the lack of a sound-treated booth rather than signal compression or distortion from delivering speech materials over the Polycom system.

Discussion

In general, the results from the reviewed studies revealed no significant differences for electrode-specific measures conducted remotely versus face-to-face (Hughes et al., 2012; McElveen et al., 2010; Ramos et al., 2009; Wesarg et al., 2010). However, Hughes and colleagues (2012) found significantly poorer speech-perception results for the remote condition. As confirmed by Goehring and colleagues (2012), this was primarily due to the absence of a sound booth at the remote sites as opposed to signal distortion through videoconferencing equipment. The use of a non sound-treated room in the Hughes et al. (2012) study introduced unwanted background noise and reverberation, which negatively affected subjects' speech perception in the remote condition (see Goehring et al., 2012).

While sound booths provide a consistent listening environment for testing across visits, they are typically not available in rural communities and are also not representative of realistic listening conditions for recipients of CIs (who have significant difficulty hearing in background noise and reverberant environments). These authentic listening environments should not discount the potential for remote programming and testing. Instead, future research should focus on ways to control and/or document background noise and reverberation in remote locations in order to provide consistent test environments for speech perception evaluations across sessions. The Ramos et al. (2009) and McElveen et al. (2010) studies did not evaluate speech perception using remote technologies; rather, subjects were tested in the face-to-face condition using MAPs that were created remotely. While this is an acceptable option for periodically evaluating progress, it would require face-to-face appointments to measure outcomes and may therefore negate the benefits of remote services.

Further Considerations for Telepractice

Telepractice is rapidly evolving and warrants further investigation. Practices established by the investigators in the studies reviewed here may be used as a guideline for future investigations. For example, because health information is transferred across the Internet and through videoconferencing equipment, it is essential for clinicians to ensure that all online and videoconferencing media are secure and protected. Remote programming from computer-to-computer should be done through a secure connection to prevent any breach of confidentiality throughout the remote session. Hughes et al. (2012) and McElveen et al. (2010) used virtual private network capabilities for secure remote testing over the Internet. Additionally, computers stored at remote sites in the Hughes et al. (2012) study had password-protected hard drives and log-ins, and were locked in a secured facility when not in use. Likewise, all videoconferencing mechanisms should be secured by firewalls and/or

encrypted technology. Future investigators should ensure that telepractice encounters take place over secure and private connections in order to comply with Health Insurance Portability and Accountability Act (HIPAA) standards (1996).

Second, Internet technology can often add a delay or lag time to testing. While the presence of a short delay was acknowledged in several studies, none of the investigators mentioned here experienced any adverse effects due to delay. McElveen and colleagues (2010) recommended using at least a 1-megabyte-per-second connection for optimal performance and to minimize delay. Likewise, the videoconference connection can be somewhat compromised at times due to heavy traffic. A poor signal can make communication especially difficult for CI recipients (as in the case of delayed or distorted video or audio). When difficulties with communication occur, clinicians should use alternate strategies, such as typing instructions into a separate word-processing document on the remote-site computer, holding a notepad up to the videoconferencing camera, or using sign language cues, when possible. Modifications such as these may need to be implemented when communicating with CI recipients via a videoconference link.

All of the studies reviewed here have acknowledged the necessity for appropriate safeguards against accidental overstimulation. Because of the lag time or delay that occurs when controlling the software remotely, clinicians should take precaution when increasing stimulation levels (as in the case of programming levels) and should increase stimulation more slowly around C-level to ensure overstimulation does not occur. Wesarg and colleagues (2010) noted that an acclimation period may be needed before a clinician feels comfortable with manipulating stimulation levels per recipient feedback. Recipients should also be instructed to notify the clinician immediately if a stimulus is too loud or to remove his/her sound processor, if needed.

A few obstacles remain with regard to the extensive use of telepractice for CI service delivery. To date, most of the research in this area of telepractice has included adult and youth CI recipients who have several months to years of CI experience. The use of remote services for initial stimulations with very young, pediatric CI recipients has not been systematically evaluated (Franck et al., 2006). The study by Wesarg et al. (2010) included 13 pediatric subjects as young as 1 year of age; however, the authors did not include specifics regarding how T- and C-levels were obtained and validated in the very young subjects. Telepractice for pediatric CI recipients would likely require additional organization, equipment, and a skilled clinician at the remote site. Remote personnel in several of the studies had training in health-related or teaching backgrounds that were not specifically related to CIs (Hughes et al., 2012; McElveen et al., 2010; Wesarg et al., 2010), while Ramos and colleagues (2009) used a "local representative" whose professional background was not reported. Coordination of remote-site personnel for various CI appointments is important to ensure the remote session is as efficient as possible.

Finally, issues such as reimbursement for remote services and multi-state licensure have hindered the broad use of telepractice (ASHA, 2005). Few states have adopted license agreements that allow providers to practice in another state. Without reciprocity or mutual recognition agreements, providers must be licensed in each state where the patient receives services, resulting in added costs to providers. It is also difficult to determine insurance coverage for telepractice across various health care disciplines, which prevents the provision of specialized care (via telepractice) for rural communities. For insurance companies that do cover services provided via telecommunications, there are often restrictions regarding what specific services can be delivered.

Conclusion

Thus far, research has shown that the use of remote/distance technology for CI programming services is a viable option. In order to address reimbursement limitations, it needs to be proven that CI services delivered via telecommunication technology is a cost-effective alternative to face-to-face services. Further investigation is needed to design and validate service-delivery protocols, particularly in the areas of speech perception testing and pediatric service delivery. For both pediatric and adult recipients of CIs, speech perception testing is an important aspect of a CI programming appointment. To accurately monitor performance within and across appointments, test conditions need to be standardized. With limitations in technology and optimal listening environments (i.e. sound booths) in rural locations, further investigation is required.

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The Volta Review, Volume 112(3), Winter 2012, 267–281

An Evaluation of Virtual Home Visits in Early Intervention: Feasibility of "Virtual Intervention"

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The provision of consistent high quality home- and community-based services to children with disabilities living in rural and frontier areas is a challenge. Distance, weather, geographic terrain (mountains, canyons), and shortages of pediatric early interventionists are among the challenges to ensuring appropriate and equitable services. Videoconferencing offers a viable means to address these challenges and is becoming increasingly accepted due to the popular use and rapid advancement of voice-over-Internet protocol (VoIP) technology, Internet expansion, the growing "digital native" population, and coaching service models. This article offers a rationale for using a telepractice model for early intervention—virtual home visits (VHV) conducted via videoconferencing—and describes components of the service model, including equipment needs, costs, and training requirements. Additionally, the article summarizes evaluation results, including service provider and family satisfaction with the use of technology, and a comparison of interactions during home visits conducted face-to-face with those via VHV.

Use of Telecommunications in Human Services

Videoconferencing technology is used by business, government, and education as a cost-effective method to bring together people living and working in distant locations. Various terms in addition to videoconferencing are in use, such as telecommunication, telepractice, telehealth, teleintervention,

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telerehabilitation, and virtual visits. All refer to communication conducted via technologies that allow individuals and/or groups in two or more locations to communicate by simultaneous two-way video and audio transmissions. The increased availability and technological improvements in Internet communications are among the factors responsible for the explosive use of videoconferencing. For example, between 2005 and 2010, broadband access (which supports videoconferencing) increased nearly 50% for people ages 12–24 years of age and doubled for people ages 25–64 years of age (Rainie, 2010).

As part of the Visiting Nurse Service of New York Home Care Program, a telepractice system has been successfully used to provide speech-language services to over 200 patients (Carpenedo, 2006). Another pilot program implemented by Witmans and colleagues (2008) found that telepractice was a potentially effective and efficient alternative to center-based care to evaluate children and adolescents with sleep problems. Telepractice systems have been used successfully to monitor the health needs of patients with chronic illnesses and to conduct "office visits" between children in schools and physicians and medical personnel located at medical facilities (Cherry, Moffat, Rodriguez, & Dryden, 2002; Finkelstein, Cabrera, & Hripscak, 2000; Finkelstein et al., 2004). Limited studies have found that telepractice compared favorably in technical quality, clinical usefulness, and time management for families compared to traditional means of face-to-face (F2F) health care delivery (Finkelstein et al., 2004; McConnochie et al., 2005).

Rationale for Use in Serving Children with Disabilities

The success of telepractice in medicine suggests its applicability to early childhood programs. Studies with young children have used telecommunication technology to assess and provide intervention to young children with autism and behavioral disorders (Barretto, Wacker, Harding, Lee, & Berg, 2006; Gibson, Pennington, Stenhoff, & Hopper, 2010). Gibson and colleagues (2010) used a desktop conferencing tool (Skype) to teach preschool staff to reduce the "running away" behavior of a child with autism. Staff learned to use functional communication intervention with fidelity and reported high levels of satisfaction with both the procedures and the technology. Baretto and colleagues (2006) used a telepractice model to conduct brief functional analyses for children with developmental and behavioral disorders. Instead of being seen as outpatients, children received their initial behavioral assessments at their school or a social service agency. While successfully used in other disciplines, applications of telepractice have lagged in the field of early intervention.

Potential to Resolve Challenges

Early intervention services to young children with disabilities and their families are governed by Part C of the Individuals with Disabilities Education

Act (IDEA), which regulates and guides the provision of early intervention services (IDEA, 2004). Within the rules and regulations are definitions of natural environment, timelines, personnel standards, and conditions for participation. Compliance with the regulations is significantly more difficult when serving families who live in rural communities. A primary difficulty is the lack of local resources. The National Survey of Children with Special Health Care Needs (U.S. Department of Health and Human Services [DHHS], 2001) found that children with special needs living in rural areas are less likely to be seen by a pediatrician or therapist and more likely to have unmet health care and developmental needs. Also, children with moderate to severe health and developmental problems are more likely to live in rural areas (9% in large rural areas, 8.1% in small rural/isolated areas) than in urban areas (7.7%; DHHS, 2005).

A particular challenge for early intervention is the provision of adequate and equitable services in the child's natural environment. The IDEA (2004) defines natural environments as settings that are natural or typical for a same-aged infant or toddler without a disability, including the home or community setting. To meet this requirement, early interventionists in rural areas of one state may travel 2 to 2½ hours in one direction to see a single child. Travel can be complicated by weather and geography, such as mountainous roads and canyons. Furthermore, travel is not just a challenge of time and distance—it is costly for programs. Travel costs include wages and benefits for driving time as well as mileage reimbursement to program personnel.

IDEA Part C regulations also dictate timelines for establishing eligibility and initiating intervention services to young children. Programs have 45 calendar days from receiving a referral to complete all eligibility evaluations and develop the required Individual Family Service Plan (IFSP). Additionally, services must begin in a reasonable time. Many states require that the initial service begins within 30 days from the specific service start date identified on the IFSP. In programs with limited staff and overwhelming caseloads, these timelines can be problematic, especially when travel is required.

Some of these challenges can be ameliorated in part by using telepractice. Telepractice reduces travel, lessens scheduling challenges, and can result in cost savings and increased program compliance with state and federal regulations. Where provider shortages exist and travel reduces time available for service, telepractice can be used to provide direct services to children and families and/or to provide expert consultation to practitioners and individuals living in rural communities. All of this can be done while meeting the requirements to serve children in natural environments and with their primary caregivers.

Feasibility of Virtual Home Visits

Over a 2-year period, the Virtual Home Visit (VHV) Project, developed by the two senior authors, evaluated the feasibility of using videoconferencing to

conduct home visits, connecting early interventionists with families of children (ages birth to 3) with developmental delays or disabilities. VHVs offers an alternative to F2F visits that require extensive travel to a family's home or community setting, expertise from a qualified professional, and completion of a visit within a specific timeline. Videoconferencing technology has very basic requirements: (a) access to broadband Internet; (b) use of a voice-over-Internet protocol (VoIP) device with audio and video capacity; and (c) access to a computer, laptop, tablet, or smartphone equipped with a webcam, microphone, and speaker. A national survey in 2009 indicated that 74% of American adults (ages 18 and older) used the Internet, 60% of American adults used broadband connections at home, and 55% of American adults connected to the Internet wirelessly, either through a WiFi connection via their laptops, or through their handheld devices, such as smartphones (Rainie, 2010). VoIP technologies continue to improve, expanding capacity and creating virtual formats that support all the aspects of F2F meetings.

Alignment with Service Delivery Patterns

VHV delivery aligns well with various patterns of service delivery. Interaction between a therapist and a child in a distant location via interactive television was described in 1988 as a feasible means to promote language development with children in rural early intervention programs prior to the development of current technologies (Rule, DeWulf, & Stowitschek, 1988). VHV delivery is also consistent with a coaching model, which is currently a recommended best practice for serving young children and their families. Further described in this article, coaching is a practice in which the provider works with the parent to facilitate the parent's use of strategies that facilitate the child's development (Rush & Shelden, 2005).

Virtual Home Visit Model

The VHV Project was funded by a grant from the U.S. Department of Education (#H327A080038). The project served 36 families who participated in the Up to 3 Early Intervention Program at the Center for Persons with Disabilities at Utah State University. The program provides services under IDEA Part C in three rural counties in northern Utah—a 7,819 square mile area.

Families participated voluntarily in the VHV Project and were paid a small stipend to participate in and evaluate virtual sessions. For comparison purposes, they also evaluated several of their regularly-scheduled F2F or in-home visits. A sample of participants was selected from families who volunteered and included residents of rural, frontier, and small city areas as well as families of various cultural and linguistic origins. Children's diagnoses were varied and included conditions such as periventricular leukomalacia,

spina bifida, and Down syndrome. Results of developmental tests for 10 children who initially participated in the project and who represent the range of delays indicated that 5 participants' delays were "severe," 3 had "moderate" delays, and 2 had "not significant" delays. The project model maintained the home-based visits established by each child's IFSP and increased service with VHVs. During Year 1of the project, 6 early intervention service providers from the Up to 3 program participated; they were selected because they served the families who volunteered to participate in the project. During Year 2, 11 additional staff members participated for a total of 17 providers. These providers, whose disciplines included physical therapy, occupational therapy, speech-language pathology, child development, and special education, coached families and provided developmental strategies to support accomplishment of the goals in each child's IFSP. Service providers used coaching techniques as they observed and facilitated interactions between parent and child. Consistent with the families' goals (expressed on IFSPs), providers listened to what parents had to say about their child's development and watched their interactions with their child. Providers offered feedback and suggested ways parents could interact to promote the child's use of desired skills. At times, the service providers modeled or demonstrated a strategy with a child, but they primarily supported the parent-child interaction. The service providers "virtually participated" at the table as the family ate their breakfast or on the floor as they played together. Videoconferencing was also used for the meeting to develop an IFSP and for transition and staffing meetings that required participation of families and team members from several agencies in multiple locations. Service providers received a monthly gift card for completing online evaluations of their experience with VHVs and recording all virtual and a sample of F2F visits for project evaluation purposes.

Laptops, webcams, speakers, and/or microphones were loaned to families, as needed. Internet services were paid for by the early intervention program for families who did not have those services in their homes, for the duration of their participation. Costs were recouped through the reduction of travel and loss of staff time (as described in more detail later).

Technology Requirements

The video and audio quality of the VHV was dependent on the speed of the Internet connection (standard, high quality, or high definition). DSL Internet service is typically slower than cable; however, both systems were rated satisfactory by parents and providers. The performance of a WiFi network connection partially depended on the strength of the radio signal between devices. The USB wireless had frequent video buffering, audio delay, and echo. The satellite IP was twice the cost and was less reliable (signal latency, line of sight issues) than cable or DSL. Internet provider costs in 2010 ranged from

$35/month for dish and cable services, $59/month for wireless cards, and $75/month for satellite service. Installation charges and contracts were negotiated to reduce rates and avoid mandatory contracts.

Four VoIP systems—Skype (www.Skype.com), ooVoo (www.ooVoo.com), VZOchat (www.vzochat.com), and Breeze/Adobe Connect (www.adobe.-com)—were tested during the project. Numerous software factors were considered during selection, including cost, ease of download and use, ability to record visits, usability by Mac and PC, availability to rural/frontier families, and split screen view of both the parents and service provider. Due to rapid advances in videoconferencing technology, system problems (buffering, echo, pixelating) identified as barriers at the time of the study are typically no longer problematic. Because the security of the systems used did not meet privacy requirements of the Health Insurance Portability and Accountability Act (HIPAA, 1996), but did meet the Family Education Rights and Privacy Act (FERPA, 2008) requirements associated with Part C of IDEA, families signed an informed consent detailing the security risks associated with videoconferencing.

Project Outcomes

Cost Savings

The Up to 3 program realized cost savings and increased availability of services from specialists. For example, in September 2010 for the 18 families served that month with VHVs, the average time savings per visit was 10 minutes for urban families; 43 minutes for rural; and 3 hours, 20 minutes for frontier residents. The average personnel cost savings per visit was urban–$14.33, rural–$39.40, and frontier–$112.50; the average mileage reimbursement savings per visit was urban–$10.20, rural–$13.60, and frontier–$122.45.

Participant Comfort with Technical Skill Requirements

To determine whether the VHV model was an acceptable way to participate in and provide early intervention services, families and providers were surveyed at various times using project-designed measures of comfort and satisfaction with technology. The surveys were administered online. Respondents received a gift card contingent upon completing surveys after each VHV. Scheduled to occur once a month, surveys were sometimes administered at longer intervals based, for instance, on a family's request to change the date of a visit. The results from various satisfaction surveys are of interest.

Parental Ratings

Parents were asked to rate their comfort with the seven steps required to use the videoconferencing systems. These steps include: (1) turning on the

computer, (2) connecting the camera and microphone, (3) connecting to the Internet, (4) connecting to the VHV Project website, (5) logging on to the website, (6) starting the camera, and (7) locking the microphone to talk. Parents' initial comfort with these technical skills was high and remained so. During Year 1 of the project, the 14 participating families who completed the surveys attended F2F training in a computer lab. To participate in the VHV, they used one of two systems (ooVoo and Breeze). After training (but before participating in a VHV), their mean rating of comfort across the seven skills was 3.7 (using a 4-point Likert Scale with 4 as the highest possible rating). After their VHV experience, the mean rating was 3.5. Only 1 respondent indicated feeling "very uncomfortable" with any one skill.

During Year 2, different videoconferencing systems were used (Skype and VZOchat). Training was offered online. Before their intervention experience, the 13 families who completed both pre- and postsurvey assigned a mean rating of 3.4 to their comfort with the required skills; 4 of the 17 families did not complete both surveys. After participation in a VHV, the mean rating was 3.6. Similar to the ratings in Year 1, "very comfortable" was the most frequent rating for each skill after parents participated in VHVs. The sole parent who indicated that she was "very uncomfortable" with each skill commented, "I acquired all skills necessary to complete the VHVs prior to the beginning of the project," leaving the source of her discomfort unexplained.

Providers' Ratings

VHV sessions and a sample of home F2F visits were recorded for evaluation purposes; that is, to learn about the types of interactions that occurred during the visits. In order to record VHVs, service providers were required to complete two more steps in addition to the previous seven mentioned: (8) recording the session and (9) close it. Providers rated their comfort before and at the end of their VHV experience.

Similar to the parental ratings, providers' ratings of comfort were high before and after their VHV experiences. During Year 1, the 6 providers' mean rating of comfort across the nine required skills was 3.6 prior to their experience and 3.7 afterwards (again using a 4-point Likert Scale with 4 being the highest possible rating). At the end of their experience, 5 of the 6 providers were "very comfortable" with eight of the nine skills required to participate in VHV. Only 1 provider expressed any discomfort. At the end of Year 2, 8 of the 9 providers who completed both the pre- and post-surveys were "somewhat" or "very" comfortable with all required skills; 8 providers did not complete both surveys. Their mean rating across the skills was 3.1 prior to their VHV experience and 3.5 afterwards. Thus, the technical requirements of VHVs did not seem to interfere with participation in early intervention.

Table 1. Parents' comparisons of VHV with face-to-face visits: Year 1

Month	*VHV* better (%)*	*VHV same (%)*	*VHV worse (%)*
January ($n = 15$)	13	60	27
February ($n = 12$)	17	67	17
March ($n = 12$)	17	75	17
April ($n = 11$)	27	46	27
May ($n = 12$)	17	67	17
June ($n = 13$)	15	62	23

* VHV = virtual home visit

Parental Satisfaction with Service Delivery

To assess satisfaction with services delivered via VHVs, families were asked to complete an online survey describing their experience after each visit. One item compared satisfaction with home visits conducted virtually with those conducted F2F. Tables 1 and 2 show how parental opinions of the two types of visits varied during the first and second project years, respectively.

As measured on post visit surveys, parents were generally satisfied with each visit modality. During Year 1, the majority of parents rated the two visit types as the same. On only two of the six monthly surveys administered were VHVs rated less favorably than F2F visits. During Year 2, families' ratings were more variable across the 10 monthly surveys administered. The percentage rating the two visit types as the same increased over time, with half or more of the parents rating them as equal on seven of the 10 surveys. The percentage rating VHVs as better ranged across months from a low of 8% (1 parent) to a high of 39% (5 parents). The percentage and number who rated VHV as worse decreased over time.

Another measure of parent satisfaction, perhaps less influenced by what happened during any particular visit, was a question on the final survey of their

Table 2. Parents' comparisons of VHV with face-to-face visits: Year 2

Month	*VHV* better (%)*	*VHV same (%)*	*VHV worse (%)*
October ($n = 13$)	23	31	54
November ($n = 13$)	23	39	39
December ($n = 12$)	8	58	33
January ($n = 13$)	39	46	15
February ($n = 14$)	14	50	36
March ($n = 14$)	14	57	29
April ($n = 13$)	8	62	31
May ($n = 6$)	33	50	17
June ($n = 8$)	12	50	38

* VHV = virtual home visit

VHV experience. When asked if they would continue VHVs if that were an option, 9 families during Year 1 and 12 families during Year 2 indicated that they would. Four participants from Year 1 explained why not—2 cited technology problems, 1 had scheduling conflicts, and 1 simply preferred F2F visits. On the other hand, another family asked to continue VHV after the project had ended.

During Year 2, as in the first, 1 parent indicated a preference for F2F visits during which the service provider demonstrated techniques in person rather than virtually. Another had a different view and said, "In the home visits, [the service provider] did more one-on-one with [child's name] and was able to interact, which he liked. On the virtual visits, she told me ways I should interact with him to get him to talk. Both were good." Another parent who had initially been only "somewhat" satisfied with early intervention prior to her VHV experience commented, "Keep the program alive, SERIOUSLY."

Parents reported other advantages and disadvantages associated with the two types of visits. For example, one commented, "Physical therapy: it would have been easier with speech" and "Hands on [was preferable from the occupational therapists] point of view, but [the VHV] makes me work with [child's name] and learn how to help him." Parents who resided in distant locations found that VHV made visits possible, saving therapists' time while permitting them to offer input about the child as they watched interactions. Some, whose children were medically fragile, preferred VHVs to protect their children from exposure to illness. One commented, "During the RSV season we have to minimize my son's exposure to germs and VHVs are a great way for him to still get his therapy during that time." Two comments indicated that VHVs were efficient with fewer interruptions and with a focus upon the intended purpose of the visit.

Provider Satisfaction with Service Delivery

Information collected from an initial project survey indicated that service providers had varying levels of computer use. Use ranged from occasional use for email, to daily use both personally and professionally. Like parents, service providers were asked to complete surveys about their experience after each VHV and after a sample of three F2F visits (while it was intended that visits occur once a month, some visits had to be rescheduled so the number of visits and therefore surveys completed varied from month to month). During the first year, according to post visit surveys, the 6 responding providers collectively served 12 to 13 families per month over the last 3 months during which VHVs were surveyed. Their mean ratings of satisfaction across these three visits were: very satisfied–32%; somewhat satisfied–47%; somewhat dissatisfied–10%; and very dissatisfied–11%. During Year 2, the 7–9 providers who responded to each survey collectively served 11 to 15 families across the last three consecutive surveyed VHVs. The mean ratings of their satisfaction were: very satisfied–

52%; somewhat satisfied–38%; somewhat dissatisfied–5%; and very dissatisfied–5%.

Comments on the post visit surveys indicated that providers' satisfaction was associated—although not solely—with the VHV medium. Technology issues were the most-cited factor associated with dissatisfaction. For example, one commenter remarked on "crashes" of the system. Several mentioned the importance of technical support in enabling visits. However, other factors also influenced providers' dissatisfaction. For example, one provider noted that the child was tired but the mother wanted to continue with the visit anyway. Another noted that a visit was one that had been rescheduled and "that always makes it a tad chaotic."

Observed Adult-Child Interactions during F2F and VHV

To learn the characteristics of the interactions between provider and parent, provider and child, and parent and child, the authors developed an observation system to measure these interactions. It was formatted similarly to the Home Visit Observation Form (HVOF rev) system developed at Iowa State University (McBride & Peterson, 1997). Interactions were coded using a 30-second partial interval system. Seven codes described service provider behaviors, seven described behaviors of individuals in the home (typically the mother, sometimes other adults, and often siblings), and two described the participating child's behavior. Definitions of these codes are available from the authors upon request.

Data from 184 recorded home visits were analyzed. Of these, 81 were recorded visits made to 11 families during Year 1 (57 virtual and 24 F2F) and 106 were visits to 25 families during Year 2 (69 virtual and 37 F2F). Recordings, with the exception of one 8-minute recording, were at least 10 minutes in duration and ranged up to 66 minutes in length.

Some recorded visits were not viewed and were, accordingly, excluded from the analyses. Recordings were excluded only if (a) they were less than 10 minutes in duration (as these did not seem representative of typical home visits), (b) if a technical difficulty (such as no sound) occurred during recording, (c) they were mediated by a translator, changing the role of the service provider (four sessions), or (d) they were evaluations rather than intervention sessions.

Observer Training and Interobserver Agreement

Five observers completed training to learn to collect data from recorded F2F visits and VHVs. During training they practiced analyzing recorded visits other than those they later observed. Training continued until they achieved a criterion of 80% agreement or higher across three recordings of different service providers and families. Two observers independently recorded data from 16 of the 81 recorded visits in Year 1 and 22 of the 103 sessions during the Year 2. The

mean percentage of agreement between observers was 82% and 89% in Years 1 and 2, respectively.

Results

To analyze the data, generalized estimating equations (GEE) were used to control for differences across families and services providers. GEEs offer efficient estimates when data do not meet the assumptions of traditional linear models about distributions, or when the responses may be correlated, there are missing data, observations are at unequal time intervals, or there are repeated measures (see Liang & Zeger, 1986). The results of the analysis of differences in interactions between F2F and VHV are shown in Table 3. Omitted from the table are four categories of behaviors or interaction that rarely occurred (such as child distress or parental attention to a distressed child).

As shown in Table 3 and subsequently described, there was a statistically significant difference between visit formats for all except three observed categories of interaction. No statistical significance was found for these three types: (1) interactions of the parent with other persons in the home, (2) interactions of the provider with others, and (3) interactions in which the provider talked to the child as the parent was engaging the child in an interaction to encourage a particular behavior. While there were differences between providers, these were not statistically significant.

Interactions during visits of both types (F2F and VHV) primarily addressed strategies to promote children's development. Coaching occurred more often during VHVs than home F2F visits; this difference was statistically significant. Coaching included the provider's discussing specific strategies parents might use to promote children's development, listening to the parent's opinion about use of the strategies, and providing feedback while observing the parent implementation of strategies. Another category of interaction—teaching and modeling—was defined as the provider interacting with a child to model the implementation of a strategy. While teaching and modeling might serve to show the parent how to engage in a strategy, teaching and modeling might actually supersede the parent's opportunity to implement a strategy during a visit. As might be expected (since the provider and child were in the same physical space), teaching and modeling occurred more often during F2F visits, and the difference was statistically significant; parents engaged more in implementing strategies with their children during those visits. This is consistent with expectations that coaching during VHVs requires discussion and interaction with the service provider, thus taking time that might otherwise have been spent interacting with the child. Accordingly, children were engaged more in strategies (with either the parent or provider) during F2F visits.

There were differences between VHVs and F2F visits in several categories of interaction that occurred infrequently. During F2F visits, parents and providers talked more about non-programmatic topics than they did during VHVs.

Table 3. Comparison of percentage of intervals of occurrence of various participant behaviors during F2F visits and VHVs

	Type 3 GEE†		*Visit type*		*Difference test*	
Behavior	*Chi square*	*p* value	*F2F** least square mean (ci)*	*VHV*** least square mean (ci)*	*Chi square*	*p* value Pr > ChiSq
Provider coaching	6.41	0.011	53.9 (46.1, 61.8)	65.9 (61.1, 70.7)	8.06	0.0045*
Provider teaching/modeling	21.68	< .0001	46.8 (39.3, 54.4)	8.6 (4.1, 13.1)	109.7	<.0001*
Provider talk about other EI‡ program issue	4.87	0.03	14.1 (10.5, 17.8)	20.1 (14.9, 25.3)	5.36	0.02*
Provider talk about non-EI program issue	8.02	0.005	5.0 (3.2, 6.8)	2.9 (1.8, 4.0)	10.13	.002*
Provider talk to child-no strategy underway	6.32	0.01	3.2 (2.0, 4.4)	5.1 (3.9, 6.3)	7.74	0.005*
Provider talk to child-parent doing strategy	0.33	0.56	6.5 (3.5, 9.5)	8.0 (3.9, 12.1)	0.34	0.56
Provider talk to someone else	0.37	0.54	4.6 (1.2, 8.1)	3.7 (2.6, 4.8)	0.37	0.54
Provider talk about technology	16.86	< .0001	3.9 (2.6, 5.2)	13.0 (10.8, 15.2)	46.4	<.0001*
Parent doing strategy	4.18	0.04	50.3 (39.9, 60.6)	37.1 (27.2, 47.0)	5.04	0.02*
Parent talking about strategy	4.65	0.03	41.0 (34.2, 47.7)	47.5 (43.2, 51.9)	5.67	<0.02*
Parent talk about other EI program issue	3.85	0.05	14.0 (10.2, 17.8)	19.1 (14.1, 24.1)	4.18	0.04*
Parent talk about non-EI program issue	9.75	0.002	5.4 (3.7, 7.2)	2.8 (1.7, 3.8)	13.9	0.0002*
Parent talk to someone else	0.07	0.79	5.8 (3.2, 8.4)	5.5 (3.3, 7.7)	0.07	0.79
Parent talk about technology	18.49	< .0001	1.3 (0.7, 1.97)	10.9 (8.8, 13.0)	76.25	< .0001*
Child engaged in strategy	15.3	< .0001	71.6 (63.2, 80.0)	41.0 (30.9, 51.0)	39.3	< .0001*

* Statistically significant
† GEE = generalized estimating equations
** F2F = face-to-face visit
*** VHV = virtual home visit
‡EI = early intervention

During VHVs they talked more about early intervention program topics, not including discussion of specific strategies to promote development, but about other matters such as children's health and technology. Providers chatted more with children during virtual than F2F visits, generally to engage a child when a parent's attention was diverted to other children or to fetching materials for use in implementing a strategy. Finally, consistent with coaching results, parents talked more with providers about strategies during virtual than F2F visits.

Conclusion

The VHV Project results indicate that VHVs can be useful in accomplishing the mission of early intervention—to support learning within the child's natural environment and using daily activities with familiar people. VHVs lessen the barriers of time, travel, and availability of qualified personnel, and require minimal experience with VoIP systems. VHVs can also further address the inequity of services to rural families that many early intervention Part C programs experience. The professional can offer services and support more frequently and to more families than would be otherwise possible. VHVs provide a feasible method to strengthen the Part C system in delivering services to young children and their families.

Training and subsequent technical support to service providers was necessary to overcome their reservations about using the technology and to troubleshoot when technical difficulties arose. While this was true for families as well, it appeared that they were more experienced users of technology. Through experience, early intervention staff identified the value of VHVs as an alternative service delivery model. Though the types of interactions between providers, children, and parents were different in the two visit formats, both focused on supporting children's development. VHVs resulted in cost-savings and increased efficiency in the use of valuable provider time; time not spent in travel could be devoted to interactions with families.

Not evaluated in the VHV Project, but warranting attention, is the risk related to Internet security and HIPAA requirements. Most VoIP technology systems have security risk factors. The Versatile and Integrated System for Telerehabilitation (VISYTER) and VidyoHealth are two software platforms recently developed to specifically meet HIPAA compliance issues. Recent studies by Watzlaf, Moeini, and Firouzan (2010) and Watzlaf, Moeini, Matusow, and Firouzan (2011) provide further information related to VoIP privacy and security.

There is growing interest and need for the provision of early intervention services using telepractice. However, future empirical study is needed to determine if telepractice is as effective as F2F services as measured by child progress and parents' acquisition of skills. Answers to all of these questions will be of interest to those adopting telepractice.

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The Volta Review, Volume 112(3), Winter 2012, 283–296

A Model of Early Intervention for Children with Hearing Loss Provided through Telepractice

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Children who are deaf and hard of hearing and their families need access to appropriate early intervention services that are delivered by professionals who are well trained and experienced using their chosen communication approach. Unfortunately, a lack of qualified practitioners, especially in remote and rural communities, and limited funding can affect the quality of services that are provided to some children. Advances in telecommunication and distance technology have led to models of telepractice that can provide access to appropriate services and reduce overall costs. While more efficacy research is needed, preliminary findings support the delivery of early intervention services through these distant service delivery models. Professionals who embrace models of telepractice can help to ensure that more children with hearing loss and their families receive the intervention to which they are entitled.

Introduction

There are challenges inherent in the provision of early intervention services to children with disabilities, especially those who are deaf and hard of hearing. The position statement of the Joint Committee on Infant Hearing (JCIH; 2007) clearly outlines expectations related to early intervention identified with unilateral or bilateral hearing loss, stating: (1) services should be provided by professionals with expertise in hearing loss, including educators of the deaf,

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speech-language pathologists, and audiologists; (2) both home- and center-based intervention options should be offered; (3) families should be aware of all communication options and available hearing technology; and (4) informed family choice in light of desired outcomes should guide the decision-making process when structuring early intervention services.

However, birth-to-3 Part C programs (of the Individuals with Disabilities Education Act (IDEA; 2004) and state early hearing detection and intervention (EHDI) programs often struggle to provide appropriate early intervention services to young children who are deaf or hard of hearing and their families. The struggle is due to a number of variables. A primary issue is the lack of qualified practitioners. Other factors include limited communication options available in the family's community and funding limitations (Roush, 2011).

