Chapter 20

Using Telepractice to Improve Outcomes for Children Who Are Deaf or Hard of Hearing & Their Families

K. Todd Houston, PhD, CCC-SLP, LSLS Cert. AVT

Increasingly, families are receiving a range of healthcare-related services through the use of videoconferencing software and a secure Internet connection.

Introduction

As telecommunication and distance technology continue to evolve, new opportunities to provide family-centered services to meet the audiological, speech, and language needs of young children who are deaf or hard of hearing (D/HH) are increasing. Early Hearing Detection and Intervention (EHDI) and Part C Early Intervention (Part C) program coordinators should be aware of these forms of service delivery—from telehealth and telemedicine to telepractice and teleintervention. Increasingly, families are receiving a range of healthcare-related services through the use of videoconferencing software and a secure Internet connection.

The technology has become cheaper, more reliable, and widely available for use on laptops, tablet computers, and even smartphones. Physicians are providing diagnostic treatment and patient counseling through models of telemedicine. Pediatric audiologists and speech-language pathologists (SLPs) are embracing telepractice to provide services to a range of patients who have hearing and communication-related delays and/or disorders (Houston, 2014). Teleintervention—a specific model of early intervention provided through distance technology—provides family-centered services to infants, toddlers, and young children who are D/HH and allows the provider to model and coach parents in language facilitation techniques (Behl, Houston, Guthrie,

NCHAM National Center for Hearing Assessment and Management Utah State University™

& Guthrie, 2010; Brown, Fleming, & Houston, 2012). As these services become more common and integrated into standards of care in some areas of the country, EHDI and Part C coordinators will need to incorporate these services into their programs.

Telehealth is described as the use of telecommunication technologies to deliver health-related services and information that support patient care, administrative activities, and health education.

Defining Telehealth & Telemedicine

According to the Agency for Healthcare Research and Quality (AHRQ), telehealth is described as 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). Telemedicine is defined as providing medical services over distance (Fong, Fong, & Li, 2011). While these definitions appear to overlap, telemedicine typically describes treatment or clinical services delivered by a physician, hospital, or medical facility. However, use of these terms is inconsistent. Baker and Bufka (2011, p. 405) observed, "The terms are frequently used interchangeably, as there is yet no universal definition or term used by legislators, policymakers, government agencies, and payers." 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:

- Telemental health
- Telenursing
- Telepharmacy
- Telecardiology
- Teleradiology
- Telepsychology
- Telerehabilitation (i.e., a broad term typically used with allied health professions)
- Teleintervention (i.e., early intervention provided through distance technology)
- Teleaudiology
- Telespeech
- Teletherapy

A Brief History of "Tele"Medical Services

In 1875, Dr. Alexander Graham Bell summoned his lab assistant, Thomas Watson, to aid him after an acid spill. This not only signaled the invention of a new communication device—the telephone—but the incident could represent the first documented example of someone seeking medical intervention via "modern" technology. As Gunsch (2011) observes, telemedicine began—on a limited basis—in the early 1900s when electrocardiograms (EKGs) were transmitted over telephone lines. By the 1920s, physicians were using radio transmissions to treat and counsel sailors at sea during medical emergencies. Some 40 years later, the Nebraska Psychiatric Institute, with funding from the National Institute of Mental Health (NIMH), is credited with being one of the first facilities to use closed-circuit television for healthcare purposes. In the early 1960s, the National Aeronautics and Space Administration (NASA) collected physiological measures of the astronauts during spaceflight, which also led to wider use of satellite technology for telecommunications. Through the 1990s, NASA continued to support a variety of 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.)

In the 1990s and 2000s, recognizing the potential impact, other federal departments and agencies, the military, private industry, medical institutions, and universities increased the study of and support for telemedicine and its broad application to related disciplines. The rapid proliferation of broadband Internet, relatively inexpensive computing technology (e.g., laptops, tablet computers, smartphones), and the availability of online software and teleconferencing websites (e.g., Zoom, WebEx, Adobe Connect, FaceTime, etc.) has made real-time videoconferencing possible, available widely, and even mobile.

Pediatric Medicine & Early Intervention Applications

In 2004, the American Academy of Pediatrics (AAP) issued a technical report describing the application of telemedicine to pediatric patients as the use of electronic communications technologies to provide and support healthcare for infants, children, adolescents, and young adults when distance separates the practitioner from the patient, parent, guardian, or referring practitioner (Spooner & Gotlieb, 2004). The report stated that telemedicine held great promise for pediatricians, and virtually any service could be provided via telecommunications technology—although continued evaluation of the model and further research was needed. The AAP also reviewed several studies that demonstrated favorable results from a range of pediatric services, including:

- Mental health
- Dermatology
- Cardiology
- Emergency and transport services
- Hospital care and family communication
- Pathology
- Child abuse
- Patient education and chronic disease
- School health services
- Home health services

Photo courtesy of NCHAM

After teleintervention, the use of audiology telepractice to conduct diagnostic auditory brainstem responses (ABRs) remotely was the second most common service implemented or in the planning stages. To help ensure timely delivery of services from properly trained professionals, EHDI coordinators also reported ongoing plans to expand or implement remote hearing aid programming and/or cochlear implant mapping through models of audiology telepractice.

Cason, Behl, and Ringwalt (2012) conducted a survey with state Part C coordinators to identify the extent to which telehealth was occurring in the delivery of early intervention. Results showed that of the 26 respondents, 30% indicated that they are either currently using telehealth as an adjunct service delivery model or plan to incorporate telehealth within the next 1-2 years. Telehealth providers included:

- Developmental specialists
- Teachers of the D/HH
- SLPs
- Occupational therapists
- Physical therapists
- Behavior specialists
- Audiologists
- Interpreters

According to this survey, telepractice and teleintervention service delivery models are playing a significant role in state EHDI and early intervention programs.