The combination of videoconferencing technology and web-based software supporting synchronous, two-way communication has created new opportunities for service delivery. Administrators and practitioners are beginning to adapt models of telepractice—such as teleintervention—to provide direct services to infants, toddlers, and preschoolers with hearing loss and their families when they live in a community that can be miles away from the provider. These models of telepractice are associated with positive outcomes (Houston, 2011; McCarthy, Munoz, & White, 2010), and practitioners and parents of children with hearing loss are acknowledging the value of these services. Because these programs are relatively new in this field, more research is needed to investigate their efficacy.

The Roles of EHDI and IDEA Part C

Several studies underscore the developmental, communicative, and social benefits of early intervention for young children identified with hearing loss (Apuzzo & Yoshinaga-Itano, 1995; Calderon, 2000; Mayne, Yoshinaga-Itano, & Sedey, 1998; Moeller, 2000; Pipp-Siegel, Sedey, VanLeeuwen, & Yoshinaga-Itano, 2003; Yoshinaga-Itano, 2003; Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998). Yet, state EHDI coordinators describe the lack of appropriate early intervention services as a *major* problem (Shulman, Besculides, Saltzman, Ireys, & White, 2010). Presently, two state agencies are responsible for assuring a child receives early intervention services: the state EHDI program and each state's IDEA Part C program. The primary purpose of the EHDI program is to ensure that a coordinated system of hearing screening, diagnosis, referral, and tracking occurs throughout the state (White, Forsman, Eichwald, & Munoz, 2010). While the EHDI initiative includes early intervention in its efforts, it is often the state Part C system that carries primary responsibility for assuring each child receives family-centered intervention (Florian, 1995). When a child with hearing loss is identified and referred to an early intervention program, a Part C service coordinator is assigned to the family to "help the family obtain

services based on the child's needs, the state's offerings, and the resources allocated by the state for early intervention" (Sorkin, 2008, p. 223).

Notwithstanding the good intentions of these two statewide initiatives, there are prevailing challenges to early intervention service delivery, such as eligibility for services, the quality of services, the capacity to serve all identified children, and the expertise of providers, including the provider's knowledge of different communication approaches. Many programs designed to serve children with hearing loss fail to address the changing and unique needs of infants and toddlers; many of these programs were developed before the advent of newborn hearing screening and have not adjusted their programs in recent years (White, 2003). Early intervention programs may not have a sufficient number of service providers (e.g., Listening and Spoken Language Specialists [*LSLS™*], speech-language pathologists, teachers of the deaf) with the knowledge and skills needed to serve this population appropriately (Compton, Tucker, & Flynn, 2009; Houston & Caraway, 2010; Houston & Perigoe, 2010; Johnson, 2004; Lenihan, 2010; Luckhurst, 2008; Robbins & Caraway, 2010; Vernon, 2007). Some investigators attribute the shortage of qualified service providers to the fact that most early intervention programs were designed to serve fewer children, which was the situation when hearing loss was not identified until children reached 21/2-3 years of age (White et al., 2010). These same state early intervention programs are, therefore, insufficiently staffed to accommodate the increased number of infants and toddlers who are now being identified through newborn hearing screening programs (Shulman et al., 2010; White, 2007).

Regardless of the communication approach a family chooses, they should have access to services from well-trained professionals who are skilled in providing intervention using that methodology (JCIH, 2007). However, a 2005 survey that included 36 state Part C coordinators indicated that auditory-verbal therapy and sign language instruction were often difficult for families to obtain (Proctor, Niemeyer, & Compton, 2005). Likewise, EHDI coordinators reported that, "appropriate educational intervention programs for infants and toddlers with hearing loss are not as widely available as they should be" (White, 2003, p. 84).

To address these challenges, a growing number of program administrators are turning to telepractice service delivery models to meet the audiological, speech, listening, and/or language needs of young children with hearing loss. The National Center for Hearing Assessment and Management (NCHAM) surveyed state EHDI coordinators, and the results of the survey revealed that 42% of the state EHDI programs had some type of telepractice underway or were in the planning stages for implementation (NCHAM, 2010). Some administrators were exploring models of telepractice for both treatment and consultation. The survey also showed that audiology telepractice, used to conduct diagnostic Automatic Brainstem Response (ABR) testing, was the second most common service being implemented remotely. Furthermore,

EHDI coordinators reported plans to implement or expand remote hearing aid programming and/or cochlear implant MAPping through models of audiology telepractice.

Early Intervention Provided Through Telepractice

The rapid, and heretofore unregulated, increase in the number of services delivered through two-way video conferencing has led to the creation of a number of terms for this service delivery model. For example, the American Speech-Language-Hearing Association (ASHA) defines this service delivery as "telepractice" for speech-language pathologists and audiologists (ASHA, 2005a; 2005b; 2010). The American Telemedicine Association (ATA), however, refers to these services as telerehabilitation; this term is applied to practitioners in several disciplines (e.g., physical therapists, speech-language pathologists, occupational therapists, audiologists, rehabilitation physicians and nurses, rehabilitation engineers, assistive technologists, teachers, psychologists, and dieticians) (Brennan et al., 2010). In fall of 2008, Sound Beginnings, an early intervention and preschool program for children with hearing loss housed on the campus of Utah State University, initiated a project designed to evaluate the overall feasibility of delivering services through a telepractice model. Soon afterward, the faculty and staff involved in the project coined the term "teleintervention" to describe the early intervention services provided through distance technology. Teleintervention, a specific model of early intervention provided through telepractice, provides family-centered services to infants, toddlers, and young children with hearing loss and allows the provider to model strategies and coach parents in the use of language facilitation techniques (Houston & Behl, 2012). As one parent enrolled in the project explained: "We had to drive two hours each way to get these services. We couldn't find an interventionist in our area who had the experience and training to work with us. Teleintervention has been a lifesaver for our family. Our overall quality of life has improved, and I see tremendous improvement in his language already" (N. Guthrie, personal communication, 2012).

As telepractice becomes more common and is integrated into existing standards of care, early intervention administrators will most likely embrace these models of service delivery. In so doing, programs will eliminate barriers to services. However, providers must develop the knowledge and skills to effectively deliver these services.

Benefits of Telepractice

In a recent literature review, Cason (2011) addresses the use of telepractice with young children, birth through age 2 years, with a disability or developmental delay. Cason discusses ways in which telepractice can improve

the annual performance of state Part C programs. Each state's Part C program is required to report to the Office of Special Education Programs (OSEP) of the U.S. Department of Education annually. This report identifies ways in which the Part C program performs on 14 established indicators, which are available through the OSEP website (www2.ed.gov/policy/speced/guid/idea/capr/crelreqdoc.doc). Cason's work addresses the application of telepractice for eight of these performance indicators.

Timely Receipt of Services: OSEP requires reporting of the percentage of infants and toddlers with Individualized Family Service Plans (IFSPs) who receive the early intervention services listed on their IFSPs in a timely manner. Telepractice can improve timely delivery of services by increasing access to providers anywhere in the state (or the region) when they are not available in the local community. Through telepractice, children can receive more consistent services due, in part, to fewer cancellations. With traditional home visits, a family may need to cancel a session if their child or someone else in the family has even a minor illness. With telepractice, cancellations can be kept to a minimum. For children who are medically fragile, telepractice can be an added comfort for parents.

Settings: OSEP requires the reporting of percentage of infants and toddlers with IFSPs who receive early intervention services primarily in the home or in community-based settings. Telepractice maintains provision of services within the home or community-based setting though the use of technology. The provider, though at a distance, is actually conducting face-to-face intervention "virtually" (Olsen, Fiechtl, & Rule, 2012). The provider implements the same strategies and recommendations that would be provided in a traditional face-to-face setting.

Infant and Toddler Outcomes: OSEP requires the reporting of percentage of infants and toddlers with IFSPs who demonstrate improved social-emotional skills, acquisition and use of new skills (e.g., early language, communication), and use of appropriate behaviors to meet their needs. Telepractice has the same potential to augment outcomes for infants and toddlers. Parents and caregivers are taught to enhance their child's skills during naturally-occurring routines. Incidentally, telepractice can also be used to conduct professional development activities, including training to teach providers to collect and report child outcomes.

Family Outcomes: OSEP requires the reporting of percentage of families participating in Part C programs who state that early intervention services have helped their families. This is measured by assuring families know their rights under the law, effectively communicate their children's needs, and help their children develop and learn. Telepractice can be used to conduct ongoing

provider training about the use of effective coaching strategies so that family experiences in early intervention lead to the desired outcomes.

Indicators #5 and #6—Child Find: OSEP requires the reporting of percentage of infants and toddlers, birth to age 1 year, with IFSPs as compared to national data, and the percentage of infants and toddlers, birth to age 3 years, with IFSPs as compared to national data. Telepractice promotes Child Find efforts by facilitating the development and implementation of public awareness activities and materials, engaging in outreach activities with physicians and referring agencies, connecting experts with one another so they may explore best practices related to evaluation and assessment of children birth to age 3 years, and providing immediate access to interpreters when families do not speak English.

Forty-Five-Day Timeline: OSEP requires the reporting of percentage of eligible infants and toddlers with IFSPs for whom an evaluation and an initial IFSP meeting were conducted within Part C's 45-day timeline. Telepractice can improve this timely delivery of services by improving access to providers and services that are not available in a local community. In this way, telepractice addresses existing personnel shortages.

Transition: OSEP requires the reporting of percentage of all children exiting Part C who received timely planning to support the child's transition to preschool and other community services. Telepractice addresses this issue; professionals (e.g., service coordinator, early interventionist, preschool teacher) and multiple family members can call in to a transition conference by using distance technology.

The indicators described here relate specifically to the delivery of early intervention services by providing families in remote and rural areas with access to qualified personnel. Telepractice may improve a state's performance on these, and other, early intervention indicators.

Telepractice Supports Family-Centered Practices

When delivering family-centered early intervention to infants and toddlers who are deaf or hard of hearing, the vital roles parents play must be recognized and supported. After all, the parents and other caregivers are the clients; the early interventionist provides services to parents to benefit their children. Numerous studies demonstrate that effective parent engagement leads to improved communication outcomes in children with hearing loss (DesJardin & Eisenberg, 2007; Moeller, 2000; Zaidman-Zait & Young, 2007).

There are three distinct components of a family-centered approach to early intervention. Mahoney et al. (1999) define family-centered therapy as a commitment to helping families learn new information, receive emotional

support, and learn specific communication strategies to augment their child's language development. Others endorse the need for the early interventionist to facilitate the child's development by teaching parents specific strategies for interacting with their children (Dunst, 1999; Hanft, Rush, & Shelden, 2004; Klass, 2003; Muma, 1998; Wasik & Bryant, 2001). This paradigm has been adjusted specifically for children who are deaf or hard of hearing (Stredler-Brown, 2005, 2011).

Early interventionists, educators of the deaf, and speech-language pathologists often do not have the training to learn to be effective coaches. Therefore, these professionals may not be comfortable engaging with parents in this prescribed way (Fleming, Sawyer, & Campbell, 2007; Houston & Bradham, 2011). In traditional face-to-face therapy, providers may revert, unwittingly, to traditional child-centered practices.

In a telepractice service delivery model, parent coaching is a central component. And, because the professional is not in the room with the child, the parent must take control of the interaction with his/her child. The professional develops a partnership with the parent and by so doing, the coaching relationship emerges. This partnership emphasizes that the parent is the one who best knows his/her child's interests and temperament (Peterson, Luze, Eshbaugh, Jeon, & Kantz, 2007). As one parent of a toddler receiving telepractice services stated, "As his mom, I'm doing all of the activities with him—not the early interventionist. During the traditional home visits, I usually sat and watched her do everything. It was very frustrating!" (T. Kenny, personal communication, 2012).

As part of the coaching relationship, the professional develops the parents' proficiency using specific strategies and increases the parent's confidence in the use of these techniques. Parents learn to reinforce appropriate listening, speech, and/or language targets during structured activities. As the parents' confidence grows, the same speech, language, and/or listening strategies are incorporated into the child's play and other daily routines. For example, the parent may learn how to appropriately model and expand language during a cookie-baking activity. With practice, the parents' skills become more habitual and are readily transferred to other commonly occurring activities (e.g., bath time, dressing, setting the table). As a result of active engagement during telepractice sessions, parents are better equipped to integrate communication and language goals into their child's typical routines.

A Model of Telepractice for Children with Hearing Loss

Evidence continues to illustrate the shortage of professionals with the necessary knowledge and skills to deliver evidenced-based medical, clinical, and early intervention services to this special population (Houston & Perigoe, 2010; Houston, Munoz, & Bradham, 2011; JCIH, 2007). To provide greater

access to services, some practitioners and/or their programs are employing models of telepractice to address the developmental, communicative, and learning needs of young children with hearing loss and their families (Behl, Houston, Guthrie, & Guthrie, 2010; McCarthy et al., 2010). Results, to date, are usually favorable.

The project investigators for Sound Beginnings at Utah State University sought to evaluate the outcomes of telepractice. The intent was to determine if early intervention services delivered through telepractice (i.e., teleintervention) was effective, while at the same time ensuring family satisfaction with the children's communication outcomes. For this project, families had chosen listening and spoken language as the desired outcome for their children. The knowledge acquired and the skills used by the parents were carefully monitored to determine if they successfully employed recommended language facilitation techniques with their children.

Since the project required high-resolution audio and video, top-of-the-line videoconferencing equipment was purchased and placed in each family's home. While this equipment was optimal for this project, practitioners can use less expensive equipment such as a laptop with a web-based camera (webcam) and one of the freely available, online, encrypted videoconferencing services. The compact videoconferencing units used by Soung Beginnngs contained a video camera and a 24-inch video monitor connected to the unit console. The videoconferencing equipment was connected to a broadband Internet connection. Parents could see and hear the speech-language pathologist, who was housed in a clinic at the university. At the university site, the practitioner used the same equipment, which provided high-quality video and audio to observe, coach, and interact with the parents. The university had high-speed Internet capacity that allowed for consistent connectivity with the unit in the home.

Families received weekly teleintervention sessions; each lasted approximately 60–75 minutes. Families often had a packet of materials (e.g., toys and books) that were mailed to them from the university clinic. These toys were selected to meet the child's current goals in speech, language, and listening. These packets were mailed every 3 weeks or so and contained a sufficient number of materials to last 1 month. Parents returned the materials after the associated lessons were completed.

A typical session started with a discussion of the speech, language, and listening goals targeted during the previous session. Parents shared ways in which they integrated these communication strategies into their child's daily routines. As well, the speech-language pathologist and parents discussed new communication behaviors that had emerged since the previous visit that showed evidence of the child's progress (e.g., new speech sounds, words, and listening behaviors). This discussion helped teach parents to become objective observers of their child's skills. Once these updates occurred, the speech-language pathologist introduced the goals for that day's session. The practitioner

explained the goals for speech, language, listening, and other interactive communicative behaviors. Both the family and the practitioner used similar toys and everyday materials as they investigated these new strategies.

Next, the speech-language pathologist demonstrated a strategy and then asked the parent to engage the child. The parent attempted the new strategy while the practitioner observed. At this point in the session, the practitioner's role shifted to that of a coach. The speech-language pathologist provided positive reinforcement and constructive feedback to the parent based on the implementation of the activity and the application of communication strategies that promoted listening and spoken language development.

This same scenario repeated as one activity ended and a new activity began. Throughout the session, the parent and the speech-language pathologist closely monitored the child's attention level. For example, if the child began to lose interest, the parent may have said, "Let's do it one more time, and then we'll get something else to play with!" By maintaining this control, the parent was often able to move through several activities to reinforce listening and spoken language without losing the child's interest or engaging in a power struggle.

Following practice with these communication strategies, the parent was given ample time to discuss any concerns about their child's progress, to ask questions about short- or long-term communication goals, and to solicit input to troubleshoot their child's hearing technology (e.g., digital hearing aids, cochlear implants, FM systems). The speech-language pathologist summarized the goals and strategies that were modeled and practiced during the session. Based on the child's developmental level and performance, the parent and practitioner discussed communication goals for the following week. For a more complete description of the teleintervention project at Utah State University, see Behl et al., 2010.

Considerations Before Starting Telepractice

Program or center administrators must carefully select the providers who will be delivering telepractice services and the families who will receive them. Professionals may recognize that some parenting and other behavior management issues are better addressed through a traditional, face-to-face service delivery model. Likewise, some parents may not feel comfortable with telepractice and may decide that they prefer a more traditional, in-home service delivery model. However, these families may consider starting services at a center or in the home and slowly move to a telepractice model.

Some professionals and parents are "technophobes" and may feel intimidated by the technology. For providers who are reluctant to use technology in this manner, it may be helpful for them to observe practitioners who are currently providing telepractice services. It is important to recognize that once the equipment is in place and functioning well, the sessions focus less

on the operation of the technology and more on the intervention. Most of the technology—from the more expensive videoconferencing equipment to the standard laptop and webcam—are relatively simple to use. Tutorials on setting up and using the technology are available online and offered by many manufacturers and service providers. Regardless of how efficient a provider becomes using the equipment, it is critical to have support from information technology (IT) specialists who are experts in telecommunication technology. These specialists inform providers about new trends and products that can enhance telepractice and troubleshoot problems that may arise.

Another consideration is the type of Internet connection available in the remote community and at the professional's site. The speed of the Internet connection is a critical component for a successful interaction. It cannot be assumed that a family has access to a high-speed Internet connection. Another factor affecting bandwidth is the volume of users at any one time. A busy clinic may need to evaluate and accommodate the Internet connection to allow for high speech access.

Conclusion and Future Directions

Children who are deaf and hard of hearing and their families need access to appropriate early intervention services that are delivered by professionals who are well trained, knowledgeable, and able to use the communication approach the parents choose for their child. Unfortunately, making this a reality for all families with young children with hearing loss remains a challenge for most early intervention programs in this country. Advances in telecommunication and distance technology offer a new option. Programs may utilize models of telepractice to ensure access to appropriate services for the families they serve. Increasingly, this is happening around the United States and in other countries, especially for early intervention programs that support listening and spoken language. Children have obtained language outcomes that are consistent with or exceed developmental norms. Additionally, parents report that they have more confidence assuming their role as their child's primary language facilitator.

Parents, too, are requesting and seeking these services, especially when highly skilled early interventionists or other practitioners are not available in their communities. Programs that embrace models of telepractice are in a better position to meet this growing demand.

The use of telepractice adheres to the major tenets of early intervention services as required by IDEA Part C (Cason, 2009). Models of telepractice eliminate many of the barriers to services that continue to affect young children with hearing loss and their families. By leveraging the use of technology with this innovative service delivery model, more young children with hearing loss and their families will have greater access to well-trained practitioners, thus

increasing the probability that listening and spoken language outcomes will be achieved.

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The Volta Review, Volume 112(3), Winter 2012, 297–312

Telepractice: The Australian Experience in an International Context

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Telepractice is emerging as a viable alternative to traditional "face-to-face" service as practitioners seek to meet the diverse needs of children who are deaf or hard of hearing and their families. Telepractice provides the opportunity for many countries to expand their reach and viability within their own borders as well as the possibility of delivering some services internationally. The potential benefits of moving to telepractice models of service delivery are significant, but successful implementation requires that consideration be given to potential barriers. As one of the international "early adopters" of telepractice, the experiences of service providers in Australia offer insight into the factors that influence the development of telepractice services as well as some of the potential barriers to implementation.

Telepractice is gaining global acceptance as evidence emerges of its benefits as a service delivery model (Doarn, Protilla, & Sayre, 2010; Gournaris & Leigh, 2004; Mashima & Holtel, 2005; Polovoy, 2008; Szeftel et al., 2011). In Australia, the use of telepractice with children who are deaf and hard of hearing and their families occurred in response to a unique combination of factors that required practitioners to look beyond traditional methods of service delivery. The vast distances in Australia, the low incidence of hearing loss, and the lack of qualified practitioners in the field have led some organizations, such as the

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Royal Institute for Deaf and Blind Children (RIDBC), to pursue the use of telepractice in supporting families of children who are deaf or hard of hearing.

The Australian Context

More than 10 years ago, two Australian nongovernment centers for children who are deaf and hard of hearing reported on their growing use of telepractice. Projects at those two centers—Taralye in Victoria (Flett, 2001) and Cora Barclay Centre in South Australia (Payne & Duncan, 2001)—variously relied on the use of Internet protocols, or Integrated Services Digital Network (ISDN) technology, to connect children and families in rural Australian locations to services provided in more populous areas. Flett (2001) described the trial placement of computers capable of videoconferencing in two locations to allow early intervention staff to interact with caregivers and the local kindergartens in which the children were enrolled. Payne and Duncan (2001) described the placement of integrated videoconferencing units in schools in remote locations to enable specially trained practitioners to work directly with students with hearing loss and also to communicate with local school personnel about programming and progress. These early applications of videoconferencing technology served as a partial proof of concept for telepractice as a method of service delivery in Australia.

Following these early applications of telepractice technologies, RIDBC developed a larger scale program in the state of New South Wales, initially using ISDN technologies and later using emerging technologies, such as Internet protocols over Symmetric Digital Subscriber Lines (SDSL). More recently, with the benefit of federal government funding support, the RIDBC Teleschool™ program has focused on installing dedicated videoconferencing equipment in family homes for the purposes of facilitating interaction between practitioners and families of children who are deaf and hard of hearing (McCarthy, 2011). RIDBC Teleschool has continued to explore the use of a variety of technologies, including cellular networks for videoconference facilitation, iPods and iPads to deliver session-support resources, and the use of Australia's developing National Broadband Network for higher speed and more reliable Internet connections with families in remote locations. A second article in this issue (McCarthy, 2012) provides more detailed information regarding the RIDBC Teleschool program and its model of service delivery.

As one of the international "early adopters" of telecommunications technologies and telepractice to serve the needs of children who are deaf or hard of hearing, Australia is able to act as an example to other countries that are beginning to explore and implement these approaches. Although many of the factors that spawned the development of telepractice in this country are

particularly "Australian" in nature, most will have resonance in other international contexts.

The Tyranny of Distance

In 1966, Australian historian Geoffrey Blainey coined the term "the tyranny of distance" to highlight the impact that Australia's geographical remoteness and vast internal distances have played in shaping the country's development. Australia is one of the world's largest countries in physical size while at the same time having one of the lowest population densities (Blainey, 1966). Adding to the tyranny of distance is the fact that the population is not evenly distributed across the land mass (Department of Foreign Affairs and Trade, 2008a, b). Two-thirds of Australians live in major cities with the remainder living in rural and remote areas (Australian Bureau of Statistics, 2009).

For Australians with hearing loss in rural areas, the tyranny of distance is significant and access to special services is often severely limited. Two Federal Parliamentary Reports have highlighted the limited expertise available to meet the needs of children and adults who are deaf and hard of hearing and live in rural and remote areas of Australia (Employment, Workplace Relations, and Education Committee, 2002; Senate Community Affairs References Committee, 2010). In order to receive specialist support for children who are deaf and hard of hearing, families have often been obliged to travel great distances to attend appointments at hearing centers in the nearest major city. In some cases, families have relocated to major cities to minimize travel time and costs. These factors significantly influenced RIDBC's pursuit of an alternative service delivery model for children who are deaf and hard of hearing and their families, and highlight the relevance of telepractice in the Australian context.

Low Incidence of Childhood Hearing Loss

In Australia, approximately 2 out of 1,000 children are identified with significant permanent hearing loss by the time they reach school age (Russ et al., 2003). When those children are located in rural and remote areas of Australia, there is frequently a limited availability of appropriate expertise to serve their needs. Given the low incidence of hearing loss, many small communities lack the critical mass of children who are deaf and hard of hearing to warrant the local availability of a specialized practitioner (e.g., a teacher of the deaf or a Listening and Spoken Language Specialist [*LSLS™*]). Instead, a generalist special educator is often deployed to address a child's and family's support needs. In some rural and remote communities where an itinerant teacher of the deaf is employed, geographically disparate caseloads mean that it is difficult to maintain timely and appropriate levels of service provision (Employment, Workplace Relations, and Education Committee, 2002).

Some rural and remote areas of Australia have a higher prevalence of childhood hearing loss than in metropolitan areas due to a range of social and environmental factors. Notably, indigenous Australian children have higher rates of middle ear disease and associated hearing loss than nonindigenous children, and are more likely to reside in rural and remote locations (Couzos, Metcalf, & Murray, 2001). In addition, limited awareness of the impact of ear disease, reduced access to allied medical services, and poor compliance with medical interventions exacerbate the pervasiveness of middle ear disease in indigenous Australian children (Senate Community Affairs Committee, 2010). These facts add weight to the need for well-developed service delivery mechanisms that are capable of overcoming the effects of remoteness and inaccessibility of services. This situation also correlates with similar circumstances in other countries (e.g., Canada and the United States) where indigenous communities have higher incidences of childhood hearing loss and may be geographically isolated (World Health Organization [WHO], 1996).

Recruitment, Retention, and Education of Professional Staff

Recruitment, retention, and professional education of current and prospective staff are significant challenges for service delivery in rural and remote areas.

Recruitment

The workforce of practitioners who provide intervention and educational services to children who are deaf and hard of hearing and their families is small and typically specially trained (Johnson, 2004). Attracting such practitioners to remote areas of Australia and retaining them in those locations presents particular problems for agencies and employing authorities—both government and nongovernment. Even when practitioners are attracted to rural and remote locations, they are often expected to cover vast geographical distances and to do so with limited resources and extremely broad responsibilities (McCarthy, 2011). Teachers of the deaf, for example, may be expected to support a caseload that encompasses children with many different types of disabilities, ages, and varying levels of complexity—often across all settings from early intervention to high school inclusion (Employment, Workplace Relations, and Education Committee, 2002). Furthermore, once recruited, rural and remote practitioners often have great difficulty accessing opportunities for professional development as well as materials and technical resources (Rude, Jackson, Correa, & Luckner, 2005). Given that practitioners in remote areas are usually the only specialist of their type in the area, they also frequently experience a greater sense of isolation and lack of professional support. The combination of these factors results in high staff turnover in rural and remote areas (Ludlow, Conner, & Schechter 2005).

The application of telepractice in rural and remote locations provides the opportunity to have appropriately qualified and specialized practitioners meet the needs of children and families via technology—regardless of where they may be located. Instead of a small community with just one or two children of widely different ages depending on the sporadic services of a single itinerant practitioner, telepractice stands to deliver the opportunity for regular service delivery by appropriately qualified practitioners capable of meeting each child's specific needs. The telepractice model delivers the benefits of regular service and the important ability to match practitioner skills and experience to the specific requirements of the child and family.

Retention

The benefits of telepractice do not pertain solely to direct service delivery. The technologies and techniques associated with telepractice (i.e., videoconferencing, web conferencing) stand to impact directly on preparation and retention of practitioners—including those who do continue to be located in rural and remote locations. These practitioners can use telepractice methods to participate in professional development opportunities in major cities or, indeed, to access regular support and guidance from other, more experienced practitioners (see DeMoss, Clem, & Wilson, 2012, or Douglas, 2012, in this issue). Even with these additional supports in place, it is clear that the supply of qualified practitioners cannot meet the demand created by the dispersed population of children who are deaf or hard of hearing, causing positions to remain vacant nationwide (Ross & Michael, 2006). Here again, telepractice can play a particularly important role.

Education

In the Australian context, telepractice has facilitated the enrollment of more postgraduate students in university programs, efficiently utilized (and distributed) academic expertise across the nation, and allowed practicum supervisors and mentors the opportunity to observe postgraduate students in real-time practice teaching sessions wherever they may be located (RIDBC, 2011). To these ends, RIDBC Renwick Centre (The University of Newcastle) currently has more than 150 students from every state and territory in Australia and internationally—most notably from countries in the Asia-Pacific region—undertaking studies in education of the deaf and/or auditory-verbal practice (RIDBC, 2011). Delivery of their coursework via telepractice allows these students to continue in their current employment while further developing their knowledge and skills. RIDBC Renwick Centre employs a telepractice model using dedicated videoconferencing and other web-based technologies to deliver postgraduate coursework in both real time and asynchronous formats. This greatly reduces the need for travel and enhances the opportunities for current

and prospective practitioners from across the nation (and, indeed, across the world) to undertake highly specialized professional education.

When students in postgraduate education programs are located internationally, telepractice permits the practical assessment of those students, in their first language, by coordinating synchronous meetings with the student, the professor or supervisor, and an interpreter. Indeed, the same telepractice technologies that are used to deliver therapy and educational services for children and families in rural and remote Australia are utilized to facilitate practical supervision of students in almost any location. For example, the practicum coordinator and an interpreter at RIDBC Renwick Centre in Australia can use technology to observe a graduate student in Seoul, Korea, and provide immediate feedback as she teaches a lesson in her own school using her native language.

The International Context

The factors outlined here have created an environment that places Australia in a unique position to embrace and develop telepractice technologies and techniques for application in the field of professional service delivery for children who are deaf and hard of hearing and their families as well as training and professional development of LSLS and other professionals. The issues faced by Australia are not, however, unique to that country. The challenges outlined pertain to varying degrees in almost all international contexts. Challenges created by extreme distances, the low incidence of hearing loss, higher prevalence among indigenous children, and the difficulties associated with developing and deploying an appropriately trained workforce are common in many countries. There are many reasons to consider the application of the Australian experience internationally, but particularly to developing countries, such as those in the Asia-Pacific region.

Demography, Not Geography

As already discussed, the geography of Australia presents an ideal circumstance and incentive for the introduction of telepractice. The large land mass and low population density of the country virtually demand an alternative to "face-to-face" service delivery models as a basis for providing equity of access to specialized hearing services across the nation. Clearly, many other countries also experience the combination of geographic distance and low population density (i.e., regions in the Circumpolar North, including Mongolia, Alaska, and northern Canada). Isolation need not, however, be solely a consequence of distance. Isolation can be a consequence of other features of geography, such as weather or hazardous terrain. For example, in Motuo, a small community in the Tibetan Autonomous Region of China, access

requires land travelers to pass through parts of the snow-bound Himalayas. Access to qualified practitioners in these locations will clearly be limited.

In other countries, however, isolation from appropriate professional services may be a consequence of factors other than geography. Like Australia, many countries will experience the effects of a relative scarcity of practitioners and the dispersed nature of potential clients in areas of low population density. In some countries, factors such as the lack of readily available transportation or the decreased viability of travel (by families or practitioners) because of the congestion caused by high traffic volumes may be the cause of isolation from services. Undoubtedly, isolation from readily available services can be a factor for children who are deaf or hard of hearing and their families anywhere in the world, even in metropolitan areas. Isolation from services, regardless of the reason, presents an opportunity for the application of telepractice as an alternative to traditional face-to-face service delivery.

Incidence and Prevalence of Childhood Hearing Loss

There is particular potential for the application of the Australian experience with telepractice to regions where both demography and geography present particular challenges for service delivery and where the prevalence of childhood hearing loss is potentially very high (Leigh, Newall, & Newall, 2010), such as parts of the Asia-Pacific region. There are numerous potential reasons for the higher prevalence of hearing loss in these regions including the higher likelihood of some maternal infections and other preventable causes of infant hearing loss, such as meningitis and ototoxic drugs (Olusanya, 2006). As noted by Olusanya, Luxon, and Wirz (2006), in developing countries in particular there is also an increased potential for childhood hearing loss associated with poor maternal and child health and a range of other health conditions. The gradual introduction of Universal Newborn Hearing Screening in many countries in the Asia-Pacific region will also likely exacerbate the mismatch between demand for and the availability of services in those countries (Olusanya, 2006).

Intervention and (Re)Habilitation

Consistent with the development of hearing screening programs in many developing countries, the WHO (2004) has sought to promote the development of audiological and associated support services, including the provision of low-cost hearing aids. There has been a corresponding growth in the application of cochlear implant technology in the Asia-Pacific region as a consequence of the wider application of socialized medicine and also through some public-private partnerships and private benefaction (Leigh et al., 2010). In regard to the latter, it is notable that, in 2006, a private benefactor donated 15,000 cochlear implant devices (and associated support for surgery) for the benefit of children who are

deaf and hard of hearing in China (Leigh et al., 2010). Such increased availability of hearing technology will undoubtedly require a shift in current intervention models in many countries in the region to accommodate a greater emphasis on the development of listening and spoken language. According to the AG Bell Academy for Listening and Spoken Language, at the time of this printing there is only one practitioner registered as a LSLS certified professional in China (AG Bell Academy for Listening and Spoken Language, 2012). Here again, the use of telepractice could provide access to appropriately certified practitioners in Australia or other parts of the world for direct service delivery and/or for the professional development of local personnel.

Implementation of Telepractice: An International Solution?

There are many countries—particularly developing countries—where there is a large gap between the need for early intervention or related services for children who are deaf and hard of hearing and the local availability of those services (Olusanya, 2006). At least in part, telepractice has the potential to assist in bridging that gap. As is the case in Australia, existing early intervention services in central locations in many countries could be delivered more widely and efficiently to a greater number of children by practitioners using telepractice. Further, there is the potential for the international application of telepractice using the skills and resources of practitioners in other (developed) countries. The latter scenario has the potential to assist in both the delivery and development of services in developing countries—potentially as part of international aid arrangements. Clearly, however, there will be some potential barriers to the implementation of telepractice as a service solution in international contexts. In these authors' experience, such barriers may include, among others, the lack of availability of appropriate technology and infrastructure to support the technology, economic constraints, the lack of availability of effective ancillary services, social and cultural constraints, language differences, and the impact of possible negative perceptions of quality of services that are delivered by telepractice.

Technology and Staffing

Telepractice can be provided using a variety of technologies ranging from dedicated professional-grade videoconferencing to freely available software on a home computer. The infrastructure existing in a particular country and/or a region within that country will influence the type of technology that can be used most successfully in that location. Remarkably, many countries have excellent technology infrastructure even when other seemingly necessary infrastructure is not yet in place. Hutton (2011) noted, for example, that more people in Africa have access to mobile phones than to clean drinking water. Nevertheless, the cost of equipment set-up and ongoing connection costs may prevent some locations

from undertaking telepractice for service delivery. Different types of equipment and technology have widely varying costs. Funding may be a significant factor in choosing the type of technology to be used in a telepractice setting. Staffing costs are also a consideration. Specially trained practitioners are essential; however, support staff (such as administrative staff and technology support staff) may be equally as important. Payment and reimbursement issues are also a consideration before commencing a telepractice program.

Availability of Ancillary Services

In some countries—particularly developing countries—lack of effective ancillary services, such as audiology, otology, and speech-language pathology, will significantly influence the likelihood of success of any intervention service. This will be no less the case with telepractice. Audiology, for example, is a relatively new profession in many countries and, as such, qualified audiologists may be entirely unavailable in those locations. This is particularly the case in parts of Asia (WHO, 1998). Similarly, in many countries there will be a dearth of technology for assessing hearing and fitting hearing aids (Kumar, 2001). Indeed, the lack of availability and/or affordability of hearing aids at all will create a significant impediment to the establishment of effective practice—telepractice or face-to-face delivery—in many developing countries (Mukari, Tan, & Abdullah, 2006). Intervention is an important component of addressing the needs of children who are deaf or hard of hearing, but intervention alone does not guarantee successful outcomes. The availability of ancillary resources will be critical to maximize the effectiveness of any telepractice program.

Cultural Considerations

Early intervention of any type may be perceived or valued differently according to the customs and cultural beliefs of the consumers of those services. It is well understood, for example, that participation in early intervention programs may be challenging for parents from some cultures because of the stigma attached to disability (Leigh et al., 2010). In other cultures, families may be difficult to engage in intervention because there is simply no perception that hearing loss requires such intervention (Rhoades, 2010a). Hearing loss may be seen as unremarkable or commonplace such that intervention of any type is not seen as necessary, much less as a priority (Rhoades, 2010b).

In some cultures, the added issues associated with telepractice may present additional cultural or social concerns. From some perspectives, the use of telepractice may be, at least initially, too confronting. Cross-cultural experience in Australia suggests that there are several key questions that should be considered before commencing telepractice services:

1. Are there cultural concerns about the participant's image being captured?
2. Is the mother, or the primary caregiver, able to engage in intervention sessions—asking and answering questions—or does another relative or elder need to be involved?
3. Are there culturally specific behaviors that must be observed (e.g., is eye contact considered acceptable or unacceptable)?
4. Does the practitioner speak the same language as the family and, if not, what ancillary services (e.g., interpreting, cultural liaison) are required in order to ensure effective communication?
5. Does the practitioner have the skill necessary to maximize the benefit of an interpreter or other community liaison worker?

In addition to these specific issues, practitioners need to consider broader issues of language and culture in setting goals and choosing activities. The inclusion of local knowledge, language, and experiences will make the intervention relevant for the family and increase the likelihood of generalization of skills outside of the telepractice session.

Perceptions of Quality

Regardless of the country involved, it may be that some families will view services delivered through telepractice with some level of concern in regard to quality or potential for efficacy. Telepractice models *may* be perceived as a lesser option than face-to-face service delivery. At the very least, clinical interactions may be perceived as being qualitatively "different." Kully (2002) reported that clients in her trial of telepractice for speech-language pathology interventions in Canada indicated that interactions during the sessions were "not the same as face-to-face interactions at the clinic" (p. 5). Nevertheless, the practitioners reported that all treatment goals were met and clients indicated that they were satisfied with the telepractice sessions and the outcomes. Further, the clients indicated that overall they preferred the use of telepractice to the exigencies of long-distance travel and that the savings in terms of time and cost were considerable.

Experience at RIDBC Teleschool is consistent with Kully's experience (2002) and suggests that some families are indeed apprehensive about the process of telepractice and require explicit information as to how it works. These initial concerns can, however, be alleviated by discussing the expectations of each participant prior to beginning telepractice sessions and providing written materials to supplement that verbal information. Clearly, however, research is required to more fully investigate any influence that perceptions of quality may have on service delivery and effectiveness. It may be that any concerns or issues are related to specific factors that may differ within countries as well as across countries. Research will ultimately need to address this issue across international contexts.

Telepractice in Samoa: An Example of International Application

In 2008, RIDBC Teleschool engaged in a project to assist in the delivery of services to children who are deaf or hard of hearing in Samoa through collaboration with an inclusive education center for children with disabilities in that country. The program began by establishing a liaison with educational and governmental agencies in Samoa to determine the needs of the population and assess the available infrastructure. A proposal was developed, which included a national plan for hearing screening, early intervention, and inclusive education.

Initially, RIDBC audiologists visited Samoa and assessed the children's hearing, fitted hearing aids, and made recommendations about which children might benefit from a cochlear implant. Three students, between 3 and 5 years of age, were identified as potential candidates for cochlear implants and intensive intervention to develop listening and spoken language skills. These children traveled to Sydney, Australia, with their families to undergo an evaluation of candidacy for cochlear implants. During the candidacy process, the families lived on campus at RIDBC in Sydney, participated in intensive auditory-verbal therapy sessions as well as group lessons, and attended RIDBC's auditory-oral preschool. Each family remained on campus for 3 months postsurgery to allow for initial MAPping and habilitation sessions to take place. English was not the first language for two of the families, but all three sets of parents spoke adequate English. Consequently, all sessions were delivered in English with the parents translating the activities into the native language for the children. Interpreters were used when necessary for more complex information, such as reviewing the consent for cochlear implant surgery.

After the 3-month residential stay, each family returned to Samoa where the children resumed their enrollment in the local education center. Their daily schooling was supplemented by weekly telepractice sessions with RIDBC practitioners who used an auditory-verbal approach to focus on the development of listening and spoken language skills. Sessions were conducted in the morning at the start of the school day (9:00 a.m. Samoa time/6:30 a.m. Sydney time). Weekly telepractice sessions were initially delivered using a computer with a webcam via Skype. The reliability of this platform was inconsistent and dedicated videoconferencing equipment was eventually donated and installed. This resulted in a more consistent connection with a superior picture quality, audio signal, and audio-video synchronicity—all of which are essential for an effective telepractice session.

The children attended individual weekly sessions with at least one adult (e.g., the parent and/or staff from the local education center). Local staff was involved in planning, preparation, and evaluation of weekly sessions with RIDBC practitioners. At the end of each session, a weekly homework plan was provided to ensure generalization of skills from the telepractice session to all

areas of the children's schooling and home lives. Samoan staff was also provided with ongoing training in specific auditory-verbal techniques, such as acoustic highlighting, responsive teaching, and prompting techniques. Three staff members at the Samoan education center were targeted to receive additional postgraduate-level education through the RIDBC Renwick Centre as well as other online continuing professional education opportunities.

Sessions included three distinct types of interactions: (1) the RIDBC practitioner providing direct intervention to the child, (2) the RIDBC practitioner coaching and guiding the adult during adult/child interactions, and (3) information sharing between the RIDBC practitioner and adult, including collaborative planning, adult education, and skills training. The first interaction type, direct intervention, included activities typically seen in any early intervention session, although in the telepractice sessions activities were adapted to be interactive across the technology. For example, in eliciting a response to an auditory awareness task, the practitioner acted as a distractor while the adult presented the sounds using live voice. When the child became a more experienced listener, the roles were reversed with the adult acting as the distractor and the practitioner presenting the sounds via the technology. With coaching, the practitioner modeled a specific activity for the adult, such as how to focus on language while preparing a meal (McGinnis, 2010). The practitioner then encouraged the adult to try the activity with the child, providing encouragement and feedback during and after the activity. Similarly, the adult often demonstrated favorite activities from home or school while the practitioner observed and provided suggestions for incorporating the child's goals into the activity. In both types of coaching, the adult and practitioner discussed successes, challenges, and ideas for generalizing the goals outside of the telepractice session. In each session, time was allocated to the third interaction type, information sharing, including the provision of information and training related to specific topics (e.g., managing the cochlear implant, as well as discussion of informal topics, or questions related to a specific strategy that arose during each session). In addition, each session concluded with a review of the activities completed and the child's progress towards identified goals. The adult and practitioner discussed which activities to focus on in the upcoming week and how to generalize goals to other activities in the child's daily routines both at home and at school.

RIDBC practitioners continue to provide weekly telepractice sessions to further develop the skills of the Samoan staff and to monitor student progress. However, the Samoan staff now confidently provide regular face-to-face services to the parents of the 3 Samoan children. In addition, a number of other children with hearing loss in the local education center have benefitted from the skills acquired by the Samoan staff through the collaboration with RIDBC. The use of telepractice in Samoa has also extended to the provision of remotely delivered audiology services and cochlear implant MAPping. The children who received cochlear implants no longer need to return to Australia for

periodic MAPping. Local staff has been trained to facilitate the MAPping in Samoa while an appropriately qualified and experienced audiologist in Sydney MAPs the cochlear implant remotely using videoconferencing and remote access software to control the local computer and software. These sessions take place using a high-speed broadband connection and associated videoconferencing equipment.

For Samoa, telepractice has overcome the crisis of capacity with regard to LSLS certified professionals and has provided direct access to cochlear implant technology and ongoing support for auditory (re)habilitation and audiological services. Telepractice has addressed issues of limited teacher preparation and professional development by providing access to a hub of expertise at RIDBC where ongoing training is provided to Samoan staff on a weekly basis. As demonstrated in Samoa, telepractice has the potential to create opportunities for children who are deaf and hard of hearing in other countries where similar circumstances exist.

Conclusion

Although there are some potential barriers to implementation, the benefits of telepractice are substantial. This has been well demonstrated in the Australian context where the benefits have improved availability and quality of service delivery for children who are deaf and hard of hearing in rural and remote areas. Those benefits include increased local access to specially trained specialists, expanded parental choice of intervention approach and communication mode (e.g., access to listening and spoken language professionals), expanded local access to a wider range of available allied health services (e.g., otology, audiology), and the creation of new and viable opportunities for initial and continuing professional education.

Without question, telepractice is particularly well-suited to support the needs of the many Australian children and families who live at considerable distances from major service delivery centers. However, it is becoming increasingly clear that telepractice has the potential to increase the efficiency and effectiveness of service delivery in areas that are neither rural nor geographically remote. This potential has been embraced at RIDBC Teleschool where telepractice is now used to deliver services to students with hearing loss who are in mainstream educational settings across the large metropolitan area of Sydney (see McCarthy, 2012, in this issue).

The knowledge gathered from the Australian experience can be used to assist the application of telepractice in other countries—particularly in neighboring countries in the Asia-Pacific region. There is great potential for services in many countries to expand their reach and viability by using telepractice service models within their own borders and/or to collaborate with countries like Australia to provide some services remotely. With appropriate consideration of

the potential barriers, the potential application of telepractice across international boundaries is enormous.

Mashima and Holtel (2005), among others (American Speech-Language-Hearing Association, 2010; Doarn et al., 2008; Speedie, Ferguson, Sanders, & Doarn, 2008), have suggested that the future of telepractice is due to a range of factors including: decreasing costs of telecommunications technologies and devices, increasing widespread connectivity, increasing demand for home health care, personnel shortages, and increasing acceptance and satisfaction of participants. In the field of intervention and education for children who are deaf and hard of hearing and their families, the application of this technology and the associated development of new and innovative intervention strategies stands to shape every aspect of service delivery into the future.

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The Volta Review, Volume 112(3), Winter 2012, 313–327

The Value of a Learning Community to Support Telepractice for Infants and Toddlers with Hearing Loss

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For a variety of reasons, professionals are taking greater control over their own professional development and demonstrating a commitment to lifelong learning. Online resources and social media outlets have provided new ways for professionals to connect and form learning communities to build core knowledge and set standards of practice. The National Center for Hearing Assessment and Management at Utah State University launched a learning community to increase and promote the knowledge base regarding the use of telepractice as an early intervention service delivery model for children who are deaf or hard of hearing and their families. The learning community was comprised of administrators and providers from six programs that were providing early intervention therapeutic services via telepractice. Members employed a variety of mechanisms to support their engagement with one another, including in-person meetings, web-based and phone meetings, and internet-based social media. Evaluation results gathered over a 1-year period showed that individuals reported that they gained new knowledge to guide their efforts. Collective accomplishments of the learning community included refinement of telepractice implementation strategies and the dissemination of new information to the field of early intervention. These outcomes, along with recommendations for the use of learning communities, are discussed.

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Introduction

Increasingly, professionals are being encouraged by their employers to take greater ownership of their own professional development and to embrace a mindset of lifelong learning. While continuing education is required by professional associations and to maintain state licensure, many professionals are turning to online resources and other social media outlets to augment and enhance their knowledge and skills. By using technology to connect with others who share similar expertise, professionals recognize the contribution of others' experiences to enhance their own learning and skill development. Thus, communities of learning and, similarly, communities of practice, are emerging as invaluable forums to actively engage groups of individuals who share a common interest to foster greater collaboration, problem solve, and build core knowledge.

Learning communities have become increasingly prevalent, but their structure and configurations vary. As an organizational tool, they are now used across a wide array of disciplines and work settings including businesses, self-employment, nonprofit organizations, higher education, and especially in elementary and secondary education (Shapiro & Levine, 2004). While no universal definition of a learning community exists, consistent principles include: (a) supportive and shared leadership, (b) shared values and vision, (c) collective learning and application of learning, (d) supportive conditions, and (e) shared personal practice (Hord, 1997a). These principles create a group identity and cohesiveness to encourage collaboration, support, and the exchange of ideas among diverse participants (Kaplan & Bartlett, 2012; Kellogg, 1999; Smith, 2001).

A learning community structure is ideal for advancing the delivery of early intervention services to families through telepractice, which is defined as the application of telecommunications technology to provide professional services to clients at a distance (American Speech-Language-Hearing Association [ASHA], 2010). Furthermore, a learning community is a perfect opportunity to investigate the use of telepractice employed specifically to serve infants and toddlers who are deaf and hard of hearing, as this practice is currently gaining momentum in the United States (ASHA, 2010). Because of their increased popularity, learning communities provide a unique platform for professionals who seek to engage with other practitioners to build core knowledge around a shared interest. More importantly, learning communities are particularly advantageous when the focus is on a fast-growing practice and one for which the evidence-base is limited. Given the chasm between interventionists' enthusiastic implementation of telepractice and the paucity of literature to guide its use, a learning community is well suited to advance this practice.

Telepractice: Meeting the Needs of Children and Families

Telepractice continues to be recognized as a viable service delivery model for meeting the needs of families of infants and toddlers who are deaf and hard of hearing (Behl, Houston, Guthrie, & Guthrie, 2010; Houston, 2011; Houston & Stredler-Brown, 2012, in this issue; McCarthy, Munoz, & White, 2010). Furthermore, while approximately 77% of children diagnosed with a permanent hearing loss enroll in early intervention by the age of 6 months, not all children enrolled have access to the services they need for speech and language development when listening and spoken language communication is chosen (Russ, Hanna, DesGeorges, & Forsman, 2010). If available, telepractice may ensure that early intervention services are delivered in a timely, coordinated, and consistent manner by providers with expertise working with this population. Studies indicate that when children with hearing loss are identified early and intervention is initiated before 6 months of age, they achieve language, speech, and social-emotional outcomes that are significantly better than those children who are identified later (Apuzzo & Yoshinaga-Itano, 1995; Mayne, Yoshinaga-Itano, & Sedey, 1998; Pipp-Siegel, Sedey, VanLeeuwen, & Yoshinaga-Itano, 2003; Yoshinaga-Itano, 2001;Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998).

Successful outcomes for children identified early with hearing loss have been tied to the services delivered by professionals who are well trained in parent-infant intervention (Calderon, 2000; Moeller, 2000). However, access to highly skilled practitioners, especially speech-language pathologists and teachers of the deaf, remains a challenge for most families. As numerous studies indicate, practicing speech-language pathologists and teachers of the deaf have significant disparities in their professional training and are often unable to meet the chosen communication and educational needs of young children with hearing loss (Compton, Tucker, & Flynn, 2009; Houston & Caraway, 2010; Houston & Perigoe, 2010; Johnson, 2004; Lenihan, 2010; Luckhurst, 2008; Robbins & Caraway, 2010; Vernon, 2007).

This dearth of appropriately trained professionals has led many children with hearing loss and their families to be either underserved or not served at all. For some families, the provider may not have the knowledge and skills to use the selected communication approach. Thus, for some families, telepractice is an alternative to traditional in-home services as it allows for direct interaction with a provider, outside of the community, who has appropriate qualifications. Even when service providers are available in the community, families may incur costs due to travel time to appointments, child care for other children in the family, and missed work. Likewise, early intervention providers may spend several hours driving to a family's home to deliver home-based services, which presents an additional cost to the organization supporting the provider (see Olsen, Fiechtl, & Rule, 2012, in this issue). In these situations, telepractice

provides a cost savings for the interventionists or their sponsoring organization as well.

Rapid innovations in videoconferencing technology and widespread broadband Internet connections have allowed models of telepractice to be pioneered by some "early adopters"—those practitioners who are respected by their peers for being a step ahead in implementing new ideas (Rogers, 1995). However, as the use of telepractice has grown, challenges have emerged. For example, Internet security and privacy remain concerns, and professionals have faced difficulty implementing robust telepractice programs due to the absence of interstate/cross-border licensure, low reimbursement, and limited efficacy data in support of the model.

NCHAM: Supporting the Telepractice Learning Community

The National Center for Hearing Assessment and Management (NCHAM) at Utah State University recognized the potential of telepractice as a means to ensure that more children who are deaf and hard of hearing and their families have access to appropriate early intervention services. NCHAM serves as the national resource center for the implementation and improvement of comprehensive and effective early hearing detection and intervention (EHDI) systems. As a multidisciplinary center, NCHAM's goal is to ensure that all infants and toddlers with hearing loss are identified as early as possible and provided with timely and appropriate audiological, educational, and medical intervention. To promote wider adoption of telepractice models and to help current providers of telepractice benefit from shared expertise, NCHAM formed the NCHAM Tele-Intervention Learning Community in early 2010. Since its inception, the learning community has had a targeted focus: to establish and disseminate a shared knowledge based and evidence-based practices that support telepractice models for families of infants and toddlers who are deaf or hard of hearing.

Methods

The procedures used to direct the learning community over a 10-month period and the activities that reflect the aforementioned principles of a learning community are described and highlighted further. Both quantitative and qualitative methods were used to evaluate the effectiveness of the learning community.

Identification and Selection of Learning Community Members

Identifying potential participants for the learning community began with a review of responses from a survey administered to state EHDI coordinators. These coordinators were asked to identify programs involved in the use of

telehealth, generally defined as the delivery of health-related services and information via telecommunications technologies (Thielst, 2010). Results revealed that multiple early intervention programs serving children who are deaf and hard of hearing were either planning to use telepractice methods or had already initiated these activities. The program directors were then interviewed to obtain descriptions of their efforts and to determine their interest in networking with other centers delivering similar services. Those who confirmed their use of telepractice methods to deliver in-home early intervention services and their interest in collaborating with others were then invited to join the learning community.

Composition of a learning community requires members who have a clear understanding of the purpose of the collaboration and a commitment for engagement. Participants who were selected to join the learning community confirmed, in writing, their commitment to achieving the following outcomes:

- Gain new knowledge about telepractice technologies and its application.
- Understand the importance of "the human factor" (e.g., building rapport with providers and families, ensuring positive interpersonal interactions in service provision).
- Articulate the key steps in the development of telepractice services.
- Identify tools to measure the cost and effectiveness of telepractice services.
- Identify resources and colleagues at a national level to offer support and technical assistance to guide the work plan.

To achieve these outcomes, participants agreed to meet the following obligations:

- A strong commitment from program administrators for involvement in the learning community.
- Financial resources to sustain and/or expand the program's telepractice efforts for at least 1 year.
- Participation from two people to represent the program (e.g., a local provider, a technical resource person, and/or a family leader).
- Ability to cover the costs to attend an onsite meeting.
- Participation in monthly teleconference calls with the learning community participants for a 6-month period.
- A willingness to share tools, materials, accomplishments, and challenges with the learning community participants and make contributions toward a collective online resource.
- Submission of presentations with other learning community members at relevant conferences.
- Collaboration with other members to disseminate resulting products.

Participants consisted of administrators and service providers/clinicians from six early intervention programs. Five of the programs specialized in providing a listening and spoken language communication approach for children who are deaf and hard of hearing. This characteristic was not an intentional criterion; rather, no programs providing Total Communication, simultaneous communication, American Sign Language, or any other communication approach were identified based on the aforementioned survey results. Additionally, one participating program serving a broader Part C population of infants and toddlers with developmental delays was asked to join the learning community due to its recent experience using telepractice and its affiliation with another participating program. Participants represented the following programs: The Listen Foundation in Denver, Colorado; Hearts for Hearing in Oklahoma City, Oklahoma; Listen and Talk in Seattle, Washington; Center for Communication, Hearing and Deafness in West Allis, Wisconsin; Sound Beginnings in Logan, Utah; and Up to Three at the Center for Persons with Disabilities, also housed at Utah State University in Logan. The learning community was comprised of 15 individuals, including facilitators and technology support staff from NCHAM.

Learning Community Activities

Initially, to form the learning community and establish an operational infrastructure, two primary activities were undertaken: an intensive onsite meeting followed by monthly conference calls for a 6-month period.

Initial Onsite Meeting

An effective learning community requires the establishment of rapport and a sense of trust among its members (Hord, 1997b). To provide this foundation, a 1 1/2 day onsite meeting was held at Utah State University. This onsite meeting also created a shared knowledge base on which to build future learning experiences. Two representatives from each program were invited to attend this meeting. Day 1 of the onsite meeting began with a reiteration of the purpose of the learning community and expectations for participation. The goal for the onsite meeting emphasized the importance of establishing a shared knowledge base and fostering a sense of community among the participants.

Next, each participating program provided an overview of their telepractice efforts. Participants brought short video clips of sessions or other visual displays describing their efforts. This was followed by a group discussion about the principles driving telepractice efforts. More specifically, a great deal of discussion focused on how a telepractice session differs from a traditional home visit and the perceived benefits and challenges of telepractice. Organizers conducted a hands-on examination of various videoconferenc-

ing/teleconferencing equipment, including voice-over Internet protocols (VOIP; i.e., Skype with a laptop computer), a Tandberg system, Microsoft Xbox 360 Kinect, Cisco UMI, and videophones to allow the group a shared experience using each system. Learning community members were able to identify advantages and disadvantages of various systems.

Day 2 focused on the direction the learning community would establish for itself based on group consensus. A repeated theme was the need to evaluate the effectiveness of telepractice. As a result, the group constructed key research questions to drive an evaluation of the learning community. The concept of creating a resource guide was developed at the onsite meeting. The purpose of this guide would be to serve as a resource reflecting the shared knowledge of the learning community. Because of the collaborative nature of the project, all learning community participants would make contributions by writing the narrative, providing references, contributing family "stories," and editing the guide.

Finally, the group determined the logistics of future communications among the learning community members. Additionally, topics for discussion were identified along with an outline and a timeline for creating the identified products.

Ongoing Communications

Participants committed to participating in monthly 90-minute calls for a 6-month period. These phone conferences were conducted using a variety of methods. Adobe Connect was used for some of the meetings to facilitate document sharing and to provide the opportunity to share desktops among speakers. Traditional telephone conferencing was used at other times. The agenda for the calls covered a wide range of topics, including identification of a skillset for early intervention providers; tools to prepare parents for telepractice; creation of an evaluation logic model; sharing of tools to evaluate telepractice; conveying experiences using new technologies; and discussion of reimbursement issues, interstate licensure issues, and funding. Each phone conference also dedicated time to the development and marketing of a resource guide for the delivery of early intervention services via telepractice. To facilitate interaction and the exchange of information outside of these calls, a password-protected virtual learning environment with Moodle, a PHP-based learning management system (LMS), was created. Referred to as a "workshop space," this site provided the opportunity for members to dialogue with one another, post documents, and share resources. Additionally, Google Docs was used to work collaboratively on products, such as an evaluation framework and the telepractice resource guide. Google Docs allowed all learning community members to work online to access a shared document and to provide appropriate edits.

Outcomes

The outcomes of the learning community are reflected in the knowledge gained, the products developed, and the evaluation of the learning community process itself.

Knowledge Gained

Through the combined investigative efforts of the learning community members, each participant expanded their knowledge base. Through hands-on experiences, members increased their knowledge of various hardware and software systems that, in turn, influenced their own program practices. An understanding of Internet broadband connectivity strength as the primary factor impacting the quality of video and audio signals was a major influence on telepractice implementation. Learning about specific issues, such as Internet security, required members to access information from the literature from online searches of telepractice blogs and from related technology-focused websites. As a result, learning community members attained a deeper understanding of Internet security in relation to the delivery of telepractice.

Members also researched policies and practices pertaining to interstate licensure and reimbursement practices within their states and within their professions. For example, learning community members developed and administered an online survey to state Part C coordinators to learn more about Part C as a source for telepractice reimbursement. Based on 19 responses, the results revealed that 73% of the state Part C agencies provided reimbursement for telepractice services, with the majority providing reimbursement for speech-language therapy. This information served to identify and illuminate a challenging issue and provide direction for addressing state-specific barriers. Additionally, the learning community members expanded their knowledge regarding ways to evaluate telepractice through the collective development of an evaluation logic model.

Products

Collective efforts of learning community members resulted in multiple products. The primary outcome was the creation of *A Practical Guide to the Use of Tele-Intervention in Providing Listening and Spoken Language Services to Infants and Toddlers Who Are Deaf or Hard of Hearing*, which is available for free online at http://infanthearing.org/ti-guide. Representatives from all of the participating early intervention programs contributed to the content and/or editing of this guide, and all worked to market the guide through their connections with various professional organizations.

Multiple tools are listed within the guide to assist in the implementation of telepractice to deliver early intervention services as well as to enhance the

Table 1. Evaluation of onsite meeting

Rate the following:	*Rating scale (1–4) (Low–High)*
The purpose of the learning community was well explained.	3.88
The expectations for participation were clear and reasonable.	3.75
Thorough information was provided about the logistics of the meeting.	3.88
The meeting was well organized.	3.88
Participants were encouraged to ask questions.	4.00
Participants were encouraged to provide their opinions.	3.88
Presentations and discussions were interesting.	4.00
The pace of the meeting was appropriate.	3.75
I gained new knowledge about telepractice from this meeting.	3.88
The onsite meeting met the stated purpose.	3.75

quality of research regarding telepractice for serving this population. Examples of these tools include a checklist for families to prepare for a telepractice session, an informed consent form to ensure families are aware of the potential security risks of telepractice, and a skills checklist for providers implementing telepractice.

The dissemination of these products also reflects a collaborative approach. Individuals from the learning community disseminated an announcement about the resource guide to targeted professional organizations, including the Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell), ASHA, the National Dissemination Center for Children with Disabilities, and the National Early Childhood Technical Assistance Center. Various learning community members also presented the efforts and resulting outcomes of the learning community at the AG Bell 2012 Convention and the 2012 Early Hearing Detection and Intervention Meeting.

Evaluation Results

Two surveys were administered to participants to evaluate the significance of the learning community process. The first survey was administered immediately after the onsite meeting. This survey was designed to evaluate the extent to which members were fully aware of the expectations prior to their participation, the dynamics of the onsite meeting, and the opportunity to increase participant knowledge. Table 1 reflects the ratings of the participants.

Open-ended questions yielded comments about each participant's preparation for the onsite meeting. One participant stated that the in-depth personal interview and introduction to the learning community via telephone prior to the meeting was important to field questions and ensure confidence in the endeavor. Reinforcing the spirit of a shared vision, another respondent wrote

Table 2. Evaluation of monthly learning community activities

Rate the following:	*Rating (1–4) (Low–High)*
How useful to you was the *content* covered in learning community calls since January?	3.64
How useful did you find the online *workshop space* in helping you access information?	3.10
How would you rate the opportunity to *engage* with learning community members?	3.27
Overall, how valuable was the *experience* of participating in this learning community?	3.55

that she appreciated the excellent facilitation of the meeting, encouragement to participate, and the generation of shared goals. Several respondents mentioned the value of extensive opportunities to interact with other participants. Another strength of the onsite meeting was reported as the "direct experience with various technology to assist in determining (materials) for purchasing."

Participants were asked to identify new ideas that were gleaned from the onsite meeting. In response to this question, participants reported that their efforts to date were validated. Participants also reported that they learned about the value of low cost technologies and expanded their understanding of technology-related terminology. And finally, participants commented that they learned new strategies for conducting telepractice sessions and planned to incorporate those strategies into their programs.

A second survey was administered at the end of the 6-month commitment period to evaluate subsequent learning community activities. The results from the survey are shown in Table 2. For this survey, open-ended responses were again solicited to understand the benefits and challenges experienced by participants. One respondent recommended that participants came prepared to address the agreed-upon assignments. The majority stated that they appreciated having the online learning environment available to access relevant documents, but several participants reported it was challenging to remember how to access the site. Several recommendations were made about ways to improve engagement with one another (e.g., using a video option for conversations and assigning different leaders for each call). When asked how the learning community impacted implementation of telepractice, participants expressed the value of learning from one another, stating "Forging relationships has been important" and ". . .input from more experienced team members has been extremely beneficial." Another participant wrote more specifically, "[the learning community] facilitated and accelerated the expansion of our implementation as we learned of others' experiences with various technologies and their successes. Sharing of documents helped us fine tune our program and procedures." Respondents made recommendations for future calls, suggesting

that there be opportunities to share more specifics about "experiences that positively and negatively impacted sessions" as well as staff training and reimbursement issues.

Discussion and Future Directions

The outcomes of the learning community demonstrate that this approach has been a successful medium to foster new knowledge, research, and tools to support telepractice for early intervention services. These accomplishments required consistent interactions and a significant investment of time and effort. Sustaining the same level of investment can be a challenge, especially for busy professionals who are responsible for operating and delivering early intervention services. As a result, changes were made in the learning community to match the interests of the members and each person's ability to continue participating.

After the initial 6-month commitment period, participants were offered the opportunity to revise the frequency of their interactions. The consensus was to limit the teleconference meetings to once every 2 to 3 months. Additionally, the participants agreed to network with one another using the Internet and other social media. A Facebook page with access limited exclusively to learning community members was developed, which has taken the place of the original workshop space and, thus far, has resulted in more postings from participants.

The learning community members recognized the importance of engaging new members while maintaining the atmosphere of candid communications among trusted partners. Over the past 10 months, some members of the telepractice learning community have dropped out due to other professional demands or career shifts away from telepractice. Two new participants in the beginning stages of implementing telepractice programs learned of the learning community via conference presentations and asked to join. With agreement from existing members, the new participants were invited to join. Additionally, the participants sought to expand their networking to a larger community. As a result, "guest participants" have offered their expertise on specific issues that were identified by the learning community members. For example, a member from the American Telemedicine Association has joined select learning community sessions to provide insights into Internet security issues.

The continuation of the learning community depends on the extent to which the members continue to value participation, have interest in the topic, and can commit to active participation. This learning community engaged providers who demonstrated these characteristics and served a specific population via the utilization of a new service delivery model. This shared interest and commitment supported a strong sense of camaraderie. In the future, as telepractice continues to grow, the learning community members may have

their needs met through participation in other special interest groups, such as ASHA's special interest group (SIG 18) on Telepractice or the American Telemedicine Association's (ATA) Pediatric Specialty Group. Branching out to join these broader entities may be part of the learning community's evolution as members search for new perspectives and a diverse knowledge base.

As mentioned, the initial onsite meeting was viewed as critical to developing the needed sense of "community." This onsite meeting provided a foundation of intensive mutual engagement and a venue for setting the direction of collaborative work. Therefore, other onsite opportunities, such as coming together at conferences or other meetings, may serve to bolster engagement of learning community members by fostering the positive nuances of onsite interactions. Further studies into this aspect of learning communities would benefit the field.

The facilitator played a critical role that guided learning community participants to set new goals and to ensure the group focused on achieving these goals. However, sustainability of the learning community will depend not only on interested participants but shared leadership, mutual engagement, and reinforcement. A commitment to shared leadership helps in the scheduling, planning, and facilitation of meetings. One critical lesson learned in the coordination of this learning community is the importance of emphasizing shared responsibilities in the learning community efforts. Having members take turns facilitating monthly calls or conducting presentations for the larger group is recommended to reduce the burden on the primary facilitator and to strengthen active participation.

With the completion of the resource guide, the learning community has completed a major accomplishment toward its goal to create resources that advance the field of early intervention telepractice. The learning community continues to operate based on member interests in networking with one another as well as the identification and exploration of new goals. To date, the learning community has identified the development of guidelines for the evaluation of telepractice as well as practical strategies for ensuring secure communications as priorities for the group to pursue. In turn, membership will evolve in relation to these priorities. As goals are accomplished, it is important to reassess the desire of members to maintain the learning community or bring it to an end if it is no longer serving a purpose.

There are practical and policy issues that need to be addressed as the use of telepractice continues to evolve. For instance, there are many unresolved and state-specific issues related to licensure, privacy and confidentiality, and reimbursement. In addition, it will be important to work with Part C policymakers to ensure early intervention services delivered through telepractice meet the requirements of a natural environment (Cason, 2011; Kelso, Fiechtl, Olsen, & Rule, 2009).

In regard to the role of learning communities in general, there is a need for evaluation data to support the use of this mechanism as an appropriate forum

for learning. For example, evaluating this approach typically has not lent itself to the use of experimental designs. However, use of quasi-experimental design strategies along with qualitative data, such as the surveys employed in this application, can provide insights to positively influence the use of learning communities.

Providers in the field of early intervention for children with hearing loss are encouraged to build on what we know now about the value of learning communities and contribute their own lessons learned to further inform the field. This will ultimately support the learning community's primary goal—to improve services for infants and toddlers with hearing loss and their families.

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The Volta Review, Volume 112(3), Winter 2012, 329–343

Using Technology to Mentor Aspiring LSLS Professionals

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Presently, there is a world-wide shortage of professionals qualified to serve children who are deaf and hard of hearing and their families who are seeking a listening and spoken language outcome. To address the crisis of capacity, it is anticipated that an increasing number of professionals not currently serving as mentors will need to engage in mentoring partnerships. These professionals must acquire unique and specific skills and be able to implement them throughout the mentoring cycle. Use of advanced technology can serve to eliminate barriers associated with traditional models. Multiple options and programs using diverse technology make it possible for increased numbers of mentors and mentees to work effectively together, thereby reducing the global deficit of qualified professionals.

Introduction

Mentoring has become a widely accepted practice in the 21st century. While the practice is on the rise, mentoring is not a novel concept. The origins of mentoring date back to Greek mythology in the 12th century B.C. (Nayab, 2011). In the 1970s, mentoring gained momentum in the United States in both public and private organizations such as hospitals, universities, and corporations (Parsloe & Wray, 2012). Today, mentoring programs abound in business, academia, education, law, and health care (Insala, 2007). For example, 75% of U.S. Fortune 500 companies have a mentor program (Knowledge@ Wharton, 2007). In the field of education, most states offer a mentor experience, an induction program, or both for new teachers (Kaufmann, 2007). Professional

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organizations, such as the American Speech-Language-Hearing Association (ASHA), offer a mentoring program for students, new professionals, and researchers (2012a). And it is common in higher education for senior faculty to mentor new colleagues beginning their careers in academia (Tracey, 2006).

Educators of the deaf, speech-language pathologists, audiologists, and other professionals are called upon to provide services for children who are deaf and hard of hearing and their families. Many practicing professionals received their education and training before universal newborn hearing screening and 21st century technology became available (Marge & Marge, 2005). More recent graduates did not have opportunities to develop specific expertise in listening and spoken language (Lenihan, 2009). This has resulted in a shortage of qualified service providers to meet the needs of early-identified children and their families who choose listening and spoken language (Goldberg, Dickson, & Flexer, 2010; Proctor, Niemeyer, & Compton, 2005).

The AG Bell Academy for Listening and Spoken Language (AG Bell Academy) is a subsidiary of the Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell). The AG Bell Academy offers a credential with two designations that distinguishes practicing professionals as well-trained and qualified to provide listening and spoken language services: the Listening and Spoken Language Specialist certified Auditory-Verbal Therapist (*LSLS Cert. AVT™*) and the Listening and Spoken Language Specialist certified Auditory-Verbal Educator (*LSLS Cert. AVEd™*). As part of the process toward certification, candidates are mentored by LSLS certified professionals (AG Bell Academy, 2012).

The process of mentoring today's professionals can be rewarding and challenging. Providing aspiring professionals with abundant opportunities for mentored practice can be fiscally challenging and time consuming as mentoring often requires dedicated time outside of the work week. LSLS mentors surveyed in 2008 requested guidelines and support to enhance their mentoring experiences (Morrison, Perigoe, & Bernstein, 2010). The AG Bell Academy continues to address the needs of the professional community by offering opportunities for professional development in mentoring and has organized a mentoring task force to this end (T. Caraway and B. Clem, personal communication, February 10, 2012). The use of technology is considered a practical tool to enhance the mentoring process and meet the needs of both mentors and aspiring LSLS professionals.

Defining Mentoring

Mentoring is typically viewed as a process. Faure (2012) describes mentoring as a long-term, supportive relationship that meets a developmental need. Others describe mentoring as a mutual relationship with an intentional agenda

(Addington & Graves, 2012) or a protected relationship in which learning and experimentation can occur (Collin, 2012). The common thread among the various definitions and descriptions is that mentoring is a two-way, mutually beneficial relationship.

Numerous benefits are associated with mentoring. Mentoring positively influences retention, productivity, promotion, and personal and professional development (Triple Creek Associates, 2007). It can also have a positive impact on student achievement (Rockoff, 2008). Other benefits associated with mentoring include increased self-awareness, shared knowledge, and the development of leadership skills (Insala, 2012; Triple Creek Associates, 2007). Research substantiates that learning is more robust when the learner has opportunities to apply information (Joyce & Showers, 2002). While learners retain only 20% of information presented in a lecture format, 95% of information is retained when individuals are provided with abundant opportunities to practice while being coached and mentored (Joyce & Showers, 2002).

Mentoring Models

Different types of mentoring models meet the unique needs of individuals. Mentoring experiences can be formal or informal and can vary in duration. Four models are described here: one-to-one, peer, reverse, and group mentoring (Management Mentors, 2010).

One-to-One Mentoring

This is a traditional model. The more experienced mentor provides guidance to a less-experienced professional. One-to-one mentoring is the most commonly occurring model in academic settings, including preservice teaching, medical and nursing residencies, and clinical fellowships. The mentor-mentee relationship develops around an area of interest and specialization, teaching methods that motivate the student, admiration of the mentor, and development of personal connections.

Peer-to-Peer Mentoring

This model pairs professionals in nonsupervisory roles. Professionals are paired to achieve specific goals, such as supporting a new employee by providing guidance on work procedures and organizational systems, engaging in goal setting activities, and enhancing skills through paired study or video-sharing. Peer mentoring supports continued professional growth, such as after certification is obtained.

Reverse Mentoring

Reverse mentoring connects senior professionals, acting as the mentees, with younger professionals in the roles of mentors. The younger professionals might share their knowledge and guide the mentees about advances and trends in technology. Or younger professionals who have the most current knowledge in a particular content area from their academic studies might guide and train senior professionals on specific topics.

Group Mentoring

In this model, a mentor works with a small group of mentees at one time. The mentor provides guidance during regularly-scheduled, topic-specific meetings. This model may be used in organizations with fewer people available to serve as mentors.

Mentoring in the Field of Communication Disorders

Professionals from the fields of audiology, education of the deaf and hard of hearing, and speech-language pathology work with children who are deaf or hard of hearing. These professionals participate in a variety of mentoring experiences during their academic training and professional preparation.

Preceptors

The term preceptor is used traditionally in medical training of nurses and physicians. This terminology is also referenced in the audiology literature and refers to the licensed audiologist who provides clinical education to an extern (American Academy of Audiology, 2012). The role of the audiology preceptor is to help the extern develop clinical skills and the ability to practice independently. Preceptors can also serve as role models and resources for newly-hired staff (HCPro, 2007).

Supervising Teachers

Educators of the deaf and hard of hearing participate in practicum experiences as a part of their preservice training. The supervising teacher is usually experienced and highly skilled. In many states there are specific requirements for supervising teachers, including demonstrating effective teaching techniques, guiding the student teacher to develop self-evaluation skills, and guiding the development of lesson plans, units, tests, and activities. The supervising teacher helps the student teacher evaluate his or her own performance as well as the needs of each student with hearing loss (Northern Michigan University, 2003).

Clinical Supervisors

A clinical supervisor's role is to facilitate the development of clinical skills for students in allied health professions. Clinical supervision occurs in academic and professional settings. Clinical supervisors oversee the clinical services provided by students or externs in their early work with clients. During clinical observations, supervisors provide specific, consistent feedback about the student's or extern's clinical performance (Malone, 2009).

Clinical Fellowship Year Supervision

Following graduation from an ASHA-accredited graduate program, speech-language pathologists are required to complete a clinical fellowship year. A fellowship year supervisor is an ASHA-certified professional who provides feedback to the new practitioner about demonstrated clinical skills and overall performance. The primary goal of the clinical fellowship year is to improve the fellow's clinical skills and effectiveness. Supervision of clinical practice through direct observation, guidance, and feedback guides the student to monitor, evaluate, and improve their performance to develop clinical competence (ASHA, 2012b). Typically fellowship year supervisors are onsite or work in the same organization.

As educators of the deaf and hard of hearing, speech-language pathologists, and audiologists begin the career journey, opportunities to serve children who are deaf and hard of hearing may lead to a desire for increased knowledge and skills in the area of listening and spoken language. These professionals may wish to develop expertise in listening and spoken language and choose a formal path to certification through the AG Bell Academy.

Mentoring in Listening and Spoken Language

Professional learning to fulfill the requirements for LSLS certification could be described as continuous and job-embedded since it involves the development of content knowledge, professional experience in listening and spoken language practice, and formal mentoring to support professional growth. Professionals seeking certification must meet eligibility criteria defined by the AG Bell Academy (2012), including having a bachelor's degree, master's degree or international equivalent in audiology, speech-language pathology, or education of children who are deaf or hard of hearing, and hold a current license or credential to practice in their geographic locale. They must also complete at least 80 hours of continuing education within the nine domains of listening and spoken language knowledge, and complete a required number of clock hours of professional experience in the provision of listening and spoken language support. Over a 3-to-5 year period of professional experience, the professional seeking certification must be

mentored by a LSLS certified professional for a total of at least 20 sessions: 8 hours in Year 1, and the remaining 12 evenly spaced throughout the remaining 3 to 5 qualifying years (AG Bell Academy, 2012).

According to the AG Bell Academy, the requirements for the LSLS certification set universal professional standards for knowledge and practical experience in the provision of listening and spoken language intervention for children who are deaf and hard of hearing and their families. The AG Bell Academy deems LSLS certified professionals as the most qualified to mentor applicants for this certification, and therefore requires that professionals serving as a mentor hold the LSLS certification. A mentor requires a specific set of skills that are above and beyond content knowledge and therapeutic skills.

Use of Technology to Support Mentoring Experiences

Twenty-first century technology allows for use of alternative avenues for communication. The option of distance mentoring is an increasingly viable alternative for LSLS certified professionals and those seeking certification. Recognizing the key role that technology can play in the professional development of LSLS certified professionals, the AG Bell Academy supports remote mentoring using video or Internet technology for professionals seeking certification (AG Bell Academy, 2012).

There is a critical world-wide shortage of qualified LSLS certified professionals (Goldberg et al., 2010). The use of technology to enhance the professional development of LSLS professionals has created opportunities for more mentors and mentees to work together. In the recent past, LSLS certified professionals relied on live synchronous mentoring in a one-to-one interaction, and in many cases involved travel by either the mentor or the mentee. The use of asynchronous methodologies included video recording of intervention sessions and transferring these to disks for mentor review. Teleconferencing was also used to deliver feedback. As videoconferencing technology developed, some mentoring occurred through the Internet. However, dial-up technology precluded quality interactions and this technology was not widely available.

Today, more technology options for both synchronous and asynchronous mentoring are available. These technological advances allow both mentor and mentee to have the ability to "meet" face-to-face in real time, regardless of where they live and work. Both mentor and mentee can choose from a wide array of electronic tools to fulfill their learning needs and match their learning styles. The use of technology advances the idea of a learner-centered approach rather than a traditional instructor-centered approach. Mentees can choose the method of technology that accommodates their needs and that is available to them. There are now more options to experience quality communication interactions in the mentoring partnership.

One of the most viable solutions to address the shortage of LSLS certified professionals is to utilize modern technology. To actualize this solution, LSLS mentors need to understand the wider scope of the mentoring process and ways in which technology can be used in all phases of the mentoring cycle.

Emerging Trends for Mentoring LSLS Professionals

The roles and skills leading to a successful mentoring partnership are well documented (Hanft, Rush, & Sheldon, 2004; Rush & Sheldon, 2011; Zachary, 2012). According to Zachary (2012), "Communication is the essential building block for facilitating all learning relationships" (p. 46). Well-honed communication facilitates a mentoring relationship and includes the ability to broker different perspectives, build and maintain relationships, guide and coach, facilitate goal setting, problem solve, provide direct and constructive feedback, and facilitate self-assessment (Hanft et al., 2004; Rush & Sheldon, 2011; Zachary, 2012).

Morrison and colleagues (2010) recently surveyed LSLS Cert. AVT professionals. Those with experience as mentors responded to specific questions regarding the mentoring process. Sixty-four respondents completed the mentor portion of the survey. Approximately 65% of respondents reported they had no specific mentor training. As a group, mentors asked for guidelines for mentoring and benchmarks for mentee performance. They also expressed the need for information related to technological adaptations that are now available (e.g., options for distance mentoring and networking with other mentors) (Morrison et al., 2010).

In the survey, mentoring observations were most frequently reported as occurring in real time, comprising 63.9% of the responses (Morrison et. al., 2010). Real time observation was conducted with the mentor present in the therapy session (39.2%), by remote observation from within the same room through a window or via a television camera positioned in the room (18.5%), or from a remote location by means of Skype or other videoconferencing technology (6.2%). Just over one-third of observations (35.1%) were accomplished by viewing recorded sessions.

In January 2012, an online survey was completed by LSLS certified professionals currently engaged in mentoring partnerships (B. Clem, personal communication, February 11, 2012). The survey's purpose was to determine the current use of technology by these professionals and identify trends since the Morrison et al. (2010) study. One hundred thirty three (133) professionals responded to the survey. Of this group, 78.9% (n=105) held certification as a LSLS Cert. AVT or LSLS Cert. AVEd. Twenty-one percent (n=28) were currently pursuing LSLS certification. For those holding LSLS certification, 60.9% had 1–4 years of certified experience, 13.1% had 5–9 years, and 26% had 10 or more years of experience. Of the 105 respondents holding certification, only 44.8 % were

currently mentoring other professionals and the mean number of mentees was 2.18 per mentor. Observations of therapy sessions occurred most frequently in face-to-face real time interactions (74%), less often via observations of recorded sessions (24.3%), and only 4.3% were conducted live through videoconferencing. Of the 28 mentees participating in a 3-year certification process, 57.2% were in their first year of the process, 21.4% were in their second year, and 21.4% were applying to take the certification exam in 2012. Among these mentees, 40% reported that the mentoring occurred in face-to-face, real time interactions, 45% through recorded sessions, and 15% through videoconferencing technology.

These unpublished survey results present a snapshot of the current trends in LSLS mentoring partnerships. Historically, LSLS mentors primarily used direct, face-to-face observations of therapy sessions and provided feedback in the same condition or used a recorded session to be viewed at a later time. However, there is a trend toward increased use of technology via videoconferencing in real time. While a direct comparison of survey results is limited, it appears that live videoconferencing is currently being considered a more viable option for mentor observations.

In addition, the results reveal a factor worth considering related to the number of available mentors. Fewer than half of the LSLS certified respondents are mentoring the next generation of professionals, and the average number of mentees for each mentor was 2.18. It is notable that 78.28% of the respondents who are currently mentoring held certification for fewer than 5 years. It seems apparent, however, that there is a need for more LSLS certified professionals to mentor an increasing number of candidates. To accomplish this, there is a need to study how LSLS certified professionals are trained to mentor. It seems advantageous to study the use of technology to conduct mentoring experiences. Secondary to this, it is important to study the impact of mentoring through technology on desired outcomes.

"Technology can be a powerful tool for building and maintaining mentoring connections" (Zachary, 2012, p.78). Internet technology is a practical and cost-effective way for LSLS certified professionals around the world to participate in mentoring partnerships. Mentors will need training and resources to develop their competencies as they use technology to deliver this service.

Technology and the Mentoring Cycle

Zachary (2012) describes four phases in the mentoring cycle. Zachary's learner-centered partnership provides guidelines and associated tasks for each stage. These four phases, along with the use of technology to accomplish specific activities, are described here. It is important to consider the unique needs of each mentoring partnership when adding in the use of technology. The premise held here is that the use of technology in combination with good

mentoring practices will provide the listening and spoken language community with a framework for mentor training.

Phase 1: Preparing

According to Zachary (2012) this phase is a discovery process. Because each mentoring relationship is unique, the mentor must set the tone for the relationship and clarify the level of commitment, expectations, and roles to establish a working relationship (Zachary, 2012). Mentors begin by engaging the mentee in meaningful conversation to establish a connection, to help determine the compatibility of each partners' goals, and to assure the mentee that the mentoring relationship is a worthy pursuit. Mentors also assess their motivation and readiness for the task, survey their mentoring skills, and create a professional learning plan to develop their own skills. A "Mentoring Skills Inventory" and other preparatory exercises are available in *The Mentor Guide* (Zachary, 2012).

Technology Applications

An initial telephone or videoconferencing call establishes the mentoring partnership. This contact establishes rapport, allows mentors to describe their mentoring philosophy, and creates an opportunity to learn more about each other. Mentors can learn about the mentee's work experience, caseload, and the feasibility of meeting eligibility requirements for LSLS certification in the designated time-frame. In addition, the mentor and the mentee can discuss learning styles, time constraints, and proficiencies with technology (Zachary, 2012). Once it is determined that the mentor/mentee partnership is a feasible match, mentors can provide tools for self-assessment and goal setting. Mentors can use the skills documented on the Mentor's Observation and Evaluation Form (Attachment F, available through the AG Bell Academy at www.listeningandspokenlanguage.org) as a self-assessment tool. Mentee's can rank their comfort level for each skill area indicating their perceived competencies and identify skills that are more challenging. Goals can be developed then addressed through the intervention review process and repeated yearly to gauge progress. Online survey tools, such as Survey Monkey (www.surveymonkey.com), are available to complete the self-assessment task and the results can be tallied for purposes of data collection.

Phase 2: Negotiating

According to Zachary (2012), the negotiating phase is replete with details. A process often overlooked, this is the time to set schedules, identify roles and responsibilities, discuss accountability measures, and make plans for closure. The process of negotiating builds consensus and commitment between the

mentor and the mentee. Zachary (2012) also suggests that an understanding will be reached that leads to a partnership agreement and a mentoring work plan anchored in well-defined goals, measures for success, delineation of mutual responsibilities, and accountability assurances.

Technology Applications

First, each partner must identify the technology that is available and their respective abilities with the equipment. Then, each partner should outline ground rules for communicative interactions including frequency, method of contact, and the amount of time for each encounter. Consideration needs to be given to the time zones in which each partner resides and the time of day and days of the week when interactions can occur.

The partners must address privacy and confidentiality protocols that are established by their employers. In advance of any mentoring interactions, mentees must complete any required paperwork, such as obtaining prior written permission to videotape a child and to submit the videotaped recordings for observation to the mentor; establishing procedures that allow the mentor to access recorded sessions; establishing access to secure servers or encrypted password-protected flash drives so that recorded sessions can be uploaded and accessed by the mentor; and eliminating a child's personal information on electronically submitted patient records. The Teleintervention Resource Guide (2011), available through the National Center for Hearing Assessment and Management (NCHAM) website, states that there currently is no U.S. federal agency that regulates Internet privacy. Because Internet use is unrestricted, privacy is controlled by using secure websites. Providers must abide by the Health Insurance Portability and Accountability Act (HIPAA), Family Educational Rights and Privacy Act (FERPA), and Individuals with Disabilities Education Act (IDEA) Part C regulations in the provision of services (e.g., exchange of written reports, observations of sessions by others, video recordings of sessions) (NCHAM, 2011). This resource also provides detailed information regarding Internet tools available for live videoconferencing.

When video recording is used, it is important to predetermine the recording method. The type of disk determines the ability to play the recording on a DVD player or a computer. Mentors and mentees should also consider ways in which the recording will be transmitted. Video disks can be mailed and video files can be uploaded to file share sites (e.g., dropbox.com, yousendit.com). Download times for large files, such as 40–60 minute intervention sessions, can take time and should be considered when choosing a recording method. Once the arrangements have been made, the guidelines for camera positioning during the session need to be discussed. It is important for the mentor to be able to see the faces of the mentee, child, and caregiver as well as the activity in which they

are engaged. Good audio for the session is also essential. A trial recording is recommended.

Phase 3: Enabling Growth

This phase manages the process, maintains momentum, and encourages change. The mentor creates a learning environment that exposes the mentee to new learning, accelerates growth, and reinforces specific skills (Zachary, 2012). Mentees receive assignments to "raise the bar" and, hence, improve their therapy practices. Zachary (2012) provides specific tools to facilitate learning, assess the mentoring relationship, and make appropriate adjustments ("Facilitating Learning Through Support" exercise 6.1, "Identifying Learning Opportunities" exercise 6.2, "Mentoring Partnership Accountability Discussion Guide" exercise 6.3, and "Monitoring the Quality of the Mentoring Interaction" exercise 6.4, pp. 160–168). Mentors are encouraged to develop plans that maximize the time spent with the mentee. Another key role in the stage of enabling growth is to intentionally connect mentees with other professionals in the field and encourage professional networking.

Technology Applications

The use of a free online scheduling tool (e.g., www.doodle.com) is an efficient way to arrange mentoring sessions. Social networking sites (e.g., Facebook, LinkedIn, Google Plus) are viable tools for frequent interactions. Facebook (www.facebook.com) provides the opportunity to create private "groups" that are accessed by invitation only. Through groups like this, mentees may contact their peers who are also preparing for the LSLS certification exam, pose study questions, and share learning experiences. LinkedIn (www.linkedin.com), a professional networking site, provides a platform for professionals to develop a profile with work-related information, join groups in areas of interest, and communicate with professionals in their own field and across all professional fields. Google Plus also provides an opportunity to establish a network of professionals and friends. The Google Hangout platform allows free videoconferencing with up to 10 users at no cost. A study by Kacmar, McManus, and Young (2012) shows that use of technology, specifically email messaging, can support an ongoing and effective mentoring relationship.

Phase 4: Coming to Closure

Protocols to support a logical end to the mentoring relationship are built into the process from the beginning and both mentor and mentee should agree to this process (Zachary, 2012). Zachary also provides checklists to facilitate development of a closure plan.

While the formal mentoring relationship might come to a close, the mentee is now a colleague and will continue to need support and encouragement. When a mentor participates in his or her own plan of professional learning and includes the mentee in that process, those experiences of sharing resources, exchanging ideas, and connecting through job-embedded learning create a synergy that enhances individual and group practice. Closure of the mentoring relationship is just the beginning for a professional seeking certification and the model that the mentor provides can have a positive effect by encouraging the mentee to be a lifelong learner.

Technology Applications

Near the close of the formal mentoring experience, mentors engage the mentee in dialogue to develop a professional learning plan. Professional skills beyond the knowledge and skills required for LSLS certification can be explored. Tools are readily available to assist the mentee in identifying their own learning style. They can learn skills in conflict resolution, team collaboration, and organizational strategic planning. Mentors can guide the mentee in an investigation of their individual strengths, weaknesses, opportunities, and threats (SWOT). A mentee's professional learning plan may also include participation in a community of learning. More professionals are participating in learning communities to enhance their knowledge and skill development. According to Learning Forward, the International Nonprofit Association of Learning Educators, learning communities may be varied in size, include members with similar or different job roles or responsibilities, and meet face-to-face, virtually, or through a combination of interactions (Learning Forward, 2012). Networked learning connections, whether through email within an organization or through online communities, is consistent with the idea of enabling growth and fostering participation in professional learning through the career journey.

Conclusion

Professionals seeking advanced knowledge and skills to work with children who are deaf or hard of hearing will likely consider certification as a LSLS. "By providing a benchmark for excellence, the AG Bell Academy ensures that parents seeking a listening and spoken language outcome for their child with hearing loss have a standard by which to measure the professionals with whom they work" (Smith, 2010, p. 24).

The AG Bell Academy surveyed professionals and parents of children with hearing loss regarding the value of LSLS certification. A majority of LSLS certified respondents reported that certification was important to or required by their employer (94%), believed the demand for their services increased (62%), and recommended that professionals seek certification (81%) (Dickson,

2011). Parent respondents felt that LSLS certified professionals were more qualified than noncertified professionals (90%), that LSLS certification should be standard practice and required (72%), were willing to compensate LSLS professionals more for their services (73%), and had more confidence in the skill set of LSLS certified professionals (80%) (Dickson, 2011).

"Currently, there is an extreme lack of qualified professionals trained specifically to provide support for a listening and spoken language outcome" (Smith, 2010, p. 24).To meet the needs of children with hearing loss and their families who prefer the services of a qualified specialist, more LSLS certified professionals are needed. Every professional working toward LSLS certification will engage in a mentoring relationship as this is a requirement of the certification process. More certified specialists are needed to accept the honored role of mentor. Mentors can be influential as they provide a positive learning experience, foster collaboration, enable knowledge and skills growth, and promote the LSLS community.

The advanced technology available today can significantly impact the mentor partnership. The use of technology is an effective way to observe intervention sessions, share feedback, and provide ongoing consultation and support. Mentoring relationships, conducted even when the partners live at a distance from one another, can thrive by employing current technologies. While more study is needed to address the effectiveness of mentoring practices and the technology used, the LSLS community has always pressed forward to creatively meet challenges. For a profession that supports advanced hearing technology as a hallmark of positive outcomes, determined and visionary professionals will continue to look forward and create innovative opportunities to use technology in other essential areas, such as mentoring.

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The Volta Review, Volume 112(3), Winter 2012, 345–356

The Center for Hearing and Speech: Bilingual Support Services through Videoconferencing Technology

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Many listening and spoken language specialists find themselves serving increasing numbers of children with hearing loss who come from families whose primary language is not English. This manuscript describes a variety of methods that can meet the needs of this ever-growing population by highlighting the dual-language support program at the Center for Hearing and Speech in Houston, Texas. The center uses videoconferencing technology and indirect methods of service delivery through remote consultations to serve this unique population.

Introduction

In Texas, there are three centers that focus exclusively on providing listening and spoken language services for children who are deaf and hard of hearing. The Center for Hearing and Speech (CHS) in Houston is the only *private* resource that teaches children with mild to profound hearing loss to acquire listening, speaking, and literacy skills. To accomplish this, CHS has a full-service pediatric audiology clinic, a speech-language pathology clinic, an auditory-oral preschool, and a family support services department. With the aid of advanced hearing technology, for more than 60 years trained practitioners at CHS have worked to develop listening and spoken language skills in thousands of children who are deaf or hard of hearing.

Seven years ago, a bilingual support program began at CHS due to a steady increase in the number of families of Hispanic origin who wanted to experience

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the same benefits of early intervention as their English-speaking counterparts. This was made possible by hiring appropriate bilingual staff and creating written resources in Spanish. Today, about 130 children attend the speech-language pathology clinic each week and 50% of them come from families who speak a language other than English.

Texas is a large state with multiple rural areas. Consequently, many children with hearing loss do not have access to specialized therapy services due to the lack of qualified professionals in their community. Advances in interactive video technology have made the use of telepractice a viable solution to connect children who are deaf or hard of hearing with qualified professionals. These professionals can conduct live, interactive therapy sessions irrespective of the location of the family and using the language spoken in the home.

Telepractice has been recognized as an appropriate model of service delivery for the profession of speech-language pathology (American Speech-Language-Hearing Association [ASHA], 2010). Telepractice is the application of telecommunications technology to deliver professional services at a distance by linking clinician to client or clinician to clinician for assessment, intervention, and/or consultation (ASHA, 2010). Using telepractice to provide speech and language services maintains all existing responsibilities of delivery that adhere to the policies and professional practices of ASHA. Telepractice procedures must also adhere to state and federal laws (ASHA, 2010).

Remote support for linguistically diverse families began at CHS in 2009. The bilingual speech telepractice program at CHS uses real-time, two-way interactive videoconferencing equipment and software to deliver speech therapy services from a distance. The speech-language pathologist is virtually present at the receiving end where the family lives, but provides therapy from a different location using computer technology. Physical distance separates the practitioner and family, but video connects them.

This article describes CHS's solution for an ever-growing population of children with hearing loss in Texas who live in homes where the primary language is not English and who live in areas removed from professionals qualified to provide listening and spoken language services. To help the reader understand the CHS approach to providing bilingual telepractice services, a description of the bilingual support program, a discussion on the use of videoconference technology, and indirect methods of service delivery (i.e., consultation) delivered through videoconferencing will be provided.

The Bilingual Support Program at CHS

Following identification and referral to CHS, extensive, face-to-face audiological evaluations are completed. As soon as infants from other-language homes are fitted with appropriate technology, a speech-language

evaluation is completed before they are enrolled in a free parent-infant program.

The decision to provide evaluation and/or treatment in the client's first language or in two languages is based on whether or not the child is a simultaneous (learning two or more languages at the same time) or sequential (learning one language, then another) bilingual language learner, and if the child comes from a bilingual home, an English-speaking home, or a primarily other language-speaking home (i.e., Spanish). These distinctions are important because each requires a slightly different approach to assessment and teaching.

Simultaneous bilingualism develops when exposure to two languages occurs before the age of 3. Sequential bilingualism is used to describe exposure to the second language after the age of 3 (Goldstein, 2004; Roseberry-McKibbin, 2002). For bilingual, English-speaking families who have children who are deaf and hard of hearing, services to support both simultaneous and sequential language learning are offered at CHS. There are no government mandates for fluency in more than one language in the United States; however, when an immigrant family speaks a language other than English and their child is deaf or hard of hearing, it is the belief at CHS that bilingualism is necessary because English is the language of education in Texas. Bilingual support services are offered through a variety of service delivery options depending on the needs of the child and family, which is determined during the assessment. These support services can include clinic-based face-to-face speech-language and educational services with the ability to provide individual and small group services through telepractice.

For children with hearing loss who come from primarily Spanish-speaking families, a continuum of services is provided (Douglas, 2011a). For bilingual families (English and another language is spoken fluently), a modified continuum is provided (Douglas, 2011a). For families who speak low-incidence languages, services are provided through either interpreters or a special procedure called the "Tag Team Approach" (Langdon, 2002; McConkey-Robbins, 2007). For children with hearing loss who are learning a second language sequentially, a coordinated service model is implemented (Douglas, 2011a). These will be described briefly in the following sections.

Providing a Continuum of Services for Primarily Spanish-Speaking Families

At CHS, a continuum of services support the needs of children from primarily Spanish-speaking homes when parents choose to expose the child to both Spanish and English simultaneously (Douglas, 2011b). Initially, the bond between parent, child, and auditory development are facilitated through free training for the child's first 18 months of life (Douglas, 2011a, b). This training begins at CHS in the language primarily spoken in the child's home and with the parent present. A bilingual speech-language pathology assistant (SLP-A), who is fluent in the both languages, implements the lesson under the direction

of a monolingual speech-language pathologist and/or Listening and Spoken Language Specialist (*LSLS™*) who is trained in linguistically diverse issues.

At age 18 months, children are enrolled in the CHS preschool program. The full-day preschool program is structured to provide learning groups of various sizes for specific purposes. Larger group instruction provided by certified general education teachers allows the children to learn spoken language during typical preschool experiences. Small group, "pull-out" instruction in a separate room makes it possible for children to get many opportunities to practice talking (Moog & Stein, 2008).

To facilitate continuous improvement in the child's bilingual development, a coordinated service model is implemented. During small group instruction, the monolingual teacher of the deaf works with the child in English, and during face-to-face and weekly individual sessions, a bilingual speech-language pathologist or SLP-A works with the child on parallel lesson plans in the home language with the parent. As the child's language becomes more complex, an integrated bilingual model is employed. At this stage, a bilingual speech-language pathologist provides parallel services in both languages and helps the child transfer skills and learn differences between the languages. For example, the practitioner may explicitly teach and have the child practice the change in word order when using adjective + noun in English and noun + adjective in Spanish. It is up to each managing clinician to determine the appropriate time to begin the integrated bilingual model, which is based on the child's metalinguistic skills (the ability to talk about language) and determined during assessment. This continuum of services can be offered with any language as long as the program has appropriate personnel who are fluent in both languages.

In some cases, a combination of bilingual support and a coordinated model is utilized. In this situation, a monolingual speech-language pathologist may provide individual instruction in English, a teacher of the deaf may provide small group therapy in English, and a bilingual SLP-A may provide individual and/or group services in the home language. All three professionals may consult with a more experienced bilingual speech-language pathologist (either employed at the center or available elsewhere in the state) who can provide input during the design of the treatment plans (Douglas, 2011a).

Modified Continuum of Services for Bilingual Families

When parents who are proficient bilinguals (speaking English and another language fluently) choose to develop both languages simultaneously with their young child, the same continuum is implemented but modified to enlist the parents as a second language teacher. CHS refers to this as the parent-centered integrated bilingual model. Here, individual, parent-centered therapy is provided by a monolingual speech-language pathologist in English. The parent is encouraged to practice the strategies learned in the weekly therapy

sessions with their child at home in either the minority language or both languages. Strategies for establishing linguistic boundaries are encouraged (i.e., home language is used in the house and English is used in the community) while English immersion through an auditory-oral or mainstream preschool with small student-teacher ratios is recommended. The professional works with the parents to obtain an inventory of the language used at home and "integrates" that information into the therapy sessions. This way, the professional can facilitate transfer of skills between the languages.

Support for Low-Incidence Languages

The bilingual support at CHS primarily focuses on families who speak Spanish and English. However, there are two types of services that can be offered for families who come to CHS and speak low-incidence languages, such as Farsi or Vietnamese. These include services provided through translators and the "Tag Team Approach."

Services Implemented through Translators

For families who need services in low-incidence languages, every effort is made to find interpreters, train them regarding policies for sequential translation, then brief them on the lesson prior to the interaction. (Sequential translation refers to interpreting what was said right after the speaker is finished versus simultaneous translation, where the interpreter speaks at the same time as the speaker.) During the interaction, the managing professional takes care to make eye contact with the client while respecting the limits of the translator's memory for sentences. After the therapy session, the managing professional and interpreter identify any issues about the session that need to be discussed and to make arrangements for the next appointment (Langdon, 2002).

Tag Team Approach

If an interpreter is not available, CHS implements the "Tag Team Approach," as defined by McConkey-Robbins (2007). Using lessons available in one of 50 languages from the John Tracy Clinic (JTC) Correspondence Course (JTC Education, 2012), the managing professional selects a spoken language session that is functional for the family. The correspondence course text serves as the interpreter. This, of course, requires that the family be literate in their first language. The managing professional "tag teams" by modeling the activity in English then invites the caregivers to do the same procedure in their language. Without knowing the language, the professional observes the parents' interaction style and provides nonverbal feedback (e.g., smiles, head nods, gestures, etc.). Linguistic boundaries are mutually agreed upon between the parent and the professional. These boundaries are built into the treatment plan

in the "Tag Team Approach" and applied as the child with hearing loss learns to interact with the professional in one language and with the parent in another. Implemented appropriately, the creation of linguistic boundaries can send the message to children that both languages are valued and valuable (Kohnert & Derr, 2004). At the same time, it sets the stage for learning the differences between the targeted languages; an important skill for developing bilingual languages (Kohnert & Derr, 2004).

Facilitating Sequential Bilingualism—A Coordinated Model

Meeting the needs of children who are developing two languages sequentially is achieved through collaboration with professionals in the community. This coordinated model combines approaches and principles from the fields of speech-language pathology and deaf education with theories on second language acquisition. Professionals at CHS work in tandem with teachers who specialize in English as a second language or the targeted language to effectively accommodate the needs of these children (Douglas, 2011a). Overall, it is the managing professional, in consultation with the family, who is responsible for recommending the most appropriate approach that can facilitate positive gains in both spoken languages. This is determined during biannual and annual assessments and at regular team meetings.

With this ongoing and multifaceted approach to providing support, many of the children in the bilingual program at CHS have demonstrated steady and equal gains in both targeted languages and many demonstrate an ability to learn English that is comparable to their English-only speaking peers who are deaf and hard of hearing (Douglas, 2011b; Douglas & Bunta, in press; Douglas, Cantu, Kirby, & Zarate, 2011).

Integrating Telepractice With Bilingual Services

In cases where the location of the child's family home is more than an hour drive from CHS or the family has challenges managing transportation to CHS, the managing practitioner can recommend delivery of services via telepractice. These sessions differ slightly in the way they are planned and delivered.

Families who participate in telepractice are required to have high-speed Internet access and a home computer equipped with a high-definition web camera. The professional sends session handouts and/or worksheets by mail or email to the house, or asks the parents to collect specific objects in the home prior to each session. Using free videoconferencing technology available on the Internet (such as Facetime, Skype, or Yahoo Messenger), the practitioner simply "dials in" to the recipient during their established appointment time to begin the session.

Once the infant or toddler is enrolled into the program, a bilingual support model is implemented. The overall goals are to facilitate understanding of the

importance of consistent hearing technology use to develop auditory skills, speech, and first words. To accomplish these goals, the bilingual SLP-A either interprets or implements a session that was designed by a monolingual professional using the child's home language. The parent is coached, through the video technology, on the goals of the session, strategies that will be introduced, and how to use the materials selected for the session. The professional offers encouraging feedback and guidance as the activities are implemented, making sure to wait for the information to be received and for a response. If the connection is lost for some reason, the professional simply "calls" the family again. On rare occasions, a session may need to be stopped and rescheduled because of interference or a poor connection.

When the child is old enough for preschool, English is introduced. The professional facilitates English learning by implementing a coordinated model. English immersion through an auditory-oral or mainstream preschool with a small student-teacher ratio is recommended while telepractice sessions continue in the home language. The bilingual professional, who may be an SLP-A, coordinates services with the preschool teacher or teacher of the deaf and hard of hearing; the bilingual professional implements lessons with the parents, using the home language, that parallel the curriculum being taught in the preschool. The sessions with the parents are delivered through telepractice.

This service continues until the child requires an integrated model of support, as determined by assessment. During telepractice sessions, the professional uses bilingual materials to coach the parent on ways to transfer skills from one language to another. In both the coordinated and integrated models, the session differs from an individual, face-to-face lesson because the professional may choose to share materials by showing them on the computer screen. This way, the child and parent can engage in the session more readily by viewing interesting stimulus items on the computer; this would have been done in a face-to-face session by looking at materials on the therapy table. These picture-in-picture views (where the client views materials on a big picture while seeing the therapist on the same screen but in a smaller picture) allow the family and professional to continue seeing each other while also seeing the materials being displayed.

For the few children who have actually benefited from access to bilingual telepractice services at CHS, parent satisfaction questionnaire results received via personal communication have indicated good satisfaction. Spoken language progress results are also commensurate with the bilingual children who receive the same services onsite.

Support for Public Schools through Telepractice

Practitioners at CHS have worked with a local public school to increase access to bilingual services for school-aged children who are deaf or hard of hearing. This school was selected because of a mutual interest in determining

the feasibility of providing such services to children with hearing loss. To move forward with the endeavor, a small group telepractice pilot program was implemented in 2010. The program lasted 18 months and served 20 children. The goal was to determine the benefits and effectiveness of telepractice for school-age children who are deaf and hard of hearing in a group setting. All children participating in the pilot project had speech perception scores of 76% or higher in auditory-only or auditory + visual conditions on their most recent audiological examinations.

During this pilot program, two children were from Spanish-speaking homes. With parental permission, these children interacted with a bilingual professional who implemented each child's Individual Education Program (IEP). The integrated model was implemented to help children transfer their Spanish language knowledge to English. A Tandberg 1700 videoconferencing unit was utilized at CHS, and a Tandberg Edge 95MXP Base Model Camera, a table microphone, and a television monitor mounted on a cart was used at the school. Connection was provided through a static IP address. The bilingual professional used a document camera attached to the Tandberg unit to display the stimulus items. This allowed the clinician to monitor the manipulation of the stimulus items and utilize picture-in-picture, zooming, and scanning capabilities. A trained para-professional at the school site was responsible for bringing the children to the therapy sessions. This same para-professional was also responsible for managing the children's behavior during the session under the guidance of the CHS professional and for obtaining and controlling any materials that were sent to the school for the lesson.

The pilot project provided 5 hours of direct therapy each week (1 hour per day). In addition, 2.5 hours per week were dedicated to therapy preparation. At the end of the pilot project, the district school personnel reported the program was efficient, helpful on days when therapy coverage was scarce, enjoyed by most of the children, and supported achievement of IEP goals. Unfortunately, due to a lack of funding, this program ended. CHS continues to seek funding in order to resume the service.

Challenges to Providing Bilingual Services through Telepractice

The provision of telepractice services at CHS has come with challenges. Obtaining funding for the right equipment and solving problems with connectivity delayed the onset of the program. Additionally, providing the service to children from other-language homes has been a constant challenge because many of these children live in impoverished environments without access to a computer. Although the Texas Speech-Language-Hearing Association is making statewide efforts, insurance coverage for telepractice is not widely recognized in Texas. There also seems to be a general lack of private funding opportunities to sustain this service and allow it to grow. Currently, bilingual telepractice services at CHS are available through the free birth–18-

month parent-infant program, when determined to be appropriate by the managing professional. At 18 months of age, efforts are made by the center's insurance specialist team to obtain insurance coverage and continue telepractice services. If those efforts are unsuccessful, the families have the choice of either paying themselves or finding a professional in their area to provide services. The family can continue to access CHS's consultation services (as described in the next section).

Overall, the benefits of telepractice, even if offered on a small scale, seem to outweigh the costs for CHS. Telepractice has increased the impact of the program by serving more children who live in remote and underserved areas of the state. Telepractice has eliminated or reduced the cost of travel for professionals and families. To date, telepractice has not required extra time for preparation or follow up. Because the practitioner is separated from the family members by both distance and technology, the service is a perfect vehicle for true active parent participation, a feature of family-centered intervention known to enhance the outcomes for children who are deaf or hard of hearing (Cole & Flexer, 2007).

Bilingual Teleconsultation Services

Another service offered through video technology that is gaining popularity at CHS is teleconsultation, which developed out of an increased need to exchange information between professionals. This type of telepractice helps to overcome barriers to sharing information and advances professional skills that can be limited by distance and personnel shortages (Nilson & Moen, 2008).

Although the number of LSLS is growing, many speech-language professionals are still faced with the challenge of developing and implementing an appropriate treatment plan without having adequate experience and support for working with children who are deaf or hard of hearing. This challenge is even greater in rural areas where there is a lack of bilingual LSLS personnel to serve as mentors.

The AG Bell Academy for Listening and Spoken Language recognizes this challenge and allows clinicians to work remotely by sending videos, CDs, or flash drives of their sessions to mentors who can then review them and provide feedback and guidance (AG Bell Academy, 2012; also see DeMoss, Clem, & Wilson, 2012, in this issue). These procedures have been expanded by the LSLS at CHS who use videoconferencing technology to provide support to professionals in various parts of the United States and Canada.

Bilingual practitioners at CHS have also used teleconsultation to implement the combination bilingual support model (mentioned under continuum of services). The bilingual professionals at CHS, who were seeking LSLS certification, connected with a previous CHS employee who relocated to San Paolo, Brazil. Through videoconferencing technology, this native Spanish-

speaking professional was able to provide feedback, mentoring, and guidance during live sessions. Through case study meetings, this LSLS professional was also able to provide teleconsultation for the design of more advanced treatment plans for bilingual children on the CHS caseload.

The equipment needed to conduct teleconsultation consists of a desktop video conferencing unit or a computer with a webcam and web-based videoconferencing software at both sites. A large television and video conferencing camera at each site are also needed. Each mentor and mentee must have high-speed Internet services or a T-1 or faster Internet connection, and a static IP address.

The clinicians at CHS connect with other professionals who have linguistically diverse caseloads to: (a) share case histories and feedback on videotaped sessions; (b) discuss possible solutions to clinical challenges or cochlear implant candidacy; (c) implement a live therapy session as the professional mentor provides online guidance and coaching to the mentee; (d) provide interpreting services during a family meeting or session; and (e) provide continuing education. Professionals pay an agreed-upon fee established by the mentor for the mentor's services.

Challenges to teleconsultation services include connectivity issues, differences in time zones, and payment for services. CHS started teleconsultation services in 2010, and since then has successfully consulted with three hospitals, five professionals seeking LSLS certification, and three school districts. To date, teleconsultation at CHS has involved more than 30 families.

Through teleconsultation, professionals seeking LSLS certification can learn on the job without the expense associated with traveling to an offsite conference. When teleconsultation is used to mentor these professionals, immediate feedback is available rather than waiting for videotaped sessions to arrive in the mail.

Teleconsultation also addresses barriers associated with licensing regulations, which allows specialized clinicians to work with children out of state by consulting with the professionals who serve them directly. Using teleconsultation, clinicians in Texas can consult with speech-language pathologists and teachers of the deaf and hard of hearing in other states; this allows more children to benefit from listening and spoken language therapy under the guidance of LSLS certified professionals. Teleconsultation also enhances skills of providers with linguistically diverse caseloads who are seeking instruction on ways to effectively serve these children.

Future Directions

Professionals at CHS would like to expand their telepractice services. More clients could be reached when third party payers support this service delivery option. In addition, fees can be charged for distance education and mentoring.

With support from third party payers, an infrastructure could be created to offer services at a satellite clinic. Appropriate equipment could be placed in a remote clinic for those families who do not have or cannot afford to have computer and Internet technology in their homes.

Additional funding can also support the expansion of telepractice to include itinerant services. Many itinerant teachers in Texas are responsible for providing services in more than one school. Consequently, they may drive more than 100 miles a day to reach all of the students on their caseload. Providing itinerant services remotely could help teachers save time and possibly serve more students. For parents who come long distances to center-based programs for after school tutoring, providing remote itinerant services could help parents save time and costs associated with lengthy after-school car rides. Remote itinerant services could include academic instruction, speech and language therapy, family counseling, pre- and post-teaching, and advancement of literacy skills. With special funding and development of relationships with universities, telepractice for linguistically diverse children who are deaf or hard of hearing could even expand into supervision of graduate students at distance practicum sites.

Conclusion

Serving the needs of all children who are deaf and hard of hearing requires professionals to offer a variety of service delivery options. Telepractice can offer services to children who are deaf and hard of hearing whose families are bilingual or speak a language other than English in the home. Like center-based programs, the provision of telepractice requires a clear understanding of the individual needs of each family. The experience at CHS is that telepractice requires generous funding, a creative use of resources, appropriate personnel, effective management of challenges, and the continuous development of relationships in the community. With these, telepractice can remain an accessible service delivery option for children who are deaf and hard of hearing, including those who are linguistically diverse.

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The Volta Review, Volume 112(3), Winter 2012, 357–364

Program Profile

Connect*Hear* TeleIntervention Program

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Introduction

"We wish we had that option in our area."
"Wish we lived closer."
"I wish I would have known."

These statements, made by parents of children who are deaf and hard of hearing, illustrate a frustrating reality for many families—a lack of access to qualified professionals and specialized services to help children with hearing loss develop listening and spoken language. When access to communication options and qualified professionals is not readily available where a family lives, parents may not be given unbiased information and consequently informed choices about service options may not be made. In the state of Wisconsin, access to certified Listening and Spoken Language Specialists (*LSLS*™) was limited to a relatively small geographic region. The professionals at the Center for Communication, Hearing, & Deafness (CCHD) began to explore ideas to make all communication options, including listening and spoken language, accessible to families throughout the state no matter where they lived. The Connect*Hear* TeleIntervention Program was established to fulfill this commitment.

About the Program

CCHD is a private nonprofit agency, near Milwaukee, Wisconsin. Since 1926, the center has worked with individuals who are deaf and hard of hearing and is considered a leader in providing quality, state-of-the-art services. CCHD offers choices across the continuum of visual and auditory approaches to meet the diverse needs and goals of the families served. The many dedicated professionals at CCHD include speech-language pathologists, audiologists,

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and teachers of the deaf and hard of hearing who are highly trained and experienced to provide quality services in a family's chosen communication option, and the only LSLS certified professionals in the state. In addition to direct intervention with families, CCHD provides awareness, education, consultation, and professional training related to a listening and spoken language approach for early interventionists and other service providers.

The Connect*Hear* program is implemented by LSLS certified professionals with experience and knowledge about offering a spoken language option, specifically auditory-verbal therapy, through the use of computers, web cameras, and high-speed broadband Internet. The program has the potential to reach families who would not ordinarily have access to LSLS certified professionals in their local geographic region.

The auditory-verbal approach can be described as a comprehensive one-to-one therapy that focuses on audition for the development of listening skills as the foundation for all aspects of language and communication. The prominent tenants that facilitate the effectiveness of auditory-verbal services via telepractice are: parents as case managers and primary interventionists; parent guidance and coaching; diagnostic nature of the approach; and highly trained practitioners with specific knowledge, background, and experience teaching listening and spoken language skills in a family centered approach. The Principles of LSLS Auditory-Verbal Therapy, as defined by the AG Bell Academy for Listening and Spoken Language (2012), provide more details.

Telepractice is a logical and advantageous pairing with auditory-verbal therapy as it relies on parents' active participation. Parent participation is key to the success of both auditory-verbal practice and telepractice.

Background

In 2006, CCHD piloted what was then called a "long-distance auditory-verbal therapy service." The primary questions to be addressed were: (1) Would this type of service delivery be feasible? and (2) Could this service delivery model be effective for positive outcomes in auditory skill development and all aspects of spoken language? Essential to the start of this program were considerations regarding appropriate equipment, costs, fees, professional issues, and sustainability. Many additional questions were raised as well—How would parents respond to this model of service delivery? Would this be appropriate for children of varying ages? How would this model compare to in-person therapy? Could the same rate of progress and outcomes for both the child and family be expected? Would families feel appropriately supported? What equipment was needed by the facility and the family? What were the Internet connection options? Would there be acceptance of this service delivery model from other providers, such as early intervention Part C programs, early childhood and Part B programs, pediatric audiologists, and referral sources?

The initial list of questions seemed potentially overwhelming and endless. Fortunately, CCHD was a bit naïve and armed with optimistic determination.

Program developers decided to pilot this service delivery model with families who were currently receiving auditory-verbal therapy, committed to the principles of the approach, and already familiar with therapy expectations and implementation. The thought was to ensure a true pilot of the *service delivery model* for providing auditory-verbal therapy and not the therapy approach itself for a specific family. Three families participated in the initial pilot. Since that time, more than a dozen families have received auditory-verbal therapy through Connect*Hear*. The age at the start of therapy has ranged from 3 months to 16 years old. To date, the majority of clients are under 2 years of age when beginning telepractice and participate for an average of 2 ½ to 3 years.

Challenges

Challenges and considerations encountered can be generally separated into two categories: technology and logistics for conducting a therapy session.

Technology

Primary technology challenges include: equipment accessibility, high-speed broadband Internet accessibility, consistency of connections, and troubleshooting and technical assistance. As CCHD is a private, nonprofit agency and is not affiliated with a medical facility, a state or government agency, or a university or school, obtaining a private network or use of a closed-system videoconferencing network was not readily possible and cost prohibitive. Following exploration of technologies and Internet connection options, a variety of hardware and Internet connections were utilized by CCHD and the families. This included personal computers, laptop computers, portable devices (such as an iPad), web cameras, remote microphone and speakers, differing Internet platforms (Skype, iChat, etc.), and differing Internet connections (wired, wireless, satellite, etc.).

While many families own a computer, some do not. In the case of one such family, collaboration with the family's local birth-to-3 program enabled a computer to be purchased through an early intervention family grant program. At the beginning of the pilot in 2006, many families needed to upgrade their computer capabilities, Internet connection speeds, and/or obtain a web camera. This has changed as most computers purchased within the last couple years have the necessary minimum system requirements for adequate sound and video quality as well as integrated web cameras. Access to high-speed broadband Internet connections can still be a challenge in many locales. Some homes in rural areas simply do not have that service available. In these cases, problem solving where a family may be able to obtain Internet access is often necessary. Parents may need to seek the availability of adequate Internet access

at a local birth-to-3 agency building or a local community building, such as a library or a school. Collaboration with local service providers and programs has been invaluable in facilitating access to telepractice for these families.

Consistency of connection, and subsequently bandwidth, is often a defining variable in the ability to provide telepractice. In general, it has been found that hard-wired connections tend to provide the most bandwidth and a more consistent signal. Internet service provided via wireless and satellite has been challenging to date because of the variability of signal received. Families may need to upgrade their service with their Internet carrier to obtain and maintain bandwidth that allows an appropriate signal. Regardless of the connection type, when using the public Internet it has been found that consistency and quality of the signal is dependent on "Internet traffic." Specific times of day traditionally have more users accessing the Internet than other times of the day, and this can affect quality and consistency of the signal.

Logistical Considerations

Considerations regarding the logistics of therapy implementation include increased planning, materials, a suitable physical space, audio time delays, a high demand for effective parent coaching (Simser, 1999), the need for management of many variables at once, and the potential for participants to feel overwhelmed.

CCHD has found that telepractice sessions can require more time in planning and consultation with the family prior to a session. This is supported by the experiences shared by the National Center for Hearing Assessment and Management (NCHAM) learning community (NCHAM, 2012; see also Behl, Houston, & Stredler-Brown, 2012, in this issue). The family's intended physical space for the session requires appropriate lighting and sound with limited environmental distractions as well as adequate physical space for parent, child, and materials within view of the camera. Communication with a family occurs prior to a session to discuss intended goals and targets to be addressed, possible strategies to be employed and practiced, and possible activities, materials, and toys to be used during the session. Toys and physical items within the home are preferred as their availability facilitates carry-over in daily routines. Occasionally, materials or references for materials will be sent to the family prior to the session. Examples may generally include finger-play/song lyrics, various art project ideas, copies for cut-outs, or a specific book title or item that may be found at a local library. As it can be helpful to use duplicate or similar toys and materials, ideas are discussed and modifications are made, when needed, based on the items available to the family and the professional.

During the session, the professional is able to guide and coach the parent regarding ways to make auditory information and spoken language as salient as possible for their child. The parent has ample opportunity to practice strategies, ask questions, and trouble shoot ideas for carry-over with the

professional. However, participants may need to manage a large set of unpredictable variables during the therapy session. This can be potentially overwhelming, especially for the parent or participant new to this delivery model. For example, the parent may need to simultaneously manage the computer and other equipment, acoustic time delays, the environment, toys and materials, and the child's motivation and behavior all while effectively implementing suggestions and practicing strategies to facilitate their child's language development. While effective parent coaching and guidance is essential to both in-person and telepractice sessions, there is an even higher demand when participating in telepractice. CCHD practitioners have learned that an effective telepractice professional will have a heightened awareness of anticipation and remote management skills to assist in obtaining the learning objectives of both the parent and child. As the ultimate goal of the session is parental knowledge and confidence in implementing strategies and objectives for integration into the family's daily routines and everyday experiences, it is paramount that parents feel supported in their efforts.

While ongoing monitoring and diagnostic assessment occur regularly during telepractice sessions, administration of standardized assessments may not be possible. Maintenance of validity and best practice may dictate that standardized assessment be completed in person.

Evaluation

The Conncect*Hear* program periodically asks parents to complete a survey regarding their thoughts and experience with telepractice. The number one reported reason for participation in telepractice is access to a spoken language option and, specifically, auditory-verbal therapy. A relatively high level of satisfaction is reported (a score of 4.5 out of 5) regarding the effectiveness of telepractice to address the child's auditory, language, and speech needs. Regarding the families who completed the survey (n =11 families, including 13 individuals), all report observation of progress in their child's skills and abilities as a result of participation in telepractice. These observations are confirmed by diagnostic monitoring as well as regular quarterly and annual assessments that are administered according to the protocol of the CCHD. Children receiving services via telepractice were found to demonstrate gains in auditory and spoken language abilities, both in amount of progress and rate of progress, comparable to children participating in traditional in-person sessions.

Additionally, parents report a high level of satisfaction (a score of 4.6 out of 5) regarding information gained and skills learned to competently and confidently facilitate their child's learning of auditory, language, and speech skills. When asked to comment, all respondents made positive statements regarding the professional's ability to support, listen, and address personal concerns, indicating an effective parent-professional partnership can be established and maintained using this delivery model. Further, all parents

reported positive benefits for both the child and parent/caregiver regarding participation in telepractice. While 2 of the 13 respondents (approximately 15%) stated a preference for in-person sessions, all stated they would encourage other families to consider telepractice to access a desired communication choice of listening and spoken language. Survey comments from parents include:

- "I think therapy via this service delivery model is extremely beneficial."
- "This therapy model benefited me the parent because it equipped me, my child's number one therapist, with the tools and strategies to work on my child's auditory skills and language skills in our daily lives all week long. . . This delivery model made auditory-verbal therapy a possibility for our family."
- "[The therapists] always made me feel listened to and supported. I always feel like I know exactly what I should be working on with our child."

Pleasant Surprises

CCHD, as well as members of the NCHAM learning community, has found that expectations of outcomes and progress for children and families participating in telepractice can be comparable to progress expected in traditional in-person sessions. CCHD practitioners have observed that parents appear to more readily assume their role as the primary facilitator of their child's development, and subsequently parental abilities appear to improve at a faster rate. Some parents report they prefer telepractice sessions for this reason. Parental abilities to display creative thinking regarding the use of a variety of materials and situations to independently target goals appears to be enhanced with telepractice, and confidence can be gained as the parent, by necessity, must take primary control of the session. Parents, therefore, become competent in helping their child develop self-control and inner discipline (Cline & Fay, 1990; Colorosa, 2002; Fay & Fay, 2000) as well as become increasingly adept at implementing strategies for facilitating their child's overall learning and development. Subsequently, the children benefit by the enriched interactions with their parents throughout their everyday activities.

Other advantages parents report include:

- Difficulties commonly experienced with scheduling and transportation can be reduced with telepractice, resulting in fewer cancellations, more consistent contacts, and less stress on the family.
- Sessions can still occur even when a sibling may not be feeling well.
- The family may choose to conduct a session in their home or in another location, such as the home of a grandparent or in the backyard, given appropriate technology access.

- Opportunities for siblings or extended family members to participate in sessions can increase consistency of expectations and beneficial learning opportunities for the child.

In addition, the application of telepractice has also included consultation to other service providers and programs allowing for increased coordination of services to support children and families. Remote consultations with teachers and/or speech-language pathologists have been conducted in the educational setting for the child who needs continuing support in their neighborhood schools. Increased opportunities for formal professional mentoring is also facilitated with telepractice. By assisting professionals to increase their personal knowledge and skills, the Connect*Hear* program furthers its purpose to provide access to trained professionals and quality listening and spoken language options.

Conclusion

Two primary questions addressed at the start of the Connect*Hear* program were: (1) Would this type of services delivery be feasible? and (2) Could this service delivery model be effective for positive outcomes in auditory skill development and all aspects of spoken language? The experience with this program indicates that the answer to each question is "yes." CCHD and the Connect*Hear* program are grateful to the families and children who have helped explore the feasibility of this service and learn about telepractice. As advances in technology and service delivery models continue, CCHD values the possibilities of telepractice. Additionally, program leaders are grateful for the opportunity to share experiences and continue learning through participation in the learning community organized by NCHAM (see Behl et al., 2012, in this issue). The Connect*Hear* program continues to strive to provide access to qualified professionals and a choice of listening and spoken language for all families of children who are deaf and hard of hearing. No matter where they live. The following comment by a parent of two children who are deaf illustrates that telepractice can be an effective option for some families:

> "We are very grateful to be able to have this service delivery model available for our children. We live in an area that does not have access to this service without a very long commute. Receiving service via the Internet. . .has made a world of difference in their ability to speak and listen."

Acknowledgements

Special thanks to the learning community, NCHAM, Utah, and the professionals and families of the Connect*Hear* Program, Center for Communication, Hearing & Deafness, Wisconsin.

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The Volta Review, Volume 112(3), Winter 2012, 365–372

Program Profile

Telepractice Services at Sound Beginnings at Utah State University

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Introduction

The Utah State University Sound Beginnings program originated in 2007 as a laboratory school to serve children with hearing loss from birth to age 6 years old living in Northern Utah. Sound Beginnings offers an interdisciplinary listening and spoken language educational option for families through the following services: toddler and preschool classrooms, individual therapy, home-based early intervention, and onsite pediatric audiology services. Sound Beginnings works closely with community partners including local school districts, early intervention centers, and the Utah School for the Deaf and Blind. In addition to serving children with hearing loss, Sound Beginnings is a practicum site for graduate students at Utah State University in speech-language pathology, audiology, and deaf education who are enrolled in the listening and spoken language personnel preparation program.

In 2007, the Joint Committee on Infant Hearing (JCIH) made recommendations and guidelines for best practices for early intervention services for children with hearing loss. The position statement (JCIH, 2007) highlights the need for families to have access to high-quality intervention services from highly-skilled professionals and that these services should be available to families regardless of geographic location. Because some families in Utah live in remote, rural areas, access to consistent early intervention services can be a challenge. Additionally, access to providers who are highly skilled in a

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particular communication option can also be a challenge, either due to travel or limited specialization of the professionals in a specific region. Because of the desire to provide the highest quality services to all families, Sound Beginnings began to explore the use of distance technologies as an alternative service delivery model.

Sound Beginnings first provided early intervention services using distance technologies in 2007 with the assistance of a Utah State University Seed Program to Advance Research Collaborations (SPARC) grant. This grant funded the purchase of hardware and support staff to pilot the provision of telepractice services to two families. To provide an optimal experience, it was a priority to use a reliable system with high quality audio and video capabilities. Based on a comparison of the available options, cameras with built-in microphones and Tandberg voice-over-Internet protocol (VOIP) systems were purchased with the SPARC grant funds. Training was obtained from providers at the Royal Institute for Deaf and Blind Children (RIDBC) in Australia, where distance technologies had been used for several years. Additionally, Sound Beginnings developed tools to support delivery of high-quality services.

Telepractice Technologies

Sound Beginnings is currently providing telepractice services using Tandberg equipment or Skype. While the Tandberg equipment offers some advantages (e.g., stability of signal, security of Internet connection, and recording ease), the primary disadvantage is the cost of the equipment (between $4000-$15,000). The cost involved with purchasing this type of equipment significantly reduces the number of families and providers that can feasibly use a telepractice model. In 2011, Sound Beginnings participated in the National Center for Hearing Assessment and Management (NCHAM) telepractice learning community (see Behl, Houston, & Stredler-Brown, 2012, in this issue). At this time, different types of equipment were sampled. With acceptable bandwidth (approximately two megabits and over), Skype was found to have relatively stable auditory and visual signals for little to no cost.

Telepractice Sessions

Several important issues must be considered before initiation of telepractice sessions. The first is selecting families that are candidates for telepractice. Sound Beginnings carefully considers families based on multiple factors, including interest, the distance of their home from the center, and scheduling preferences. This information is obtained through a discussion with the family about the technological, environmental, and interactive aspects of engaging in telepractice. Once it is determined that the family is interested in receiving telepractice services, the family is given a Checklist for Determining Home

Capacity for Tele-Intervention (see Appendix A) to assess the need for support in the home, including the hardware, software, and connectivity for telepractice.

Second, it is important to communicate with families about the telepractice process to ensure their comfort level and to set up and provide training with the equipment. The provider sends a letter, the "Sample Letter to Families: What Happens During a Tele-Intervention Session" (Edwards, 2012), to the family outlining recommended preparation. In addition, the "Preparing for Tele-Intervention Session Checklist"(Behl, 2012) is completed prior to the first session; this checklist outlines the logistics of a telepractice visit (see Appendix A). These documents are reviewed with the family over the phone or in person. Families and telepractice providers also conduct a practice session to ensure that the equipment is functioning properly and to troubleshoot as needed. For example, issues that may arise during this first session include inconsistent bandwidth, poor audio and/or visual signal, visual glare or darkness at either site, and signal interference from other household technology (computers, cell phones).

The telepractice provider mails a box or packet of materials to the family for use during sessions held throughout the month. The provider also asks the family to compile items from home that can be used during the session. A selection of larger materials is recommended to help make the objects more visible over the computer screen. Document readers can also be used to share picture books. It is important to ensure that the family has the designated materials prepared in advance of the telepractice session. The family is encouraged to use these materials in daily family routines and in between sessions to reinforce the language facilitation techniques that were learned during a telepractice session.

Telepractice providers are either speech-language pathologists or educators of the deaf; irrespective of their training, they all have expertise in supporting listening and spoken language acquisition. Families typically receive telepractice services once a week. In keeping with the principles of family-centered intervention, the service provider models language facilitation techniques then asks the caregiver to demonstrate these techniques during the session. The telepractice provider watches the parent-child interaction and provides feedback regarding the parent's use of the techniques. Providers ask parents to gauge their comfort level with the techniques and to reflect on how they could be incorporated into their daily routines. At the conclusion of the session, the telepractice provider connects with the family to highlight goals, techniques, and skills used to determine what went well in the session and address any challenges that might have occurred. In so doing, the provider works with the parent to establish new goals, to implement new strategies and techniques, and to plan for future sessions. (For an overview of a typical Sound Beginnings telepractice session, please see www.infanthearing.org/ti-guide/implementation.html#overview.)

Central Components of the Sound Beginnings Model

One prominent component of the Sound Beginnings model is the role of the telepractice provider, who serves as a "coach." While there is no strict definition of coaching, the field of early intervention describes coaching as an interactive process of observation, reflection, and action in which the provider promotes the parent's ability to support the child's participation (Hanft, Rush, & Sheldon, 2005; McBride & Peterson, 2007; Peterson, Luze, Eshbaugh, Hyun-Joo, & Kantz, 2007; Roggman et al., 2008; Rush & Sheldon, 2006). This type of coaching is integral to the philosophy of listening and spoken language practice, which emphasizes that parents (not the interventionist) are the primary facilitators of their child's communication development. This coaching role works to support communication between parents and their child and makes the parent, rather than the provider, the primary communication partner in the session. Parent coaching has been particularly effective in fostering four aspects of parent-child interactions: (a) amount and type of parent-child interaction, (b) parent responsiveness to child communication, (c) amount and quality of linguistic input to the child, and (d) use of language learning support strategies (Roberts & Kaiser, 2011). In a coaching model, parents are given opportunities to practice particular communication strategies, provide feedback on their comfort level in using these strategies, and reflect on how this skill can be used throughout the day.

A second component of telepractice, which is unique to Sound Beginnings, is the ongoing assessment of the effectiveness of the practice. Sound Beginnings evaluators use surveys to obtain summative evaluation data. In addition to the documents mentioned previously, families complete a technology satisfaction survey that provides the program with specific feedback that can be used to improve technology in the future. Telepractice providers also complete a satisfaction survey that is reviewed with administration and information technology personnel. These surveys are completed every 6 months to evaluate overall satisfaction, competence, and confidence of families and providers in the implementation of telepractice. Through these evaluations, a number of benefits and challenges have been discovered.

Benefits

The primary benefit of telepractice is that families become active participants during sessions, which has led to an increased understanding and use of language facilitation techniques in between sessions. Because the sessions are recorded, family members and other caretakers who are not able to attend the sessions in person are able to review intervention sessions. This increases the entire family's understanding of the techniques and strategies modeled. The telepractice model also has decreased the number of visits that are missed due to inclement weather, illness (either provider, parent, or child), and scheduling

challenges. This model has also provided families living in remote areas with the opportunity to receive specialized services using listening and spoken language. Finally, telepractice sessions have resulted in increased provider–parent communication. Because the session is dedicated to facilitating fluid parent–child interactions, parents and providers are in more regular contact outside of the intervention session (via phone call or email) to discuss progress and session highlights and ensure that feedback does not interrupt parent–child interactions.

Challenges

One of the challenges with the telepractice model is the limitation of technology. Sessions can be interrupted due to an inconsistent signal, weather, and poor bandwidth in certain geographic regions. While Sound Beginnings is working to identify and decrease these problems, they do occur and make some sessions less than ideal. Typically, technical problems can be identified easily and promptly addressed. Another issue is management of the child's behavior via telepractice. While behavior management can also be a challenge in face-to-face contact, it can become more of an issue in a telepractice session, particularly if the parent is not comfortable managing behaviors. Because the telepractice providers are not physically present, they are unable to directly facilitate behavior management and this can take away from the effectiveness of the session.

Reimbursement has not been a challenge for providing telepractice services at this time. Sound Beginnings works with Medicaid reimbursement requirements and provides at least one face-to-face visit per month. For more information about reimbursement issues, visit www.infanthearing.org/ti-guide/reimbursement.html.

To ensure a successful session, it is important that both parents and providers allow for increased planning time. While telepractice sessions can decrease the amount of travel time by a provider, there is a considerable amount of preparation and planning needed prior to and following the session. Providers estimate that preparation, outside communication and follow-up with families, and planning take approximately 1 hour per session. When video recordings are used to reinforce targets and to share with family members not present at the session, this preparation can increase considerably (30 minutes to 1 hour per week). It is important that administrators and telepractice providers do not underestimate the time needed to plan, prepare, and communicate with families outside of the telepractice session, particularly when the sessions are first initiated. This extra time needed per family decreases approximately 1–3 months after telepractice services have been initiated. Factors contributing to the eventual decrease in time dedicated to planning and follow-up depend on family comfort taking the lead role in intervention, the parents' ability to model

language, child progress, and improvements in connectivity or technology issues.

Future Directions

Maximize Outcomes of Children with Hearing Loss and Their Families

Sound Beginnings' goal is to ensure that every child enrolled in the program reaches his/her full potential. Regular assessment of child and family outcomes are part of the tracking process and are used to evaluate the program and serve as the basis for changes to the program. Family satisfaction surveys are distributed every 6 months, at which time children are assessed across developmental domains. Sound Beginnings is in the process of collecting and analyzing data to compare outcomes of children and families enrolled in face-to-face visits compared to those receiving services through a telepractice model.

Increased Understanding of What Works and What Doesn't Work

While telepractice services have been well received and are increasing as a service delivery model, there is still little empirical data proving the effectiveness of telepractice sessions or describing when and why breakdowns occur. Careful analysis will provide increased understanding of the variables that impact telepractice sessions (e.g., family, child, provider, technology) and will help to enhance and strengthen the services that are provided. This ongoing assessment of family and provider satisfaction will ensure that an effective system is in place.

Sound Beginnings is working with the Utah School for the Deaf and Blind to expand telepractice services across the state of Utah. Currently, training is in place to introduce new early intervention providers to the process outlined in this article. As more families are served through telepractice, the staff at Sound Beginnings hope to discover new ways to improve the model for families and early intervention providers. In addition, they are working to develop a model for telepractice that accommodates families using English as a second language.

Sound Beginnings has found that provision of telepractice services is a critical element in the provision of high-quality early intervention services to families of infants and toddlers with hearing loss. Telepractice has fostered a better understanding of the components of successful family-centered services. Through systematic analysis of the process, Sound Beginnings expects to better understand the variables that contribute to successful implementation of a telepractice model for children, families, and providers. As this model becomes

more well-defined, Sound Beginnings plans to increase the number of families served. Overall, because Sound Beginnings strives to offer the highest quality services, this innovative model has the unique potential to offer specialized services from highly qualified professionals to children and families regardless of their geographic location.

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Appendix A
Sample Checklists and Letter to Parents Engaging in Telepractice

Checklist for Determining Home Capacity for Telepractice	www.infanthearing.org/ti-guide/implementation.html#tech-checklist
Sample Letter to Families: What Happens During a Telepractice Session	www.infanthearing.org/ti-guide/docs/sample_letter_to_families.pdf
Preparing for a Telepractice Session Checklist	http://www.infanthearing.org/ti-guide/docs/technology_and_home_environment.pdf

The Volta Review, Volume 112(3), Winter 2012, 373–381

Program Profile

RIDBC Teleschool™: A Hub of Expertise

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Introduction

The Royal Institute for Deaf and Blind Children (RIDBC) is Australia's largest independent special education provider and one of Australia's oldest charities. Founded in 1860 in Sydney, Australia, RIDBC seeks to provide high quality, innovative education and therapy to children who are deaf and hard of hearing and their families. RIDBC strives to implement innovation in all aspects of service delivery by regularly undertaking program evaluation, conducting external review and assessment, and seeking feedback from families (RIDBC, 2012). RIDBC currently provides specialized hearing and/or vision services to more than 1,000 children and families across Australia.

Historically, families living in rural and remote areas of Australia received limited, if any, support for their child's hearing loss. Support was generally provided through correspondence courses, infrequent outreach visits by specialists, or by families undertaking long journeys to major cities. By the late 1990s, advances in telecommunications technologies provided the means to connect families with professionals using real-time, two-way audio and video transmission. RIDBC initially developed a telepractice pilot program that relied on existing Integrated Services Digital Network (ISDN) connections to link families in the country with professionals in the city. These ISDN connections were often found in hospitals and community health centers (McCarthy, 2011). In 2004, the Australian Federal Government recognized the success of the RIDBC pilot project and provided funding to expand the program nationwide. The national program became known as RIDBC Teleschool™ and focused on the use of in-home technology to provide consistent service to rural children who were deaf and hard of hearing. A team of highly qualified and experienced teachers of the deaf and speech-language pathologists were chosen to develop a hub of expertise, which included

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dedicating significant amounts of time to acquiring advanced technical skills and creating a shared pedagogy for telepractice.

As early adopters of telepractice, RIDBC Teleschool has been developing and refining a model for best practice over the last 10 years. RIDBC Teleschool has received national and international recognition for its innovation, and professionals from around the world have sought advice and training from its expert team, including those from the United States, India, China, Bangladesh, Singapore, Australia, and New Zealand.

Over 400 children have received RIDBC Teleschool services since its inception. The use of telepractice expanded steadily during the first 5 years, increasing tenfold from four families initially to 40 families by 2007. In the last 5 years, families have embraced the idea of using telepractice to access a hub of expertise, and enrollments have increased exponentially, reaching 171 families in 2011 (RIDBC, 2011). RIDBC Teleschool also uses telepractice to support families in international locations, such as Samoa, Fiji, India, Dubai, and Singapore.

Technology

As technology evolved, RIDBC moved from the use of ISDN lines to more advanced technologies, including Asymmetric Digital Subscriber Line (ADSL) and cellular (McCarthy, 2011). The shift to ADSL and cellular allowed RIDBC to move from studio-based telepractice sessions to sessions conducted in the family home. This required the installation of dedicated videoconferencing equipment, such as Polycom, as well as a dedicated Internet connection in each home, at no charge to the family. Although many programs use families' home computers and personal Internet connections coupled with freely available software (such as Skype), RIDBC Teleschool has found the use of dedicated videoconferencing equipment connected to a private network to be far superior. Technical parameters within a private network, such as an Internet Protocol Wide Area Network (IPWAN), can be set to prioritize data flow and limit contention, producing a more reliable connection for telepractice. This option is generally not possible on public Internet networks. Dedicated videoconferencing equipment typically has a number of additional features that enhance service delivery. These include a camera with a high quality lens and a variety of remotely controlled features, such as pan, tilt, and zoom. Dedicated videoconferencing equipment allows professionals to operate both their own camera and the family's camera through remote control at either location.

Additional internal features of dedicated equipment allow the professional to record sessions, share content (such as a presentation or a website), and include multiple participants in a session. Furthermore, dedicated equipment can be monitored and managed remotely by a technician at a

central site, regardless of the location of individual units. This level of maintenance is difficult to achieve when families use their home computers (McCarthy, 2012).

RIDBC Teleschool Model

RIDBC Teleschool offers a nationwide program and accommodates for time differences by offering extended operating hours (8:00 a.m.–8:00 p.m. M-F and 8:00 a.m.–12:00 p.m. Sat.). Children are eligible to receive services through RIDBC Teleschool from the time they are diagnosed with a hearing loss until the time they leave school, usually at age 18. Families primarily access ongoing support and specialist services from RIDBC Teleschool via telepractice. Families are encouraged to visit RIDBC annually, but this is not a requirement of enrollment. Annual visits provide families with access to a wide variety of additional services, including group sessions, preschool/school site visits, audiological assessments, and in-person sessions with RIDBC professionals. The service is provided free of charge to families with the majority of funding provided by charitable donations and a small portion from government funding.

Visits to the RIDBC campus also provide opportunities for families to meet other families whose children are deaf and hard of hearing. This helps families enrolled in RIDBC Teleschool develop a sense of belonging to a wider community, especially when their child is the only child in the local community who is deaf or hard of hearing. Having a support network reduces the feelings of isolation experienced by families and provides a continuing sense of solidarity for families when they return to their rural locations. For those families who are not able to visit RIDBC, other methods are used to develop a family support network, i.e., parent courses and web interactions (see Innovation section later). In-person visits also offer additional opportunities for professionals to develop rapport with children and families. For families who are unable to travel to RIDBC, rapport can be developed exclusively via telepractice. The professional must make a concerted effort to include ample opportunities to build and foster the relationship with the child and family during weekly telepractice sessions.

Staffing

Currently, RIDBC Teleschool employs 14 full-time equivalent professionals, including teachers, speech-language pathologists, and audiologists. Teachers hold a variety of qualifications, such as teacher of the deaf and hard of hearing, early childhood educator, and Listening and Spoken Language Specialist (*LSLS™*), and some hold multiple certifications. RIDBC Teleschool also employs additional nonteaching staff, including a program manager, administrative/technical assistant, toy librarian, and information technology

(IT) specialist to ensure smooth operation of the program. When needed, RIDBC Teleschool practitioners and families can also access professionals from other departments within RIDBC, including occupational therapists, audiologists, or psychologists.

Early Intervention Program

The early intervention program uses a family-centered approach focused on "guiding and coaching families to become the primary facilitators of their child's listening and language development" (AG Bell Academy, 2012). Families are typically provided with a 1 hour weekly telepractice session, although some families prefer, and receive, two shorter sessions per week. Sessions use a combination of the family's own resources as well as educational resources sent from RIDBC's lending library. Sessions follow a predictable routine:

- Greeting/rapport building.
- Discussion of previous week's developments.
- Review of follow-up activities from previous session.
- Explanation of activities and goals for the day.
- Audiological check.
- Review of familiar activity.
- Introduction of new activity.
- Summary of session outcomes.
- Planning for follow-up and in-home activities.
- Confirmation of scheduling details for next session.

In a telepractice session, the triad of parent, child, and professional creates opportunities for three distinct types of interaction (see McCarthy, Duncan, & Leigh, 2012, in this issue). The first occurs when the professional takes the lead, interacting directly with the child and including the parent as a participant in the activity. During these interactions, the professional takes an instructional role and demonstrates skills and techniques for the parent. The second type of interaction occurs when these roles are reversed and the parent takes the lead, interacting directly with the child. During these interactions, the professional assumes the role of coach as the parent is guided to fully integrate listening and spoken language goals into the activity. The third type of interaction occurs between the parent and professional without the child and focuses on parent information and education. In the early stages of intervention, parent education often centers on understanding the child's hearing loss and associated audiological reports. Over time, parent education targets specific topics, such as speech development hierarchies or listening and spoken language strategies (e.g., acoustic highlighting or prompting techniques).

School-Age Program

Beyond early intervention, RIDBC continues to support children who are deaf and hard of hearing and their families after the child begins school. Some families continue a program similar to the early intervention program described above, receiving weekly telepractice sessions at home. Other students participate in telepractice sessions during school hours with support from a paraprofessional at their local school. These school-based telepractice sessions can range from 1 hour of weekly support to 30 minutes of daily support, depending on the needs of the student and the amount of local services available at the school. Telepractice sessions focus on the student's specific needs in the areas of listening, speech, and language, regardless of whether the sessions take place at home or at school. RIDBC Teleschool professionals collaborate closely with school personnel and the student's family to ensure that skills and strategies from the telepractice sessions are generalized to both school and home settings.

Pedagogy

RIDBC Teleschool professionals have found significant differences in the skills required for an in-person intervention model compared with those needed in a telepractice model. As a result, RIDBC Teleschool has developed and refined a model of telepractice pedagogy. Telepractice places heavy demands on professionals, requiring them to adapt their existing knowledge and skills to a telepractice model as well as developing new skills specific to telepractice. This is crucial to consider when hiring professionals to work in a telepractice program. Professionals must be creative in developing lessons that can be delivered successfully via telepractice and flexible in adapting lessons when there is an unexpected challenge. Time management and organizational skills are necessary for the successful planning and preparation required for telepractice. Professionals who have less training or who are new to early intervention may find it difficult to focus on the added complexity of telepractice (McCarthy, 2012).

Once employed, RIDBC professionals receive ongoing training in both technology and pedagogy specific to telepractice. New staff members receive intensive training during their first 3 to 6 months of employment. Pedagogy training includes observation of experienced professionals, self-evaluation of telepractice sessions, and peer reviews. Initial technical training includes an introduction to available equipment, basic operation of the system, and understanding of the transmission methods. Training is provided through lecture, practice, and feedback from supervised telepractice sessions. Later technical training focuses on advanced features of equipment (e.g. closed captioning), the use of peripheral equipment (e.g. visualizers), and the

inclusion of multimedia resources, such as video, web-based, and portable media. Because technology is constantly evolving, professionals must maintain current knowledge of technical developments and their application. RIDBC practitioners meet weekly for 2 hours to support ongoing professional development. Five full-day sessions are held annually and professionals have access to various courses through the RIDBC Renwick Center. Topics covered include rapport building, parent coaching, adult learning styles, new technologies, and specific listening and spoken language strategies.

Innovation

The initial objective of RIDBC Teleschool was to pioneer the use of in-home videoconferencing to provide highly specialized hearing support to families living in rural and remote areas of Australia. RIDBC Teleschool achieved this objective through intensive staff training and pedagogical development. As new technologies emerge, RIDBC Teleschool is focusing on further refining a model of best practice and including new and innovative approaches into its service delivery.

Multimedia Resources

RIDBC Teleschool employs a Multimedia Instructional Designer who develops resources to complement and enhance telepractice sessions. A variety of current and emerging multimedia are used to develop and distribute innovative educational resources. Media include print, video, web-based, and portable media, such as iPad applications (apps). These resources enhance the delivery of telepractice by providing variety within the session and additional learning opportunities following the session. For example, when both the professional and the family bring an iPad to the telepractice session, the level of engagement is increased because the child can interact directly with the resource rather than simply observing the professional as she models an activity. Having duplicate materials also allows the professional to demonstrate how to use various components of a particular app, such as the RIDBC Old MacDonald app. After the demonstration, the family takes the lead while the professional coaches and guides the parent to focus on the integration of listening and language skills into the iPad activity. The family can then continue to use this resource to focus on the child's goals throughout the week. RIDBC has an extensive lending library, including toys, books, games, iPads, iPods, and other materials and equipment that are regularly sent to families.

Another multimedia resource developed by RIDBC Teleschool is a private, password-protected website for families who are enrolled in the program. The website incorporates aspects of social networking as well as blogging and facilitates collaboration, information sharing, and parent training. Families are able to connect with one another, ask general questions, and share their

experiences. Professionals also use the site to supplement weekly sessions and maintain an ongoing dialogue with families. Weekly telepractice sessions are recorded, enabling professionals to edit specific clips from the session, upload them to the website for private viewing by the family, and begin an asynchronous discussion to review and consolidate the key points from the weekly telepractice session. This recording also provides a running record of the child's progress over time. Beyond the educational opportunities, the RIDBC website also overcomes geographical barriers by connecting people from great distances and alleviating feelings of isolation.

Multipoint Sessions

Because families enrolled in RIDBC Teleschool are geographically dispersed, parent courses are delivered either on campus during residential visits or via telepractice. RIDBC Teleschool uses dedicated videoconferencing equipment (i.e., Polycom) that has the capacity to connect multiple participants. The use of multipoint videoconferencing allows for multiple participants at various locations to join in the conference simultaneously. Families may use the technology that is set up in their home by RIDBC, or they may attend a studio, whichever is more convenient for them. Multipoint videoconferencing allows all participants to see and hear each other in addition to the professional. This technology is primarily used with adults for courses related to their child's listening and spoken language development, but sessions have also been trialed with children. One instance included a professional facilitating a discussion between a teenager who had received a cochlear implant at age 11 and another teenager who was considering cochlear implant surgery. Younger students benefit from the social language opportunities presented in a multipoint conference, including conversational turn-taking, listening skills, and staying on topic.

Closed Captioning

Some of the families enrolled in RIDBC Teleschool include those where one or both parents are deaf or hard of hearing themselves. These families use listening and spoken language and have chosen a listening and spoken language approach for their children. Unfortunately, lip reading cues can be difficult to perceive via telepractice and additional supports may be necessary for these parents. RIDBC Teleschool has begun experimenting with closed captioning, which is another potential benefit of dedicated videoconferencing equipment. Dedicated Polycom cameras have an internal captioning function built in as a standard feature. Professionals can easily integrate captions within the telepractice session in real time using a standard keyboard. RIDBC Teleschool pairs this in-built camera functionality with Dragon Speaking Naturally Voice-to-Text software to improve the speed and ease of captioning.

This feature not only benefits parents who are deaf and hard of hearing, but also has the potential to promote literacy skills in older students who are deaf and hard of hearing.

Assessments

RIDBC professionals conduct formal assessments every 6 months to monitor student progress. Assessments include a range of standardized tests as well as language sampling and criterion-referenced checklists. When possible, assessments are administered during family visits to RIDBC's main campus in Sydney. Unfortunately, many families in rural and remote locations are unable to travel to RIDBC for assessments. As a result, RIDBC Teleschool has developed a specific protocol to administer assessments via telepractice (McCarthy, 2012). This protocol was developed following extensive informal investigation by RIDBC to ensure that results acquired in a telepractice setting are comparable to results achieved by the same students during an in-person session. Camera placement, access to materials, and robustness of technology have all been carefully considered.

Metropolitan Services

The success of telepractice in rural and remote areas has led RIDBC to explore potential applications in metropolitan areas. The use of telepractice has the potential to increase efficiency of metropolitan service delivery, especially for itinerant professionals. Telepractice results in reduced travel time and elimination of occupational health and safety issues related to travel, while simultaneously expanding the reach of highly skilled professionals into multiple locations. Telepractice is also emerging as a preferred model for adolescent students enrolled in RIDBC Teleschool as they prefer to participate in therapy via telepractice rather than working with a practitioner in the classroom.

Conclusion

As pioneers in the use of telepractice, RIDBC Teleschool has developed a successful model for supporting children who are deaf and hard of hearing and their families. The growth of RIDBC Teleschool from a small pilot project to a well-established national program required a significant amount of reflection, revision, and training, which resulted in the development of a shared pedagogy for effective telepractice. RIDBC Teleschool has created a hub of expertise by combining this shared pedagogy with dedicated technology and highly qualified professionals to provide regular, ongoing family-centered intervention and services for school-aged children. RIDBC Teleschool continues to explore innovative technology solutions in an effort to enhance

and expand its existing telepractice program. As other agencies begin to adopt the use of telepractice, RIDBC Teleschool provides a model for the successful application of new and emerging technologies to meet the needs of children who are deaf and hard of hearing and their families regardless of their location.

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The Volta Review, Volume 112(3), Winter 2012, 383–391

Program Profile

Maximizing the Impact of Telepractice Through a Multifaceted Service Delivery Model at The Shepherd Centre, Australia

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Introduction

The Shepherd Centre is a nonprofit early intervention program in New South Wales, Australia, providing listening and spoken language services through an interdisciplinary team approach to children with hearing loss and their families. The program has been providing distance services to families in rural and remote areas of Australia and in other countries for over 35 years. Advances in communication technology and the global push towards telepractice and e-health service delivery models, and, in more recent times m-health (which is the use of mobile telecommunication and multimedia technologies integrated within mobile and wireless health care delivery systems; Istepanian, Laxminarayn, & Pattichis, 2006), compelled The Shepherd Centre to adapt their distance service delivery model to provide up-to-date, effective, and efficient telepractice services to families from rural areas.

This profile describes how the distance support program has adjusted its service to embrace telepractice through a low cost, accessible, and reliable framework. In addition, individual telepractice sessions are supported with a residential workshop program for families and professionals. Experience with this model has shown that the workshop program maximizes telepractice outcomes by providing face-to-face follow up and combining the team and

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network support families need to be confident, empowered, and successful in guiding their children with hearing loss to listen and speak.

Program History

The Shepherd Centre was founded in 1970 by Dr. Bruce Shepherd, his late wife Annette, and their two children, who were born profoundly deaf. The Centre was the first of its kind in Australia to provide early intervention for children with hearing loss and the opportunity for families to guide their child to learn spoken language through listening. Beginning with just five families, the Centre now works with more than 300 families from five bases across Sydney and Canberra. In their search for an intervention program, Bruce and Annette Shepherd visited the John Tracy Clinic in Los Angeles, California, to learn about listening and spoken language options for their children. Upon returning to Australia, they were determined to provide a similar service to other families seeking a listening and spoken language outcome for their child with hearing loss. One of the integral aspects of the program has been the annual Workshop and Distance Education Program for families and professionals from rural and remote areas of Australia and from other countries. This program is based on the International Summer Session Program provided by the John Tracy Clinic.

For many years, families from rural and remote areas of Australia who were seeking a listening and spoken language outcome for their children attended the Centre's annual Residential Workshop and joined the Centre's correspondence program, in which they were regularly mailed session themes and activities to work on with their child. With the advances in communication technology and the global focus and trend towards telepractice, The Shepherd Centre investigated ways to provide this distance service more efficiently and effectively for both families and staff. The key focus of this change was to provide a means for families to regularly access all members of The Shepherd Centre team, including Listening and Spoken Language Specialists (*LSLS™*), pediatric audiologists, child and family counselors, and ear, nose, and throat (ENT) specialists, to provide the comprehensive services families need to facilitate optimal language outcomes for their children. Family experiences and feedback strongly indicated to the team that these telepractice services needed to be supplemented with intensive face-to-face group programs for families and local professionals, despite the extra geographical challenges, in order to maximize the effectiveness of the service.

Telepractice Services at The Shepherd Centre

With almost 70% of Australia's population living in cities (Australian Bureau of Statistics, 2003) and with a land mass not much smaller than the United States, services in Australia are thinly spread. New South Wales, where The Shepherd

Centre is based, has almost one-third of the total Australian population. Although the state has the same population numbers as Washington state in the United States, it is geographically four times the size. The Shepherd Centre is a relatively small, nonprofit organization that relies heavily on fundraising as it receives only 30% of its income from government grants. To provide services in this landscape, The Shepherd Centre needed a telepractice model that was (a) cost effective, (b) accessible by all families, and (c) sustainable throughout the duration of early intervention services (birth to age 6 years). Skype, a free online videoconferencing tool, was selected as the optimal telepractice medium to facilitate remote sessions.

Telepractice sessions are provided to families and health care professionals on a weekly, biweekly, or monthly basis, as determined by individual need. Typically, these begin after an initial visit to the Centre for the family to meet the intervention team, which the team believes is critical in developing a relationship with the child and family. From there, the online sessions are most often run by a LSLS certified professional and focus primarily on educating parents to become the facilitator of listening and spoken language development in their own home. Rather than set activities with clinician-selected toys, the initial part of the session (a preconsult with the family) identifies the child's current level of functioning and rate of progress in the areas of listening, speech, language, and cognition, and parent areas of focus and concern. The session itself is then very fluid in nature and encourages parents to use every day experiences (e.g., washing up at the kitchen sink) rather than conducting a table-based therapy session. Professionals work with the family by guiding and coaching them as they perform their daily activities. Professionals focus family member attention on current goals in the identified areas. Reflecting the interdisciplinary nature of the team, online sessions also include child and family counselors and pediatric audiologists. These services cover the remote MAPping of cochlear implants, consultations, and trouble-shooting as required, and provide access to ENT specialists through The Shepherd Centre's integrated First Sounds Cochlear Implant Program (run in conjunction with Sydney Children's Hospital).

Families (including extended family members), child care facilities, preschool/school age teachers, and local health and education professionals (e.g. speech-language pathologists and itinerant hearing support teachers) all participate in Skype sessions to achieve family goals. A consultative relationship between The Shepherd Centre team and local health professionals enables the necessary on-the-ground follow up for the family. Families from a range of demographic, socioeconomic, and educational backgrounds access the services, although there are currently no families from an indigenous background using the telepractice program.

Equipment in Australia can be purchased through federal or state government funding assistance for eligible families. Professionals initially train families how to use the technology over the phone, and then throughout

the initial online sessions. Families are guided and coached in how to set up the system and use it effectively in different ways, and are taught troubleshooting techniques and strategies. All families consent to the use of Skype for providing telepractice health care intervention for their family and are aware of the limitations of using Skype as a secure communication tool.

Advantages to Telepractice Services at The Shepherd Centre

The well documented advantages to telepractice services (Houston, 2011; Marcin et al., 2004; McCarthy, Munoz, & White, 2010) are applicable to the service provided by The Shepherd Centre. These include ongoing guidance and monitoring of a child's progress and reduction of travel time and expenses to both the family and the service provider.

When asked to describe the benefits of their sessions, families reported empowerment, confidence, new ideas, up-to-date information, working with local providers, and being in their everyday home environment as benefits of the program:

- "We are empowered to make our own decisions about our child's therapy."
- "[The session] helps give me confidence and keeps me on track."
- "Ideas, just through trying to help me be aware, saying you could be doing this or doing that, or try to read books to him this way, just different ways of playing with toys...It helps me get a real sense of trying to think outside the box."
- "We've recently acquired a tablet device, which means I'll be able to walk through the house as we're doing things rather than just having him sitting at the table, and the therapist will be helping me with my language, with what I'm saying."
- "It was a great relief to know there was this kind of help available, because we really got some out-of-date help and advice where we are located but didn't know it at the time."
- "Once we've done the sessions, our therapist will email our local speech-language therapist about my child's progress so we're all working together as a team. That's helped our therapist because she's not a specialist in the field."

Professionals also identified benefits above and beyond those that can be provided in face-to-face sessions, including the use of the family's resources, working within the home environment and routines, empowering parents as therapists, and increased opportunities for parent education:

- "Using resources the family has makes follow-up seamless."
- "Working in the home environment and through family routines helps generalization of targets."

- "It becomes impossible for the therapist to 'take over' the session."
- "By their very nature, remote sessions empower parents, bringing them to the realization that they *can* do it because they *are* doing it."

Is Telepractice Enough?

Challenges to Telepractice Services Provided at The Shepherd Centre

As with any program reliant on technology, there are clear limitations and challenges to providing services to families via a remote, online connection. Despite the benefits, Hooshmand (2010) reports that it does not and cannot take the place of a face-to-face service. It requires good communication between the professional and family, and relies heavily on technology and equipment. Challenges and barriers, as reported by families and professionals, include technology, engaging children through the screen, and working on particular speech sounds:

- "One of the barriers when we first started telepractice was that our computer was pretty old and the connection was unreliable. Sometimes I could hear the therapist, but I couldn't see her even though she could see us."
- "You're not face-to-face and the technology can let you down sometimes. If you've got a really good connection, it's brilliant, it's like being in the same room."
- "Another particular challenge is working on speech. It can be quite difficult to hear the child's productions in order to give feedback on whether they are correct or not, but that's just because of the sound quality sometimes."

Telepractice does provide a platform for regular services to families and the ability for a team of professionals to monitor a child's progress remotely. However, ongoing experiences and feedback provided by families has indicated overwhelmingly that families benefit more from their telepractice services when they are supplemented with face-to-face sessions.

Some activities are best done in a group environment with families in similar circumstances, which aren't possible through telepractice services alone. Families living in rural areas with no direct access to specialists or others in their situation report feelings of isolation. They report having a need for information, advice, guidance, and support as this impacts their ability to remain positive and provide the daily therapy their child needs.

As such, a crucial supplement to the telepractice services provided to families through The Shepherd Centre is the family's attendance at an annual Residential Workshop Program. The workshop has been running at the Centre for over 35 years to provide families from rural and remote areas access to specialized services. The program is provided at a minimal cost to families and

is funded from grants and donations from community and corporate organizations. In 2011 and 2012, extra funding was sourced to enable the week-long program to be supplemented with shorter outreach workshops for families in their local communities. All members of the family are encouraged to attend, and specialized programs for siblings, fathers, and parent advocacy are offered. The program is structured with parent education seminars and panel discussion topics designed around the needs of the attendees. These topics relate to:

- Listening, speech, and language development.
- Optimization and management of hearing devices.
- Building family resilience.
- Positive parenting.
- Goal setting.
- Using the principals of auditory-verbal therapy.
- Medical and surgical interventions.
- Living with a hearing loss.

These seminars and discussions are facilitated by ENT specialists, cochlear implant surgeons, pediatric audiologists, LSLS certified professionals, child and family counselors, graduates and their parents, and teachers and representatives from regional advocacy organizations. In conjunction with these seminars, families attend daily auditory-verbal therapy and education sessions, group language sessions, and individual audiological and counseling consultations. Aided/unaided hearing tests and speech and language assessments are conducted as appropriate. Families also attend an excursion based on a routine family outing where they are coached to maximize audibility and language input for their child in an everyday activity and a familiar environment. A specialized program for siblings who have typical hearing is also provided for them to share their individual experiences, attitudes, and needs as brothers and sisters of children with hearing loss.

The workshop program also provides a concurrent training program for professionals working with families in regional areas. Professionals from regional areas are encouraged to attend with the family they are working with or on their own, and participants work with professionals from The Shepherd Centre throughout the program. As one participant commented, "A fabulous workshop, inspiring and supportive. I would highly recommend it to other colleagues. I will now be reassessing my programs and the way in which I deal with parents."

Benefits/Challenges of Group Residential Workshops

Families from rural and remote areas often feel isolated from the rest of their local community when their child is diagnosed with hearing loss. They may

never have met another child or family with a similar diagnosis. Connections are forged at residential workshops; parents are able to share their experiences with others while children with hearing loss socialize and play together. Parents report that the workshops have provided a forum for them to meet other parents who are experiencing similar things, understand the situation they are in, and build a valuable support network. Online forums for these families often stem from the workshop program, which serves to facilitate and strengthen a family's support network well beyond the workshop week. The number of contact hours a family receives throughout the week-long workshop program is equivalent to 6 months of weekly, center-based services. As families often "leave their life behind" and focus solely on learning the skills required to teach their child to listen and speak, the benefits for families attending these programs often far outweigh those for families attending centre-based sessions.

There are some challenges for families to attend the workshop program in addition to their regular telepractice sessions. The primary challenge is finding the time for the whole family to attend the workshop and leave behind their daily commitments. Child and family outcomes are so positive from the workshops that The Shepherd Centre is committed to working with and assisting families to attend and sourcing the necessary funds and resources for continuation of the program.

Effectiveness of the Residential Workshop Program

The effectiveness and impact of each of the residential workshop programs is evaluated through a parent and participant survey. The Net Promoter Score (NPS; Taylor, 2006) is used to gauge the effectiveness of the program as part of the survey. Information is obtained by asking participants to answer questions on a 0 to 10 rating scale, where 10 is extremely likely and 0 is not at all likely. The score is measured by asking, "How likely is it that you would recommend the workshop to a friend or colleague?" Based on their responses, participants are categorized into one of three groups: Promoters (9–10 rating), Passives (7–8 rating), and Detractors (0–6 rating). The percentage of Detractors is then subtracted from the percentage of Promoters to obtain a NPS. The NPS can be as low as −100% (all Detractors) or as high as +100% (all Promoters). An NPS that is positive (i.e., higher than zero) is felt to be good, and an NPS above +50% is excellent. Out of 35 families who attended the workshop in 2011 and 2012, 32 families returned evaluations (91% response rate). Results indicated that overall, the workshop program achieved a NPS of +100% (n=32 Promoters, 0 Passives, and 0 Detractors).

The evaluations of individual sessions provided at the workshop indicated mean satisfaction scores for auditory-verbal therapy sessions of 4.78 out of a total possible score of 5.0 (n=32), and for group listening and language sessions, 4.47 (n=30).

Outcomes for Children Receiving Telepractice Services

In 2011, 45 children and their families received ongoing telepractice and workshop services through The Shepherd Centre's Early Intervention Program. Of this group, 3 children were aided unilaterally, 19 used bilateral hearing aids, 7 used one cochlear implant and one hearing aid, and 16 used bilateral cochlear implants. As per The Shepherd Centre's standard assessment protocols for all children in the Early Intervention Program, formal speech and language assessments were administered by speech-language pathologists to all children in the program at 6-month, 12-month, and 24-month post device fittings, and then at the chronological age of 3 years, 4 years, and 5 years old. Results from the Preschool Language Scales 4 (Zimmerman, Steiner, & Pond, 2002) indicated that of those who were enrolled in the telepractice program, able to complete the assessment in a standard manner, and able to attend the centre for assessment within the appropriate time window of the data collection point (23 of the 45), 47% (n=11) achieved a total language score within the average range and above. The children were diagnosed and fitted with hearing devices before 12 months of age and had highly-engaged parents who actively sought telepractice services for their children. In contrast, 53% (n=12) achieved a total language standard score below the average range. There were several possible reasons for these lower scores. Four children in this group had access only to local intervention services in a rural location for a number of years prior to joining the program, 3 had a diagnosis in addition to hearing loss, 2 were diagnosed after 12 months of age, and 3 had significant internal family barriers that prevented them from accessing regular telepractice and workshop services. The program is currently looking at ways to work with families who are less engaged and with reduced internal family capacities to increase their participation in services and contribute to improved outcomes for all families and children.

Summary

The combined telepractice service and workshop program at The Shepherd Centre provides regular, holistic, and interdisciplinary services for children with hearing loss and their families who live in regional areas with limited access to the services needed to develop listening and spoken language. The residential workshops add unique experiences and benefits that work to maximize the outcomes achieved by standard telepractice services. In combination, telepractice sessions and supplementary face-to-face workshops provide an opportunity for families to become enabled and empowered to make choices, obtain knowledge and information for their child, receive one-on-one access to a range of professionals, and establish critical family-to-family

support networks. More information about the program at The Shepherd Centre can be found at www.shepherdcentre.org.au.

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The Volta Review, Volume 112(3), Winter 2012, 393–402

Program Profile

TeleCITE: Telehealth—A Cochlear Implant Therapy Exchange

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Introduction

What might bring the efforts of a physician, a speech-language pathologist, a teacher of the deaf and hard of hearing, and a nurse together? The answer is the innovative use of telepractice to deliver high quality, family-centered early intervention to infants and toddlers with hearing loss. TeleCITE: Telehealth—A Cochlear Implant Therapy Exchange—was a regional collaborative effort in a western region of the United States. The primary contributors to this collaboration worked in different capacities in Colorado. One partner is a certified Listening and Spoken Language Specialist (*LSLS™*) with 19 years of experience providing early intervention to infants and children with hearing loss. Another is an administrator who has been trying for many years to investigate effective ways to provide equitable early intervention services to children irrespective of the geographic location in which the family lives. The third partner is the executive director of the Listen Foundation; this program has a 40-year history working with children, their families, and professionals to promote the development of listening and spoken language skills for children who are deaf and hard of hearing. The fourth partner is a physician involved in promoting telepractice in health care services through the integration, utilization, and promotion of information and communication technologies.

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A quest to explore the use of telepractice to serve young children with hearing loss brought these four professionals together. In 2009, a grant proposal was written following a request for proposals from the Colorado Clinical & Translational Sciences Institute (CCTSI). These professionals formed an academic-community partnership to investigate the delivery of services by LSLS certified professionals to children in remote or rural areas of Colorado. The project intended to develop a research platform to support telepractice. Children with cochlear implants living in rural and remote areas and whose parents sought to implement a listening and spoken language approach to learning would receive services.

In no time, the need was so profound and so well accepted that the project officer was encouraged to extend the project to include two neighboring states—New Mexico and Wyoming. Over the course of 12 months, 15 partners joined together to advance this initiative. The project benefited immensely from the time and expertise of Dr. Dale Alverson—a pediatrician, the medical director for Telehealth and Cybermedicine Research at the University of New Mexico Health Sciences Center, and, at the time, president of the American Telemedicine Association (ATA).

A significant commitment from the Alliance for Technology, Learning, and Society (ATLAS) on the University of Colorado campus made implementation of this project possible. ATLAS is an assessment and research center and collaborates with faculty, scientists, outreach partners, and public school educators to evaluate and research educational technologies and to develop and encourage use of technology-based curricula. The efforts of Dr. John Bennett, director of the ATLAS Institute, and Dr. Revi Sterling, an instructor in the ATLAS Institute, are notable and contributed directly and indirectly to the success of this project.

History of the Grant—A Three-State Collaboration

During the 12-month grant period, the partners shared their expertise toward a common goal—to deliver listening and spoken language therapy using telepractice technology. A literature search was conducted to learn about effective models of telepractice within the fields of speech-language pathology, audiology, and occupational therapy. For instance, the American Speech-Language-Hearing Association (ASHA) published a position statement, a technical report, and a list of knowledge and skills related to telepractice (ASHA 2005a, b, c, 2010). ASHA and the American Occupational Therapy Association (AOTA) have created brochures, DVDs, and websites addressing the delivery of their services through telepractice. The AOTA has identified practitioner qualifications for delivering services through technology (AOTA, 2010). These materials were reviewed along with other published resources about telepractice (Grogan-Johnson, Alvares, Rowan, & Creaghead, 2009;

Kelso, Fiechtl, Olsen, & Rule, 2009; Mashima & Doarn, 2009; McCarthy, Munoz, & White, 2010; Reynolds, Vick, & Haak, 2009). There is strong evidence that telepractice can be used effectively by speech-language pathologists to provide access to therapy. To date, however, few services have been delivered specifically to children who are deaf and hard of hearing using this service delivery model (McCarthy et al., 2010).

The project partners, located in four states, met monthly through videoconferencing to discuss the information gleaned from the literature review. The partners worked together to discuss ways to promote telepractice. These meetings often included presentations from practitioners who were pioneers in the field and actively using telepractice to supplement traditional clinical practice. Video demonstrations conducted by LSLS certified professionals served as a powerful tool to educate all partners and to achieve a shared vision of the project's goals. These activities fostered partnerships that would ultimately promote sustainability of the project when grant funding ended.

In addition, the partners contacted administrators and therapists in individual schools as well as staff in several state departments of education that were already providing any type of rehabilitation services through telepractice. Contacts were made with professionals in Illinois, Indiana, Maine, New Mexico, North Dakota, Oklahoma, Texas, Utah, and Wisconsin. Representatives involved in telepractice in these states provided information about the strengths, needs, opportunities, and threats they experienced when they first pursued delivery of services through telepractice. Partners also contacted staff from the British Columbia Early Hearing Program (S. Lane, personal communication, September 19, 2010) and a program at the University of Queensland in Australia (D. Theodoros & T. Russell, personal communication, June 28, 2010).

Potential stakeholders in the region were invited to participate in synchronous meetings organized and funded by the project. These stakeholders included professionals working in cochlear implant centers and representatives from two cochlear implant manufacturers. Most importantly, stakeholders invested in providing services to children with cochlear implants were identified and invited to attend. The sessions with LSLS certified professionals in the area and administrators of listening and spoken language programs served as a professional enrichment experience and introduced telepractice as a new and emerging strategy. These educational sessions also supported the goals of the grant by providing grant personnel with input from participants who would have a role in future research projects.

In addition to the prospective benefits to be gleaned from these rich partnerships, the project leaders wanted to roll out a pilot therapy program. A LSLS certified Auditory-Verbal Therapist (*LSLS Cert. AVT™*) would conduct therapy sessions with two children with cochlear implants. Before formally soliciting potential participants, the grant staff received calls from families in the region. This was very encouraging. Families who were able to secure

funding for telepractice sessions were selected. Both families chosen initiated telepractice within 3 months of each other.

Grant staff assessed the status of existing equipment in each child's home and in the LSLS practitioner's office, and evaluated physical space, including acoustics and lighting. It was assumed that the standards for delivering this service to children who are deaf and hard of hearing would need to meet a high standard in order to support adequate video and audio transmission.

The findings reported here describe the outcomes for both families; one had less-than-expected success and the other experienced a very successful outcome. Through these trials, grant staff learned about a myriad of issues that accompany a shift from a traditional face-to-face delivery model to a telepractice service delivery platform. Some of these issues include licensure, travel requirements, scheduling arrangements, payment, technological challenges, functioning of advanced hearing technology (i.e., cochlear implants), parental desires and willingness to embrace an auditory-based communication approach, and the unexpected time needed to plan for therapy and communication between therapist and parents.

A Challenging Experience

The first client was a 2-year-old living in a very rural western state. He failed the newborn hearing screening, was identified with a profound hearing loss, received hearing aids at age 9 months, and received a cochlear implant at age 15 months. He primarily used sign language to meet his communication needs and did not have access to listening and spoken language therapy. The child had been working with a speech-language pathologist, but according to diagnostic testing and the therapist's report the child was not making adequate progress. The LSLS Cert. AVT was to provide training to the parents and instruct the local speech-language pathologist in specific ways to improve communication using a listening and spoken language approach.

Several challenges were experienced. The first obstacle was that the LSLS professional practiced in one state and the child lived in another. Crossing state lines to deliver telepractice was a predictable obstacle. The LSLS professional was required to obtain licensure from the state in which the child lived, which required time and money. In order to secure licensure, this professional had to obtain letters from ASHA, transcripts from universities, and statements documenting licensure from other states. Even though the therapy was starting mid-year, the annual fee for licensure was not prorated.

Because there was not adequate equipment or bandwidth in the home to support telepractice sessions, the project team decided to conduct telepractice sessions from locations with business-class, room-based videoconferencing systems, onsite IT support, and reliable broadband connections. This was an attempt to access the very best infrastructure and to support a successful trial.

To accomplish this, sessions with the family were conducted on both ends at local universities using a device known as a "bridge", which was located on a third university campus, to connect the participants. The bridge provided the opportunity to record the sessions, as this option was not available at the two university locations. The family's local early interventionist, a speech-language pathologist, participated in the sessions. One logistical challenge was that the LSLS professional's own office was approximately 25 miles from the university campus. This added a significant amount of driving time to the scheduled session.

Significant technical difficulties were encountered despite the business-class teleconferencing infrastructure being used; it took multiple attempts to obtain a clear image and signal with synchronous audio and video. It is notable that even when professional teleconferencing equipment is utilized, there are often network barriers that can affect the audio and video signal quality. The LSLS professional worked with IT experts on campus to improve the quality of the service.

Another challenge was the limited amount of time the parents were able to devote to the therapy. The child's father worked more than one job and the child's mother was in college and working full-time. Their busy schedules made it difficult to identify a time for therapy. To further complicate the scheduling process, the family also needed to arrange for their travel time to the university in order to participate in therapy sessions. A parent needed to drive to the child's daycare center, pick-up the child, bring him to the university for the telepractice session, and then return to daycare and work/school. The parents also had a difficult time making some of their child's appointments and integrating auditory learning into their daily lives.

The LSLS professional was very concerned with this child's lack of response to sounds after having used his cochlear implant for 16 months, and indicated this to the child's parents. It appeared, early on, that the cochlear implant itself was not functioning appropriately or perhaps it was not programmed optimally because the child did not have full access to spoken language and demonstrated little progress during the first few telepractice sessions. The LSLS explained the importance of having a good implant MAP and for the child to use the cochlear implant processor consistently. Following the recommendation of the LSLS, the family made a trip to their cochlear implant center shortly after telepractice sessions were initiated. At this time, they had a face-to-face therapy session with the same LSLS, an appointment for cochlear implant MAPping at the implant center, and a test of cortical auditory-evoked potentials. The cortical auditory-evoked potential results showed poor responses and limited development of the auditory cortex, which suggested the cochlear implant either was not programmed correctly, was not being worn consistently, or the possibility of the child having other developmental issues. The parents seemed concerned.

During the first 2 months of telepractice, and prior to the child's re-evaluation at the implant center, the child began responding to sounds and to his name more than he had prior to therapy. He also began imitating some sounds inconsistently. Unfortunately, after 2 months, the parents chose to discontinue telepractice sessions. They reported they could not manage the scheduling issues nor make a commitment to proceed.

A Successful Experience

The second family had a more successful outcome. This family lived in a rural county approximately 6 hours driving distance from any of the LSLS professionals in the state. This 3-year-old child had a progressive hearing loss and received bilateral cochlear implants when she was age 2 years, 5 months. She was seen two to three times each month by an early intervention provider who had experience working with infants and toddlers with hearing loss but was not, herself, a LSLS certified professional. The LSLS Cert. AVT and the early interventionist developed a coordinated treatment plan by sharing goals and weekly notes through email. The child also received 30 minutes of speech services from a speech-language pathologist in her local public preschool.

Telepractice sessions started shortly after the child's third birthday. Several logistical issues needed to be addressed. Regarding the technology, the parents were comfortable with various types of hardware and software and were willing to investigate trials with various types of computers (laptop or desktop) and different teleconferencing providers (Vidyo and Skype). The parents upgraded their wireless speed to the maximum offered in their community. This provided a signal with improved quality, which allowed telepractice sessions to be conducted in the child's home rather than requiring the parents to travel to a community center with broadband access. There were a few times during the sessions when a signal was lost, the microphone stopped working, or the quality of the visual and auditory signals was degraded. These limitations did not seem to hinder the notable progress made in the child's listening, speech, and language.

An IT specialist evaluated the infrastructure in the LSLS professional's office and adjusted the equipment by increasing broadband capability to optimize upload speed. Trials with various types of computer technology (e.g., desktop, laptop, iPad), different cameras, and lighting were completed in order to conduct telepractice sessions from her office rather than driving to the university. These alternatives provided more flexibility to scheduled therapy appointments.

Funding was another challenge; the family approached various agencies to secure funding to pay for telepractice sessions. Ultimately, after weeks of phone calls and research, Medicaid became the payer for the telepractice sessions. The

home was also a busy one with six children and a father who held three jobs, but sessions were scheduled regularly and there were few cancellations.

This child was at home with her family many hours each week. The parents had been able to work on specific strategies throughout the day by integrating them into daily routines. This child's parents saw the necessity to increase their demands and to present new challenges to their child; they have been rewarded for their efforts.

To date, this child has received weekly telepractice sessions for 14 months. Her expressive vocabulary has advanced from 10 words to over 500 words. She is talking in fairly complete and complex sentences, though she still requires prompts for noun markers and some state-of-being verbs. She is overhearing conversations and asking questions about what she has heard, and is able to follow three to four-step directions by listening.

This child made remarkable gains in the first 9 months of therapy. She made 18 months of progress in receptive language in 9 months' time; expressively, she made 9 months of progress in the same amount of time. While this child did not have a sufficient number of vocalizations to administer a standardized test of articulation at the start of telepractice, her articulation score was within normal limits for her chronological age when she was tested after 9 months in therapy. While behavior was a struggle initially, this child is now able to use phrases and sentences to express her needs and emotions. The child is currently enrolled in a local preschool with peers who have typical hearing and she has a communication facilitator with her at all times.

Lessons Learned

There are many similarities between face-to-face therapy and telepractice, but there are some differences as well. Practitioners may find they need more time to plan for each session and to share the session plan with the family before the session. This gives the practitioner and family members an opportunity to identify materials that will be used and to ensure the materials in both locations are similar. A separate time may be set aside to identify the materials the family has in the home and materials that can be accessed for a therapy session.

More time in the session is dedicated to implementation of coaching techniques. This is time well spent as these techniques improve family members' confidence in their ability to model, prompt, correct, and develop their child's skills. An attendance policy may help a family to understand that this time is set aside specifically for them and the time is to be treated as if it were an office visit.

A checklist of items to consider prior to the first telepractice session (e.g., taking the child to the bathroom, feeding the child, ensuring siblings are cared for during the session) is helpful. Since parents become the primary facilitators of activities for their child, it is helpful for them to take notes about the work

they are doing with their child. These notes provide the material for discussions during future sessions.

Conclusion

The critical need to deliver appropriate therapy to children who receive cochlear implants has been well documented. Speech perception shows substantial growth for the first two to three years of device use (Fryauf-Bertschy, Tyler, Kelsay, Gantz, & Woodworth, 1997; Geers & Brenner, 2003; Miyamoto et al., 1994; Quittner & Steck, 1991). Speech production shows substantial improvement over at least 3 years post implant (Tobey, Geers, & Brenner, 1994). This translational research project investigated the efficacy of providing children with hearing loss who have cochlear implants with high-quality therapy even when they live in remote or rural areas of a three-state region. A partnership of academic researchers, a nonprofit therapy center, and a technology consultant fostered collaborative mechanisms to document the need for this therapy service, to determine where services were needed, and to identify the technology to meet the need. The delivery of high-quality services through telepractice narrowed the gap, in a small way, between what is known based on the research advances cited here with what is actually possible. Therefore, the goal is to offer equitable therapeutic services to children living in geographically-challenged regions.

At the beginning of the TeleCITE project, the authors hoped that professionals in the three-state region would be able to glean some useful information from these efforts. This pilot project determined ways to deliver therapy to children with hearing loss who have cochlear implants in their remote or rural communities; helped identify ways to support LSLS certified professionals who deliver telepractice services through appropriate, well-functioning hardware and software supported by adequate available bandwidth and network connectivity; and sought out effective means to engage teachers and therapists living in remote and rural communities. Each partner in this pilot project brought their unique clinical expertise, knowledge of technology, and consultative expertise to the table.

Long-term plans have been made to apply what was learned about telepractice so that it may become a full-scale service delivery model. This could occur on a statewide or national level. The authors believe that many more children with hearing loss can benefit from telepractice. While this project focused exclusively on children learning to listen and develop spoken language, the lessons learned also apply to children using other communication approaches. The overall goal as therapists, teachers, physicians, and administrators is to provide quality care that affords children and their families opportunities to access the services they need to succeed. Telepractice can open these doors for children with hearing loss and their families.

Acknowledgement

This project/publication is supported in part by Colorado CTSA Grant 5UL1RR025780 from the National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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The Volta Review, Volume 112(3), Winter 2012, 403–407

Program Profile

Implementing Coaching in a Natural Environment through Distance Technologies

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Introduction

Listen and Talk is an early intervention and preschool program based in Seattle, Washington, that provides auditory-verbal education and therapy to children with hearing loss and their families. In addition, staff members provide consultations with public and private schools across the state. The mission of Listen and Talk is to teach children who are deaf and hard of hearing to communicate and learn through listening and spoken language. Established in 1996, Listen and Talk is the largest organization of its kind in the state. Its programs are family-centered and include parent coaching and educational support. Since February 2011, team members have been exploring the use of distance technologies to provide services to families remotely. This practice is referred to as telepractice. Team members have found that telepractice can meet the needs of families and, in some cases, improve the impact of coaching techniques.

Importance of a Coaching Model

Coaching has been recognized as an effective process by which to support families of children with disabilities (Hanft, Rush, & Shelden, 2004; Rush, Shelden, & Hanft, 2003). Doyle (1999) elucidates five components of the coaching process: (1) initiation—the coach and parent jointly developing a plan that includes purpose and specific outcomes; (2) observation—an opportunity for the provider to observe the family and assist in building competence or for

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the parent to observe the coach demonstrating or modeling a strategy; (3) action—the demonstration of the parent's use of the new skill; (4) reflection—the coach asking questions and causing the parent to think about what is happening in the moment, what he wants to happen, and how changes can be made to meet the goals; and (5) evaluation—reviewing the effectiveness of the coaching process.

Professionals working at Listen and Talk use a coaching paradigm to strengthen the competence and confidence of the parents. This includes improving the parent's abilities to reflect, self-correct, and generalize their skills as they enhance and promote their child's development and participation in everyday activities. Specifically, professionals adhere to the principles of Listening and Spoken Language Specialists (*LSLS™*), which is fundamentally based on the "guiding and coaching of parents as the primary facilitator of their child's listening and spoken language development" (AG Bell Academy for Listening and Spoken Language, 2012). The majority of Listen and Talk's early intervention sessions take place in a "natural environment," as dictated by Part C of the Individuals with Disabilities Education Act (IDEA; Federal IDEA, 2010) and Washington state guidelines (Annual State Application, 2012). The natural environment is described as "settings that are natural or normal for the child's same aged peers who have no disabilities" (IDEA, 2004). The home setting is often the most natural environment in which to provide services and for which there are a myriad of learning opportunities. Telepractice helps support this by having the professional conduct sessions virtually in the child's home using every day activities.

Integrating a Telepractice Model

The Listen and Talk service delivery area cuts across a large region of Western Washington State. In an effort to improve the program's ability to meet the rising demand for services across this large geographic region, Listen and Talk initiated a pilot project in early 2011 to explore the utility of employing distance technology to provide early intervention services. The provision of services via distance technology versus in person services upholds the best practice of providing early intervention in the most relevant places, at the most relevant times, by the most relevant people (Siskin Children's Institute, 2012). Providing support to families within their home environment enables one to take advantage of opportunities that occur throughout the day, every day. The equipment is merely the tool for providing the same services that have historically been done in person and thus meets the intent of the natural environment clause of the federal regulations.

Listen and Talk purchased Tandberg videoconferencing equipment to pilot the provision of services through distance technologies. The installation of the equipment in a family's home consists of a video camera, a video conferencing

console, and a monitor. The provider's equipment utilizes identical components. Both sets of equipment are connected to broadband high speed Internet, providing quality audio and video for session activities. Equipment is loaned to families as needed.

Benefits

One of the anticipated benefits of telepractice was that the technology would enable Listen and Talk professionals to serve families more consistently than face-to-face sessions, which can often be cancelled due to inclement weather or family members' illness. In addition, team members anticipated greater ability to include other family members in sessions due to increased flexibility in scheduling telepractice sessions.

Staff members' experiences reflected these anticipated advantages. Interventionists were able to keep appointments that would otherwise have been canceled, including during a snowstorm, when the provider was mildly ill, and when a family temporarily moved out of the area. Implementation through distance technologies also proved beneficial in a case when a child had extreme stranger anxiety. The interventionist was able to coach the parents without the child's hesitation since the interventionist wasn't present to elicit the child's anxious reaction. In addition, providers discovered that using a telepractice model can provide opportunities to improve the parents' abilities within a session. The nature of the interaction using distance technology necessitates the active participation of the parent. Because the professional isn't immediately available to step into the activity, the parent must become the primary—or exclusive—facilitator of the child's communication and language. Passive observation of the professional's interaction with the child is not possible.

In addition, Listen and Talk has found increased opportunities for collaboration and teaming with various local service providers who may also be serving a family. A significant number of the children receiving services from Listen and Talk also receive other services, such as vision support or physical therapy. Ideally, there should be a high degree of coordination of care between providers, including joint visits. It has been very difficult to schedule a time when both providers can be at a home session. Engaging in telepractice eliminates travel time for local providers and increases opportunities to provide collaborative care to families.

Related Challenges

There are a number of challenges related to telepractice (National Center for Hearing Assessment and Management, 2012). High quality videoconferencing equipment is cost-prohibitive on a large scale. Listen and Talk is exploring the use of lower cost commercially available services to meet expansion needs. In

addition, team members have found it necessary to build a toolbox of equipment that can be loaned out to families who do not own the necessary hardware to enable telepractice sessions. In addition, lack of connectivity within a families' geographic region has prevented the implementation of telepractice in some cases. For example, there are areas of western Washington where the Internet connectivity is so limited it cannot sustain real-time transmission.

Conclusion

Listen and Talk's experience is that telepractice provides a powerful means by which to provide home-based listening and spoken language support services. By engaging in telepractice, professionals have reflected their own personal desire to intentionally focus on ways to strengthen their coaching skills so that families can better facilitate listening and spoken language learning in a natural and playful way through their daily routines and activities. Telepractice provides an effective means to nurture the relationship between parent and child and support the child's desire to communicate with the family. Through modeling, reflection, and practice, families gain competence in the interactive process of helping their young child to develop the ability to listen and speak. And while this can be achieved through in person or telepractice sessions, Listen and Talk's preliminary experience with telepractice indicates that it holds promise for enabling as good or, in some cases, improved quality of services to more families.

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The Volta Review, Volume 112(3), Winter 2012, 409–416

Program Profile

Telepractice: Creating a Statewide Network of Support in Rural Maine

Karen Hopkins, M.Ed., CAGS; Barbara Keefe, M.Ed.; Angela Bruno, M.S.Ed.

Introduction

The Maine Educational Center for the Deaf and Hard of Hearing's *POINT* (Providing Opportunities for Integrating New Technologies) project is implementing a telepractice, distance learning collaborative in Maine with eight hub sites and 18 end points using Tandberg videoconferencing technology. This network is planned to be a national model enabling students who are deaf and hard of hearing and their families to overcome geographic, language, and cultural barriers to access rich and diverse early intervention and educational programs.

The Maine Educational Center for the Deaf and Hard of Hearing (MECDHH) is located on a small island off the coast of rural Maine. MECDHH provides statewide services to children birth through age 21 who are deaf and hard of hearing. For over 25 years, outreach programs have provided support to children with hearing loss in their homes, daycare centers, public schools, community libraries, and hospitals. There are challenges inherent in serving children in a state like Maine that has large rural areas. Limited opportunities for collaborative training with other professionals, winter travel, and distances to rural communities often prohibit delivery of ongoing and in-depth support to parents and professionals in local school districts.

In recent years, MECDHH has been a leading force in Maine's distance-learning initiatives. MECDHH utilizes distance learning technology to provide statewide access to information, support, and programming

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throughout this geographically large state. For instance, when a family travels out of state to receive a comprehensive evaluation, the use of telecommunication equipment allows MECDHH to set up meetings with the evaluators to discuss their findings. Having the parent in Maine surrounded by their home support team makes the implementation of recommendations a smoother process for all.

MECDHH also utilizes distance learning technology to foster collaboration. For example, MECDHH and the New England Consortium of Deafblind Projects and Services for the Blind joined forces to provide a full day clinic to assess cortical visual impairment (CVI) of young children. Using Tandberg's MOVI, a mobile device for personal computers, experts located in Pennsylvania evaluated students while teachers of the visually impaired in Maine observed. It was a very successful use of technology to assess children and provide needed training for professionals in Maine. MECDHH expects that opportunities like this will increase the use of professionals in hub sites as well as experts in other states through access to compatible technology to enhance knowledge and skill sharing. MECDHH continues to look for ways to enhance the services they offer by utilizing new technology.

POINT Project

MECDHH is engaged in a 2-year distance learning project funded through a U.S. Department of Agriculture, Rural Utility Service (RUS) grant. The project, called *POINT*, will transmit resources from eight hub sites using Tandberg videoconferencing technology to targeted rural areas throughout Maine (Figure 1). In 2012, staff developed training modules and designed delivery systems. In 2013, staff will begin program delivery and evaluation.

MECDHH recognizes the importance of collaborating with other organizations to offer families and professionals access to experts in the field of hearing loss. Through this grant, MECDHH, which is one hub site, collaborates with four additional hub sites: Children's Hospital Boston, Clarke Schools for Hearing and Speech, Hear Me Now!, and Rochester Institute of Technology. Experts from each of these sites represent many different professional disciplines, including: teachers of the deaf, educational audiologists, speech-language pathologists, Listening and Spoken Language Specialists (*LSLS™*), mentors who are deaf and hard of hearing, and psychologists. *POINT* has four program goals:

1. Educate professionals who work with students who are deaf and hard of hearing.
2. Provide appropriate academic and social support to children who are deaf and hard of hearing in mainstream settings.
3. Assist families of children who are deaf and hard of hearing to access resources in a timely manner.

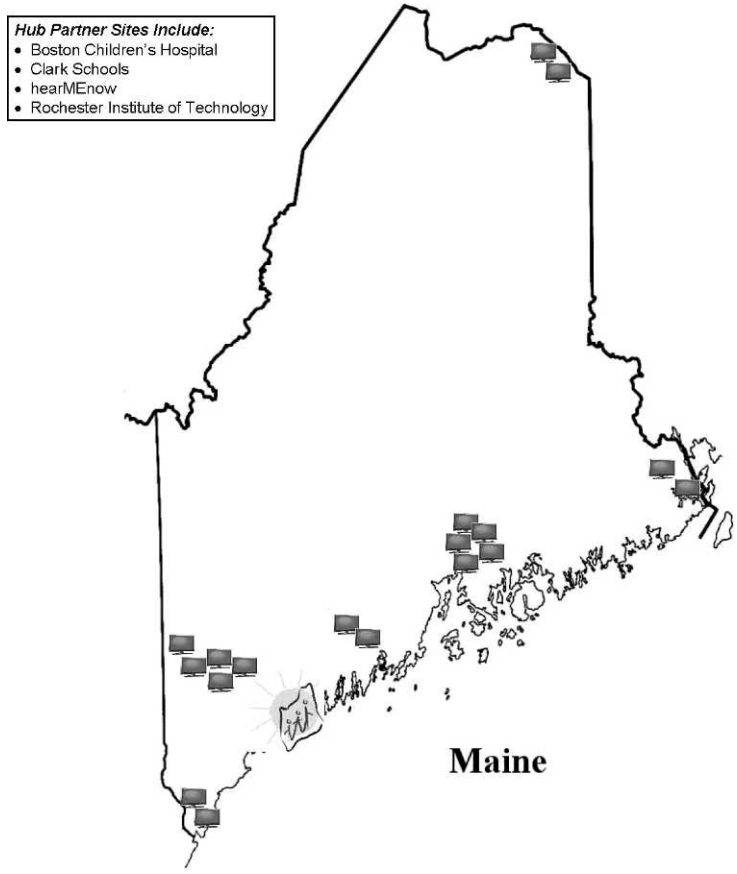

Figure 1. Geographical distribution of schools participating in the *POINT* project. Additional videoconferencing equipment is located in over 1,000 schools, hospitals, and state/community agencies statewide.

4. Raise community awareness and understanding of the needs of children who are deaf and hard of hearing.

Finding Resources to Meet Needs

Professionals who work in the field of early intervention and deaf education need skills to support the children and families with whom they work. However, a prevailing issue is finding additional funding to expand programs using 21st century technologies during difficult economic times. For MECDHH, a viable option was to find a grant that focused on technology. The RUS grant supports programs utilizing distance technologies. The center utilized the services of a

grant writer and collaborated with the MECDHH Public School Outreach and Early Intervention Outreach program coordinators.

Steps in the Process

Initiating a statewide program using grant funds involves many steps and requires collaborative discussions with stakeholders from many different agencies. With this process comes challenges and successes. The first step was to identify school districts in Maine where children who are deaf and hard of hearing reside. This grant requires the placement of technology in rural areas that match child and family needs, such as distance from providers, being able to include extended family members, and specific Individualized Education Program (IEP)-driven requirements. It was important to ensure that these children lived in towns that met grant requirements, such as towns that were rural or lacked appropriate services.

The next step in the project involved soliciting matching funds through discussions with the administrators of the selected school units. Each school's technology budget needs to be considered because the criteria for accessing grant funding involves a monetary cash match. The schools that provide services for students who are deaf and hard of hearing were receptive to enhancing services to this population and welcomed the additional resources from experts in the field of deaf education. Twelve school districts committed to the project, and 18 different schools were engaged.

National and state resources in the field of hearing loss were also contacted to see if they were interested in serving as hub sites to provide resources and services as part of the *POINT* project. This particular process was free of challenge since all agencies that were contacted responded with enthusiasm to the opportunity to support more children, families, and professionals in rural areas of Maine. The project's five hub sites (MECDHH, Children's Hospital Boston, Clarke Schools for Hearing and Speech, Hear Me Now!, and Rochester Institute of Technology) were equipped with high end Tandberg videoconferencing equipment. Tandberg's MOVI was chosen because this software client is capable of delivering video at 720p (an HDTV signal format and 30 frames per second). This equipment served as a common link to deliver programming to the end points in Maine, which included the 12 school districts involved in the *POINT* project as well as other users of distance technology. Tandberg technology is compatible with Polycom, which is significant as there are hundreds of Polycom units throughout the state. The equipment was also used with families who received services in their homes.

A technology vendor provided expertise and input on the equipment needed for the grant proposal. It was critical to explain the needs and goals of the program to the technology vendor to ensure that appropriate technology was selected. MECDHH worked with a trusted vendor to create a budget that took into account the technology and the training needed to prepare professionals to

work with distance technologies. Families and providers would also be given support to ensure they are comfortable using the technology. Telepractice requires some basic equipment and services at both the hub site (the expert provider's location) and the remote (rural) site. The essential elements of telepractice include a computer with a monitor or an integrated conferencing station, a webcam, high speed Internet, and software that provides a shared, virtual workspace. Optional equipment includes dual headphones with boom microphones, printer, copier, fax, document camera, and in-room phone (Juenger, 2009).

The final step in this process was securing approval from the MECDHH's school board as MECDHH would be serving as the grant's fiscal agent. School board members required an explanation about the commitment that was being made, the advantages to MECDHH's mission to offer all communication approaches, and the delivery of this new service throughout the state of Maine.

Needs of Families in Rural Maine

Many families living in rural areas are unable to access the same programs, resources, and services in their local communities that are offered to children living in urban environments. The use of technology can provide families in rural areas with access. The hub experts connect and collaborate with families, early intervention providers, local school districts, and hospitals using telecommunication equipment (videoconferencing equipment and computers) to provide a variety of supports and resources to families and professionals throughout the state.

Early Intervention Support

The Early Childhood and Family Services (ECFS) program of MECDHH offers an early intervention program for children birth to age 3. The ECFS program provides information to families and professionals across the state, supports the choices families make to benefit their children, and helps parents to identify the resources that will help them meet the individual needs of their infant or young child. Home visits and child care visits are scheduled to support the family and primary providers for children who are deaf and hard of hearing, or who have a suspected hearing loss. ECFS works collaboratively with Maine's Part C agency, Child Development Services.

The *POINT* project expands MECDHH's goal of statewide access to services. This is done in many ways, such as connecting more families to adults (aka; mentors) who are deaf and hard of hearing and introducing families to different professionals (e.g., LSLS, educational audiologists, speech-language pathologists, teachers of the deaf) and support networks (e.g., parent support groups for children who are deaf and hard of hearing)

throughout New England. Videoconferencing equipment is set up in each family's home so the child and caregiver can view the provider, mentor, or specialist in real time on a television screen or computer monitor (Cason, 2011). Each family is also provided a license for MOVI, which is paired with a USB camera at the family home. Families utilize their personal computers. Grants are currently being sought to support families who do not have computers in their homes.

The early interventionist, acting as a coach, supports and encourages the parents as they learn and practice new strategies. Rush (2000) noted that the practitioner-as-coach provides support to parents to improve their child's skills and abilities rather than working directly with the child. The early interventionist, in turn, provides ongoing feedback about the parent's use of particular techniques supporting the child's language development, overall development, and behavior (Kaiser & Hancock, 2003).

The consultants from MECDHH may serve as a liaison between the family and the specialist providing the telepractice services. Or the MECDHH consultant may be a conduit between a provider in the rural community and the specialist. Families also receive support during the Individual Family Service Plan (IFSP) process by utilizing technology to include professionals in the field of hearing loss who are not onsite.

Consultation

The ECFS consultants, and some of the *POINT* project hub partners, provide consultative services to daycare providers and preschool teachers throughout Maine. Telepractice aligns well with the consultative service delivery model and may be used to connect specialists working in different locations with people in a rural community. Using telepractice, team members work together to identify learning opportunities within a child's natural environments, teach therapeutic techniques to embed within daily routines, problem-solve collaboratively, coordinate care, and identify community and family resources (Cason, 2011). Using videoconferencing technology, more families can join support groups and participate in classes that are otherwise available only to those in urban areas of the state.

A specific need is for children in Maine who are considering, or have received, a cochlear implant. Currently there are no cochlear implant centers in Maine. Families travel hours to engage in the cochlear implant candidacy process. Meetings and consultative sessions related to implant candidacy often occur without the support of the child's team in Maine. Through distance technology, families can collaborate with providers at Children's Hospital Boston. Although some face-to-face appointments are necessary, the cochlear implant team can collaborate, remotely, with the child's local team to reduce some of the travel.

Telepractice offers more opportunities to serve students and boosts student learning (Juenger, 2009). For the first time, educators and therapists in Maine can receive frequent interactive support for students that are placed in their classrooms. The Public School Outreach (PSO) program of MECDHH employs consultants who support students in mainstream settings. In collaboration with the *POINT* project, PSO and the project's partners are able to offer more frequent and in-depth support to teachers and therapists throughout the state. Most distance events are collaborations among professionals and family members. Collaborative efforts move from explaining and debating possibilities to executing outcomes (Ricci & Weise, 2011). Parents and professionals are given an opportunity to provide feedback during the program sessions. As evidenced by family feedback and measured child outcomes, a balance of onsite and distance support is proving to be successful. Through these consultative activities, professionals in rural areas are able to receive information quickly and "face-to-face." Professionals working in the mainstream are able to ask questions and get immediate responses to help modify their curriculums and the strategies they use with their students. A range of topics is offered, including literacy, language development, and use of all forms of hearing assistance technology.

A combination of in-person and distance technology appears to be a successful way to support the social-emotional needs of students who are deaf and hard of hearing. They are being connected to their peers throughout the state and the nation. This fosters opportunities to develop one's identity as a person with hearing loss. For example, through the collaborative efforts of PSO and local district staff, two students who are deaf met and established a friendship through ongoing meetings via videoconferencing. These students established a comfortable social communication framework while using videoconferencing to create a relationship, which flourished into a "BFF" relationship, after meeting face-to-face at regional and family programs provided by MECDHH.

Raising Community Awareness

Children who are deaf and hard of hearing often choose to be involved in community activities, such as scouts and sports. With support from the Americans with Disabilities Act (ADA; 1990), individuals are assured access. MECDHH and its hub partners are creating a network of support using distance technology to help local community leaders provide this access. LSLS certified professionals, adults who are deaf and hard of hearing, teachers of the deaf, speech-language pathologists, educational audiologists, and other experts conduct the trainings with community leaders. Training sessions

provide instruction about hearing assistance technology and interpreting services; opportunities for adults to share their experiences as an individual who is deaf or hard of hearing; support for the social-emotional development of children who are deaf and hard of hearing through inclusion in community programs; and information about communication strategies.

Summary

In rural states such as Maine, more information, support, and services can be offered through telepractice to children who are deaf and hard of hearing. The use of distance technology can be a successful way to improve access to services. Generating the funds to deliver services through distance technology can be challenging; MECDHH's *POINT* project has shown that grant funds are a viable way to acquire the technology and develop programs.

Collaboration among professionals and their respective agencies is needed to ensure services are available to all families throughout the state irrespective of the chosen communication approach, degree of hearing loss, or location of the child. By providing distance learning opportunities, MECDHH is expanding their resources to support children living in rural communities. This will help provide equitable access to services in spite of geographic challenges.

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The Volta Review, Volume 112(3), Winter 2012, 417–422

Program Profile

ihear® Internet Therapy Program: A Program by St. Joseph Institute for the Deaf

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Introduction

The ihear® Internet Therapy Program (ihear) provides effective, individualized, and interactive therapy that is tailored to each child's specific needs through a secure, high-quality Internet connection. The program brings listening and spoken language services directly to schools and families. The foundation for ihear is based on the St. Joseph Institute for the Deaf (SJI) philosophy of education developed throughout a 175-year history of working with children with hearing loss in the St. Louis, Missouri, area. As an educational institution, SJI believes that listening and spoken language can best prepare children for inclusion in the societal mainstream, and that this goal is best met when professionals partner with families beginning in infancy. SJI's therapeutic and educational process begins by analyzing the child's needs. SJI staff develop a dynamic learning environment where each child is actively engaged. By using the child's strengths, affinities, and desire to learn, staff create objectives and goals to meet the needs of the child.

The ihear program follows the mission and philosophy of SJI with the addition of several critical components unique to providing therapy via the Internet for children with hearing loss. When developing ihear in late 2008, the idea of using the Internet as a mode for delivering therapy was in its early stages and decisions on how best to conduct a session online had not yet been established. Therefore, the ihear staff started with the best practices learned through their careers: comprehensive assessment and evaluations, creative and focused lesson plans, strong collaboration between trained professionals and the community surrounding each child, and a safe, secure environment to maintain a trusting and effective therapeutic relationship.

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Internet Therapy Outcome Tracking System—iTOTS™

From its inception, ihear included a commitment to rigorous assessment and analysis of all essential aspects of the therapeutic process. iTOTS, a noncommercial program, provides a systematic framework for collecting data and tracking the efficacy of the ihear program. Each aspect of the program is analyzed individually and data are aggregated every 6 months to determine the effectiveness of the program as a whole. These data provide all stakeholders with evidence that supports the efficacy of ihear as a therapeutic program. iTOTS monitors the individual progress of each child in the ihear program. Upon a student's enrollment in ihear, norm-referenced assessment scores are gathered from referring partners, or norm-referenced assessment is administered by an ihear therapist to obtain baseline data. The therapist integrates the information gathered from previous assessments, current evaluations (including audiological reports and needs identified by the family), and referring partners with the criterion-referenced tools, and then develops the child's objectives. The criterion-referenced tools used include the Cottage Acquisition Scales for Listening, Language and Speech (CASLLS), Hawaii Early Learning Profile (HELP), and Guided Objectives for Auditory Training and Developing Listening Curriculum (GOALS). The therapist charts the child's individual progress towards the objectives at each session using a base-10 data form and generates reports quarterly. The information from the norm-referenced assessment as well as measured growth of the child's individual objectives determines the progress of the child receiving ihear therapeutic services.

To date, the results of norm-referenced assessments as well as the progress toward individual objectives are encouraging. Children ages birth to 6 years old enrolled in the ihear program show increased standard scores on norm-referenced language assessment, indicating that they have made better than month-for-month growth and are closing the gap so that their skills are commensurate with their peers who have typical hearing. For children ages 7 years and older, 88% show at least month-for-month growth in language. The remaining children in this older group did not show increases in standard scores because their language skills scored below the lower limits of the range of the assessment. However, these children have demonstrated language growth, which was reflected in an increase in raw scores. Thus, it appears that all children show growth in language skills while enrolled in ihear.

iTOTS also monitors program satisfaction. This is assessed by a parent/professional survey, an Internet technology checklist, and a lesson-rating questionnaire developed by ihear staff. In addition to giving the parents and school professionals an opportunity to comment on their experiences with the program, these informal assessments provide the ihear staff with valuable information for improving the quality of services. The ihear client satisfaction survey is used to rate and analyze the quality of the ihear service and has a

completion rate of 76%. In all categories, 100% of families or professionals ranked their satisfaction with the ihear program as very satisfied or extremely satisfied.

Coaching

The ihear program utilizes the coaching process to deliver therapy to children enrolled in the program. In early intervention, coaching is a process that builds a cooperative and collaborative relationship between the parent and the specialist through empowerment. The empowerment model described by Turnbull and Turnbull (2001) places an emphasis on parental involvement in equal partnership with the professional. In this professional-parent partnership, both work collaboratively to learn from each other about better ways to support the child's language development. When parents perceive themselves as competent, they are more successful in developing language skills for their child (DesJardin, 2006). Furthermore, according to a research study by Moeller (2000), children develop language best when families are highly involved with their child. In the school setting, the coaching process is applied as a consultative approach for collaboration between the specialist (i.e. deaf educator, speech-language pathologist, or special educator) working with the child and the classroom teacher (Dinnebeil, Pretti-Frontczak, & McInerney, 2009).

In ihear, the coaching process is employed so that the family and/or local professionals are the focal point of this collaboration. The ihear therapists view the parent and local professionals as adult learners. The goal is to empower them to apply their prior knowledge to develop new skills and the confidence to use those new skills with their child or student. While it is important to remember that adult learners gain strength from their life experiences and knowledge (Bodner-Johnson, 2001), they also want information, ask to be actively involved, and reflect on their learning as they practice these skills.

Sessions via ihear are outcome driven and each session includes a new therapeutic strategy that the parent or local professional can embed into the child's routine to develop language skills through listening. Not only does the parent or local professional learn a new strategy, but the students develop skills for participation in their natural environment: home, school, or both.

ihear Internet Therapy Program Lessons

The child is the focus of the ihear lessons; the teacher uses each child's affinities and strengths to teach to the child's individual needs. These individualized, interactive, and web-based lessons meet the needs of the child while keeping the child engaged and attentive. Initial data from the ihear lesson-rating questionnaire indicate that 95% of the therapists agreed or

strongly agreed that the students were engaged during the ihear lesson. The ihear lesson plan template has been used in over 2000 lessons, includes a coaching strategy for the parent or local professional, and student objectives in the areas of **C**ognition, **A**udition, **R**eceptive and **E**xpressive language and **S**peech (iCCARES). Lesson plans are analyzed by the ihear therapist not only with regard to the child's ability to increase a skill, but also the lessons' engagement of the child. This systematic approach and subsequent data analysis, tracked in iTOTS, ensures that the needs of the child are being met by measuring progress toward identified objectives.

HIPAA and FERPA Compliance

The ihear program is compliant with the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the Family Educational Rights and Privacy Act of 2008 (FERPA). HIPAA and FERPA are legal and ethical necessities. Both HIPAA and FERPA define confidential information and the conditions under which it can be released, and both laws clearly apply to the use of videoconferencing technology for educational or therapeutic purposes. HIPAA, in the Security Rule (U.S. Department of Health and Human Services, 2003), specifically mentions the biometric record of an individual, meaning any data that would distinguish a biological trait must be protected. It includes fingerprints, retina and iris patterns, voice waves, signatures, and pictures. FERPA addresses telepractice in school settings through the 2008-revised definition of attendance to include "videoconference, satellite, Internet, or other electronic information and telecommunications technologies for students who are not physically present in the classroom" (34 CFR Part 99). In addition to legal considerations, the code of ethics of most professions speaks to confidentiality or legal statutes, such as HIPAA or FERPA. The ihear Internet Therapy Program uses proprietary, noncommercial HIPAA and FERPA compliant software. This software comes certified and HIPAA-compliant from the vendor. It is imperative to protect the privacy of therapeutic moments that are part of a relationship built on trust. Ensuring the highest online protection available by meeting federal and state guidelines is a reasonable way to protect the child and the relationship.

Just a Beginning

ihear was developed by SJI to provide specialists trained to develop spoken language through listening to children who have little or no access to services. According to the summary of the 2009 Center for Disease Control and Prevention (CDC) Early Hearing and Detection Intervention Hearing Screening and Follow-Up Survey, 31.5% of eligible children with hearing loss did not receive early intervention services and 24.5% were lost to follow-up

(CDC, 2009). The ihear program is accessible to families in rural areas and has reduced the time between identification of hearing loss and engagement in an early intervention program, which is important for the success of the child's ability to acquire language as documented in research studies by Moeller (2000) and Yoshinaga-Itano, Sedey, Coulter, and Mehl (1998). The ihear program works in partnership with families, school districts, and referring partners that have no qualified providers available to ensure that 100% of infants with hearing loss are enrolled in programs with appropriate early intervention services. Technology, innovation, and best practice, as measured by iTOTS and along with SJI's dedicated and expert faculty, are the foundations of the program. The ihear program closes the gap for families and schools by giving them access to specialists trained in developing spoken language through listening. Through the coaching process, families and professionals are developing skills that can be implemented in the child's natural environment and preparing children with hearing loss for inclusion in their community, home, or school. Tools that determine the efficacy of the coaching process are under development in ihear. The ihear program will continue to analyze outcomes in order to set the standards for best practice in telepractice. Please visit www.ihearlearning.org for the latest in program developments and view the videos at www.youtube.com/ihearlearning.

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The Volta Review, Volume 112(3), Winter 2012, 423–427

Program Profile

Virtual Hearing Resource Services for Children who are Deaf and Hard of Hearing

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Background of an Early Intervention Program

The BC Family Hearing Resource Society in Surrey, British Columbia (BC), recently celebrated its 28th year providing family-centered services to children with hearing loss and speech and language challenges ages birth to 5 years old. Since its inception in 1982, the Society has housed two independent programs—the BC Family Hearing Resource Centre (BCFHRC) and the Surrey Early Speech and Language Program. The Society has come a long way from having two staff and five clients to currently employing 20 staff and providing services to over 250 children for the BCFHRC and over 400 children for the Surrey program.

Many skilled professionals, such as speech-language pathologists, teachers of the deaf and hard of hearing, auditory-verbal therapists, early childhood educators, a sign language consultant, and a family support parent, provide education and support to families and their children and communities. As the largest early intervention service provider in BC, professionals have specialized expertise to provide early intervention services to babies, toddlers, and preschoolers with hearing loss. Services include individual assessment and intervention sessions, consultative sessions, and group programs to children and their families in the greater Vancouver area. Professionals also travel to various communities across BC to provide individual and consultative services to families and their community service providers. Alternatively, community service providers can also receive support via webcam for consultative or educational sessions regarding their clients.

Throughout the year, the BCFHRC is also involved in providing various workshops, training opportunities, and educational activities in response to the various needs of professionals in the community. The Centre is recognized

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as a clinical teaching facility by the Faculty of Medicine at the University of British Columbia and is also in the process of building a foundation for research in partnership with the University of British Columbia.

The purpose of this article is to provide information on the benefits and challenges of using virtual hearing resource services for a specific kindergarten readiness program—the Preschoolers Esteem and Emotional Readiness (PEER) program for families and their children who are deaf and hard of hearing throughout the province. The PEER program is also open to community service providers engaging in direct support to families and their children transitioning into a mainstream kindergarten. The structure of the virtual hearing services is described along with the goals and benefits of the PEER program.

Structure of the Virtual Hearing Resource Centre

In 2008, the BCFHRC initiated a virtual learning environment called the Virtual Hearing Resource Centre (VHRC). The VHRC utilizes videoconferencing technology to provide a range of services to families and community service providers across BC. The virtual learning environment is a proprietary program developed for the Centre that requires a web camera, microphone, computer, and a connection to the Internet by the two users—the professional and the family. This technology utilizes a common Internet browser, such as Internet Explorer, with the Adobe Flash Player installed on the computers. The VHRC offers two-way live communication similar to a videoconferencing session. Families can use their in-built or external web cameras. If the family cannot afford one, the VHRC loans one to the family until services are completed.

Each user utilizes a secure and authorized access by using a personal username and password to initiate use of the VHRC. The VHRC is a fast and efficient way to use technology wherein families have ease of access to a wealth of early intervention educational and support services in the comfort of their own homes. Families receive these services at no cost due to funding provided by the BC Ministry of Children and Family Development, Provincial Health Sciences Association—BC Early Hearing Program, major donors, and fundraising efforts.

Utilization of VHRC for the PEER Program

The PEER program is unique to the BCFHRC. The Centre is the only early intervention agency in BC that provides a substantive, concrete educational and support program designed for families and their children who are deaf and hard of hearing transitioning to a mainstream kindergarten. Planning for kindergarten can be exciting, yet it can also be a stressful process because

parents are making a myriad of decisions for their child (Wildenger & McIntyre, 2011). Throughout the year, families with children transitioning to kindergarten are supported by their individual professionals and the PEER program; families are also encouraged to use the kindergarten transition book as a guideline (BC Family Hearing Resource Society, 2011). The PEER program offers monthly sessions for parents and a 3-day workshop for both parents and children that is facilitated by two professionals — a teacher of the deaf and hard of hearing and a parent trained to provide family support.

Goals of the PEER Program

The objective of the PEER program is to help families make informed choices for a successful kindergarten transition for their young children who are deaf and hard of hearing. Some of the specific goals of the program are to educate families:

1. On the process of transitioning from an early intervention agency to the school system.
2. To understand the social, emotional, and academic challenges that children could potentially encounter.
3. To effectively advocate for their children's needs in school.
4. To enable children to develop self-advocacy skills in challenging situations.

PEER Sessions

The PEER sessions are offered to parents once a month from October through March each year. Each session lasts for 1½ hours, between 7:00 p.m. and 8:30 p.m. Families can join the sessions in-person or via web camera. Prior to the start of the monthly sessions, parents are issued their PEER binder, full of supporting information on the various topics covered in the program. Topics covered at the evening sessions include education on audiological information, impact of a hearing loss in an educational setting, hearing equipment, classroom acoustics, kindergarten transition and readiness, socialization and socio-emotional development, communication strategies, classroom accommodations, parent and child self advocacy, Individualized Educational Programs (IEPs), school placement options, and much more.

Each session includes participation among parents and the two professionals. Sessions are mainly educational and supportive in nature and include the sharing of personal experiences among families and staff. In addition, each session briefly reviews topics from the previous session; this is based on families' requests to further discuss a previously covered topic. It is recommended that families read the material pertaining to each session prior

to attending online sessions. Families are free to ask questions at any time during the session. They are also encouraged to consult with their local professionals if they have questions in between sessions. Families in rural and remote communities who have fewer options for specialized services benefit from the online sessions (O'Callaghan, McAlister, & Wilson, 2005). A 3-day PEER workshop offered in April supplements the online sessions. The workshop includes learning activities for children as well as their parents and is open to any family from the BCFHRC whose child is transitioning to a mainstream kindergarten.

Success of the PEER Program

The benefits of the PEER program are measured each year by the number of families attending the PEER program and a kindergarten transition survey that is distributed to parents about 5–6 months after their child has started kindergarten. In 2012, the PEER program included 27 families who had children transitioning to kindergarten. Of the 10 families who signed up for online services, 7 attended sessions every month and 3 attended sporadically. The families who attended online sessions were from the greater Vancouver area, the remote communities from the interior, the Kootenays, Vancouver Island, and Northern BC. Of the 16 families who signed up for in-person services, 11 attended sessions every month. One family was interested but did not sign up for online or in-person services.

The kindergarten transition surveys are distributed to all families participating in the PEER program. Families can choose to fill out the surveys online or by paper. The survey measures satisfaction, competency, confidence levels, and advocacy skills of parents. 2011 results indicate high satisfaction levels for all families for the information, education, and support provided to them via in-person or online sessions.

Challenges and Plans for Improvement

Although the VHRC has been a boon in many ways and has enabled many families in remote and rural communities access to services it is not without challenges (American Speech-Language-Hearing Association, 2010). Like any other technological device there have been delays in audio signals, interruptions to the video signals, and challenges with having multiple users access a workshop simultaneously. Parents and professionals find it frustrating when an individual session is in progress and the audio/video signal is interrupted or delayed. At this point in time, the VHRC is unable to record live sessions and review these sessions with families at a later date. The current application of the VHRC is being modified so that recorded sessions can be shared with other families, professionals can review information sessions already attended or unattended by families, and for educational purposes.

The VHRC is currently exploring options of utilizing a cloud-based videoconferencing system that is secure and will enable use and compatibility of different platforms at both user ends. Every family has the right to access the same level of early intervention services and the goal of such a system is to overcome the existing inequity of services in remote and rural communities compared to larger urban cities.

Conclusion

Despite the challenges to the wide range of virtual hearing resource services for children and families with hearing loss, access to the unique PEER program provides an opportunity for all parents to prepare for their child's kindergarten transition. To date, the PEER program is the only program to educate and support parents across BC on readiness for kindergarten, and the number of families accessing the program live and virtually has increased. Using VHRC to access the PEER program is an efficient and effective way to reach many families whose children transition to kindergarten and cannot access this information elsewhere.

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The Volta Review, Volume 112(3), Winter 2012, 429–433

Program Profile

Children's Hearing and Speech Centre—Telepractice Programs

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Introduction

British Columbia (BC) is a vast province in Canada made up of several distinct geographic areas. Most of the province's population lives in a few metropolitan areas, with the greater Vancouver area being the largest. British Columbians living outside these areas must travel significant distances to see specialists of any kind. Treacherous winter driving conditions, limited and expensive air service, and costly ferry rides are a few of the challenges individuals face when accessing services only available in metropolitan areas. Although Children's Hearing and Speech Centre of BC (formerly the Vancouver Oral Centre) has provided a listening and spoken language option since 1963 for children who are deaf and hard of hearing, families who desired this option and the Centre's services were required to live in or relocate to the Vancouver area. In 2006, Children's Hearing and Speech Centre began providing direct services via telepractice to families of children birth to age 5 living outside of the greater Vancouver area. This initial project became an established part of the Centre's program after the first year. Subsequently, in 2008, site visits to a group of schools in Kelowna, a community 250 miles from Vancouver, resulted in another pilot telepractice project. In October of 2008, the Centre began supporting students in these schools through telepractice in addition to the established onsite services offered there. The initial project for the school-aged population has also now become an established part of programming at the Centre.

A Sound Move (Ages Birth to 3 Years)

Children's Hearing and Speech Centre provides early intervention to families with children with hearing loss from birth to 3 years of age through the

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First Words Programme. A Sound Move, as a part of the First Words Programme, provides direct intervention via telepractice in the homes of families who live outside of metro Vancouver. Families may be referred by their community audiologist, the BC Early Hearing Programme, or by self referral. The goals of A Sound Move are:

- To provide a listening and spoken language approach through direct intervention.
- To provide support to other professionals on the family's community team.
- To provide ongoing assessments following the BC Early Hearing Programme protocols.
- To develop Individualized Family Service Plans following the BC Early Hearing Programme protocols.

A Sound Move telepractice is provided to:

- Infants and toddlers birth to age 3 with hearing loss.
- Families who wish to pursue a listening and spoken language approach.
- Families who are able to commit to participating in intervention on a regular basis.

After an initial consultation with Children's Hearing and Speech Centre's executive director, the family is contacted by the designated early interventionist from the Centre who explains and discusses possibilities for support and guidance. A first visit to the Centre is scheduled, when possible, before therapy begins via telepractice. The purpose of this face-to-face visit is:

- To conduct initial assessments and discuss needs and goals for the child and the family.
- To provide training in setting up and using the equipment.
- To meet other families enrolled in the First Words Programme.
- To provide the family with materials and resources to get started.
- To develop a relationship between the therapist and family.

Frequency of service is determined on an individual basis. The BC Early Hearing Programme protocols call for weekly intervention for infants with bilateral hearing loss. Adjustments may be made on an individual basis, depending on family and infant needs.

Stepping Out (Kindergarten to Grade 12)

The BC Ministry of Education provides a special education grant to school districts and private schools throughout BC to support students with hearing loss enrolled in the mainstream setting. Most public school districts hire

teachers of the deaf to deliver these services. Private schools outside of greater Vancouver must contract for services with the public school district or another qualified professional. School districts in more remote areas of the province often share contracts with the specialists. In both instances, services to the student may not be frequent enough to meet individual needs and often lack continuity from year to year. The Stepping Out program was designed to meet the needs of students via telepractice by providing appropriate frequency of service and long-term continuity for the student, the school, and the families. Referrals for services can be made by school personnel responsible for students with special needs, parents, and audiologists. The goals of the Stepping Out program are:

- To ensure the student's success in the enrolling school and to support transitions.
- To provide ongoing development of auditory skills.
- To develop expressive and receptive language skills necessary to succeed in a typical classroom.
- To continue to refine articulation skills.
- To enhance academic, social, and emotional development.

Services provided through the Stepping Out program include:

- Direct intervention to students in the areas of speech, language, and listening.
- Development of age appropriate self-advocacy and social skills.
- Speech and language assessments, as needed.
- Academic support, when necessary.
- Participation in the development of a child's Individualized Education Program (IEP) with the school-based team.
- Team meetings and in-service training for school staff and parents.
- Technical consultation for hearing aids, cochlear implants, and FM systems.
- Semiannual written progress reports.

Any student who qualifies under the BC Ministry of Education requirements for services from a teacher of the deaf is eligible. Frequency of service is determined on an individual basis through collaboration among school personnel and the Children's Hearing and Speech Centre's executive director.

Equipment

Children's Hearing and Speech Centre is currently using a mixture of Table Top Sony PCS1 Video and the Sony Integrated PCS G50 Video Conferencing system that allow for distance learning to multiple sites. The Centre places all required equipment in the home or on the school campus, including a TV when

necessary. A dedicated high-speed Internet connection is required at both the school setting and the Centre. In both settings, the equipment is provided by Children's Hearing and Speech Centre at no cost. Schools are expected to provide appropriate security for the equipment, ensuring that access is limited to those students and staff members who are involved in the program. Ideally, each school will have a designated information technology (IT) person who can be called on to troubleshoot equipment failures and glitches. The Centre also provides a contact person for troubleshooting over the phone for families and schools.

Funding

Funding for the initial equipment purchases and operating costs to make A Sound Move and Stepping Out programs possible was provided by a variety of funders, including The Alva Foundation, CKNW Orphan's Fund, May and Stanley Smith Charitable Trust, Telus, The Vancouver Foundation, and The Variety Club. Both programs also receive some ongoing government funding through the Ministry of Children and Families, BC Early Hearing Program, and the Ministry of Education.

Enrollment

A total of five families have participated in A Sound Move to date. Currently, two families are enrolled in this program. A total of 14 students from seven schools (six independent or private and one public) have participated in Stepping Out since it was established. Active enrollment in both programs has stayed consistent every year. A Sound Move has served two families each year since it was established and Stepping Out has consistently enrolled eight students annually. Participants represent areas throughout the province.

Successes and Challenges

The Children's Hearing and Speech Centre telepractice programs have been positively received by the community of students and families it serves. Families, schools, and children with hearing loss now have the option of receiving direct service from a Listening and Spoken Language Specialist (*LSLS™*). Geographical and financial barriers no longer preclude families and students from receiving the high quality of intervention formerly only available in metropolitan areas. On September 13, 2011, Children's Hearing and Speech Centre was honored to receive the first provincial Telus Innovation Award for the Stepping Out program in recognition of the program's provision of important and necessary support and services to children and families throughout BC.

Telepractice is not without its unique challenges. As local audiologists are a family's first and primary contact at diagnosis, these individuals have a tremendous impact on the type of intervention a family might choose. Educating audiologists about the possibilities and options for families is crucial to the long term success of both A Sound Move and Stepping Out. Many remote communities do not have local audiological services. Other communities that do have audiological services have difficulty keeping the position filled. This kind of turnover makes the critical relationship building especially challenging.

The equipment currently in use by the Centre has been discontinued and Sony has transitioned to new high definition systems. The cost of equipment upgrades will continue to be a challenge in maintaining the high level of service provided. Staffing changes require ongoing training in the technical aspects of the job. In addition, IT supports in every community and school situation are variable and can present a variety of technical challenges. Therefore, each session must be carefully planned and prepared, which requires additional telephone calls or email to ensure the family or the school is prepared for the session at the appropriate time.

Summary

When an infant is diagnosed with hearing loss in BC, listening and spoken language is now a real option for families, irrespective of where they live. Telepractice has eliminated the constraints of geography in the choices parents make for their children with hearing loss. Both A Sound Move and Stepping Out have expanded the choices available to families from initial diagnosis through high school graduation. The telepractice initiatives at Children's Hearing and Speech Centre continue to be a work in progress with its success far surpassing the requisite glitches that come with advancing technology.

The Volta Review, Volume 112(3), Winter 2012, 435–442

The Future of Telepractice for Children who are Deaf and Hard of Hearing

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Introduction

Telepractice can be used to deliver early intervention, therapeutic, and educational services to children who are deaf and hard of hearing (DHH). For infants and toddlers, telepractice can provide early access to family-centered services that are delivered by experts in hearing loss, irrespective of where either party lives. For school-age students, telepractice has the potential to connect learners with experienced listening and spoken language professionals, including teachers of the DHH and speech-language pathologists who may not be assigned to a student's school.

This service delivery platform is rapidly advancing and includes initiatives within several professional disciplines serving this population: speech-language pathology, audiology, education of individuals who are DHH, and early childhood special education. Authors for the articles in this monograph were strategically selected to share experiences and expertise from the perspectives of these different professional disciplines. Telepractice can also be used to provide professional training to benefit children. Telepractice can cross state lines, with appropriate considerations given to licensure and reimbursement. Services can also be delivered to children when the professional and the child live in different countries. Telepractice is, indeed, a global matter.

For many years, the technology to provide telepractice was not readily available. And for some, the cost was prohibitive. However, as the articles in this monograph repeatedly attest, today the equipment is readily available and

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cost effective. Now, interested parties can turn their sights to the practical implementation of this emerging practice.

At this point in time, inconsistent terminology is used in the literature to describe this service delivery model. This presents a bit of a challenge as no single term adequately captures the nuances of the various related service delivery formats. In the preparation of this monograph, many terms were noted in the literature including "telepractice," "teleintervention," "teletherapy," "teleschool," "teleconsultation," "telemedicine," and "teleaudiology." For ease of comprehension, the term "telepractice" was the primary descriptor used in this monograph. (At this point in time, the Alexander Graham Bell Association for the Deaf and Hard of Hearing [AG Bell] follows the American Speech-Language-Hearing Association [ASHA] guidelines for terminology [ASHA, 2010], and its publications use the term telepractice for consistency.) In this monograph, telepractice is defined as the provision of a professional service over geographical distances by means of modern telecommunications technologies.

This monograph offers insights and opportunities to advance the adoption of this service delivery model. Because many professional disciplines engage in the delivery of services to children who are DHH, the articles in this monograph represent the perspectives of these disciplines. In so doing, we are supporting and promoting collaborative delivery systems. Considerations and recommendations for program development and program enhancement are also discussed.

Recommendations for Future Program Development

Telemedicine has demonstrated the potential to revolutionize health care delivery (Speedie, Ferguson, Sanders, & Doarn, 2008). Now, the fields of rehabilitative care can look at the accomplishments and challenges experienced in the medical profession and plan accordingly. For instance, the medical profession operates on the assumption that care is inextricably linked to the location of the *provider* (Speedie et al., 2008). Telepractice challenges this assumption; yet, careful attention must be given to alter this longstanding assumption. Telepractice also carries with it some practical and logistical challenges, such as licensure, privacy, and reimbursement. Stakeholders in the professions working with children who are DHH can learn from the medical profession on the ways in which these challenges have been addressed. Some of the recommendations for programs adopting telepractice, or enhancing existing initiatives, are discussed here.

Technology

The audio and video components of technology, as well as the synchronicity of the two signals, need to be addressed (Puskin, Cohen, Ferguson, Krupinski,

& Spaulding, 2010). The standards for delivering this service to children who are DHH may need to meet a higher standard than those adopted by other professions. For instance, a higher speed for video transmission may be needed to allow for the transmission of visual communication supports (e.g. sign language and speech reading) in real time. Because some treatments focus on the development of listening and spoken language, there will likely be a need for enhanced audio as well. Puskin and colleagues (2010) recommend asking providers about the specific features they want in any technology that is used.

In addition to using the appropriate hardware (e.g., screen size, screen resolution), access to appropriate connectivity must be assured. Program personnel must investigate access to broadband telecommunications, which may be available in a family's home, a local school building, and/or the professionals' offices.

Scheduling

Some practitioners report challenges integrating telepractice into busy practice workflows (Puskin et al., 2010). However, this concern may be offset. Some telepractice providers attest to less episodic care and greater frequency and intensity of care (Speedie et al., 2008), and these benefits are assumed to be more appropriate to the clients' needs and desires.

Perhaps the solution to this contradiction is to shift providers' ways of thinking so that telepractice is perceived as a "value added" service. In this context, "value added" can be defined as characteristics of telepractice that go beyond the standard expectations of intervention or education while providing a benefit to the client at little or no additional cost.

In the field of psychology, Nelson, Barnard, and Cain (2006) suggest that telepractice allows for easy access to the provider after therapy has ended. These "booster" sessions are conducted more easily than in-person follow-up sessions. It is postulated that these booster sessions facilitate positive long-term outcomes for the client.

Hybrid Activities

Some providers of telepractice wish for or conduct some of their tasks in the face-to-face condition. For instance, some providers prefer to meet the client, in person, during the first encounter (B. Hecht, personal communication, May 23, 2012). Others rely on the face-to-face condition to conduct developmental assessments (K.T. Houston, personal communication, April 28, 2010; A. Peters-Lalios, personal communication, May 26, 2010).

In the field of psychology, Wade, Wolf, Brown, and Pestian (2005) pair telepractice sessions with self-guided online sessions for children with traumatic brain injury. The online material includes didactic content regarding specific skills, video clips showing individuals and families modeling a skill,

and exercises and assignments that provide family members with opportunities to practice a skill. This strategy could be easily adapted for parents of children who are DHH.

Evaluation of the Telepractice Platform

Stredler-Brown (2010) discusses the benefits of assessment and considers assessment of child outcomes to be a relevant, indeed integral, aspect of intervention. Assessment results allow the professional to monitor the rate of progress made by the child and, in so doing, supports high expectations.

Ongoing evaluation of telepractice is needed to encourage decision makers to adopt and/or expand this service delivery model. Ideally, a program already collects performance data and this routinely-collected data can be utilized to demonstrate the outcomes of a telepractice model. Puskin and colleagues (2010) warn that attempts to collect special data in a special format specifically for telepractice may compromise compliance and limit the amount of data that is tendered.

Reimbursement

The first consideration when initiating telepractice is the cost of the capital investment in equipment, including hardware and broadband access. Next, reimbursement for the therapy needs to be studied. The reimbursement for therapeutic and/or educational services will vary depending on a client's health insurance, each state's Individuals with Disabilities Education Act (IDEA) Part C regulations, and relevant school district policies. As of 2012, 14 states require private-sector insurance companies to pay for telepractice services delivered by speech-language pathologists (Brannon, 2012). As of 2009, Medicaid programs in 23 states reimburse for telepractice (Brown, 2009).

More Research is Needed

The documents published by ASHA (2005a, b, c, 2010) repeatedly state the need for outcome data to evaluate the efficiency, clinical effectiveness, and levels of satisfaction of clients and providers. The literature compels professionals to conduct more research related specifically to the effectiveness and efficacy of treatment (Cason, 2009; Heimerl & Rasch, 2009).

The Human Factor

It is critical for any program utilizing telepractice to secure buy-in from the clinicians (Puskin, 2010). Specialists in information technology (IT) can offer support for the equipment and telecommunications connectivity. Support for the therapeutic process can be provided through careful access to materials.

Colleagues who have experienced the shift from face-to-face delivery to telepractice can also provide assistance. The hope is for practitioners to perceive "value added"—in this context, Puskin (2010) defines value added as a person who loves their job. . .and would quit if they didn't have access to telepractice.

Sustainability

Singh, Mathiassen, Stchura, and Astapova (2010) report that telepractice innovations often struggle to endure after initial sponsorship (e.g., grants) end. The advice offered by Cradduck (2002) states that a telepractice service is considered sustainable when it is "no longer considered a special case, but has been absorbed into routine health care delivery" (p. 8). To accomplish this, each professional discipline involved in the effort needs to participate in planning and evaluating the telepractice services being offered. Any number of stakeholders may be involved, including the organization providing the service, staff in public schools receiving the service, IDEA Part C programs funding early intervention, university facilities, and specialists using different communication approaches to educate children who are DHH.

A path toward sustainable telepractice is described in detail by Singh and colleagues (2010). These authors initiated telepractice in a large public health district in the state of Georgia. The initial step was to develop a shared vision among staff within an agency and, shortly thereafter, cultivate participation from people in organizations in other communities. Together, the stakeholders seek and develop new ideas to establish a shared vision based on needs and potential participants. Then, funding sources can be explored along with technological options. After this, administrative processes can be established or improved. It is highly recommended that multiple agencies participate in the funding to demonstrate their commitment and, hence, to improve sustainability.

Unique Opportunities for Children who are Deaf and Hard of Hearing

When inviting professionals to share their experiences implementing telepractice with children who are DHH, it was evident that many initiatives were in place around the country; the impact was sometimes worldwide. One central theme supporting the interest in and advancement of telepractice was the opportunity to provide services to all children. This includes audiological services (Goehring, Hughes, & Baudhuin, 2012; Hayes, Eclavea, Dreith, & Habte, 2012); services to school-age students (McCarthy, Duncan, & Leigh, 2012); and, interestingly, a prominent focus on delivering early intervention (Douglas, 2012; Houston & Stredler-Brown, 2012; Olsen, Fiechtl, & Rule, 2012).

The attention also goes beyond direct services and includes support for enhancing skills of professionals delivering the treatments (Behl, Houston, & Stredler-Brown, 2012; Cohn & Cason, 2012; DeMoss, Clem, & Wilson, 2012). Hopefully, this is a trend that will satisfy the recommendations from the Joint Committee on Infant Hearing (JCIH, 2007) for services to be delivered by professionals who have the appropriate knowledge and skills about childhood hearing loss.

Conclusion

For decades, individuals have utilized communication technologies as a means to relay or transmit health-related information (Bashshur & Shannon, 2009). In the past, if the technology did not exist or if it failed to do an adequate job, users sought and took advantage of new technological advancements to develop or enhance services. This is exactly what seems to be happening with the adoption of telepractice to serve children who are DHH. Yet, efforts to date have not been addressed uniformly.

By fully understanding the past, practitioners can continue to shape the future of telepractice to fully realize the potential of this service delivery model. The content in this monograph provides an opportunity for readers to discover the growing trend to deliver services remotely. The intent is for this body of information to motivate readers to move forward with this initiative.

There is a common theme throughout the monograph—the incentive to harness current technology to provide high-quality intervention, both therapeutic and educational, to more children in the United States and around the world. Children who are DHH are unwitting members of a low-incidence disability group. Where a child lives need not dictate access to services. Nor should one's geographic location dictate the type of services or communication method chosen. Using telepractice, each child has an opportunity to learn from experts who may live at previously incapacitating distances from a family's home. Telepractice can increase the efficiency and effectiveness of services delivered in urban settings. And, telepractice can span time zones and continents.

We have the technology. The broad list of contributors to this monograph is evidence that we, as a profession, have the motivation. There are growing incentives. Now, we need only take the information we are garnering and apply it to benefit the children we serve.

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