Telepractice in Audiology

The American Speech-Language-Hearing Association (ASHA) defines this videoconferencing service delivery model as "telepractice" for practitioners in audiology and speech-

language pathology (ASHA, 2005a; ASHA, 2005b; ASHA, 2010). Evaluating the use of telepractice in audiology, Swanepoel and Hall (2010) analyzed related peer-reviewed literature and found that hearing screening, diagnosis, and intervention were feasible and reliable across ages and patient populations. Cohn and Cason (2012) also found that many audiological services may be delivered via telepractice.

State-based EHDI systems work to ensure that infants are screened by 1 month of age, diagnosed by 3 months, and connected with early intervention services by 6 months, which is known as the 1-3-6 rule. A study in 2010 by the Center for Disease Control and Prevention found that 97% of newborn babies in the United States receive a newborn hearing screening—lowering the average age of identification to just 2 months of age. This has led to more children identified as D/HH to enter into an early intervention system, which—when combined with advanced hearing technology, such as cochlear implants and/or hearing aids—results in improved communication outcomes for these children.

A key component to these improved outcomes for children identified as D/HH is that they also have access to specialized personnel (Rushbrooke & Houston, 2016; Bond et al., 2009; Sparreboom et al., 2010; Turchetti, Bellelli, Palla, & Forli, 2011). Unfortunately, almost half of infants who do not pass their newborn hearing screening are "lost to follow up"—often due to the difficulty in accessing an audiologist with pediatric expertise. This is a greater challenge for families who live in rural and remote areas who may be hours from an appropriately trained pediatric audiologist. Teleaudiology—the delivery of audiological diagnostic and treatment services via telehealth—has the potential to ensure that infants who are in need of audiology services can receive them in a timely and coordinated manner (Rushbrooke & Houston, 2016).

Almost half of infants who do not pass their newborn hearing screening are "lost to follow up"—often due to the difficulty in accessing an audiologist with pediatric expertise.

In 2012, the National Center for Hearing Assessment and Management (NCHAM) brought together representatives from seven sites who were implementing remote diagnostic audiological evaluations with infants to form a learning community. Based on the accomplishments of these programs, teleaudiology has been demonstrated to be a viable option for conducting diagnostic evaluations with infants who otherwise may be lost to follow up. Some aspects of audiology, such as behavioral assessments of infants, can be the exception, since these procedures often require the practitioner to be in close physical proximity to the client. The use of synchronous immitance testing via telepractice is expected to become more prevalent as computer-based tympanometry continues to be developed (Krumm & Vento, 2013). Remote cochlear implant mapping has been pioneered, often with favorable results (Hughes et al., 2012; Rushbrooke & Houston, 2016; Wesarg et al., 2010; ***NOTE***: For more information, please visit http://www.infanthearing.org/teleaudiology/index.html.)

Telepractice in Speech-Language Pathology

Mashima and Doarn (2010) completed a review and described broad application of telepractice in speech-language pathology, including treatment of:

- Neurogenic communication disorders
- Fluency disorders
- Voice disorders
- Dysphagia
- Childhood speech and language disorders

In a comprehensive literature review, Theodoros (2011) found telepractice was also effective for the management of articulation, language, and literacy disorders. A recent telepractice study in Australia demonstrated high caregiver satisfaction for the service delivery model, along with equivalent speech and language outcomes with children who received auditory-verbal therapy (AVT) through telepractice versus children who participated in traditional in-person visits (Constantinescu, 2012).

Too often, professionals are reluctant to engage the parent as their child's primary language facilitator. Numerous studies, however, demonstrate that effective parent engagement leads to improved communication outcomes for children who are D/HH.

Telepractice for Early Intervention

The use of teleintervention—the delivery of early intervention services via videoconferencing technology—is rapidly becoming an important tool in providing services to families of children with special needs (Houston, 2014), particularly infants and toddlers who are D/HH. Cason (2011)—using the term "telerehabilitation"—demonstrated how telepractice has the potential to improve state Part C programs' annual performance on eight specific indicators (see *Table 1*; ***NOTE:*** Each state's Part C program is required to report annually to the Office of Special Education Programs [OSEP] of the U.S. Department of Education about how the program is performing according to 14 indicators.)

The use of telepractice adheres to the major tenets of early intervention services as required by Part C of the Individuals with Disabilities Education Act (IDEA). Specifically, through telepractice, services can be delivered in the child's natural environment or in community settings where typical developing peers are found. Services can be family centered and include parent coaching. Services can be direct or consultative and can support a range of teaming models—multidisciplinary, interdisciplinary, or transdisciplinary. (For a more thorough discussion of possible early intervention services delivered through telerehabilitation, see Cason, 2011; ***NOTE***: The terms telerehabilitation, telepractice, and teleintervention are used to define services delivered to the same population: Children under 3 years of age and their families.)

Recent studies demonstrate the effectiveness of teleintervention as a service delivery model. The Virtual Home Visit Project (VHV)—a 2-year study by Olsen, Fiechtl, and Rule (2012)—investigated the delivery of early intervention services using videoconferencing to conduct home visits with parents and their children under 3 years of the age. The study demonstrated that VHVs support learning within the child's natural environment and encourage family members to use daily activities and routines to provide intervention for their child with disabilities. VHVs lessen the barriers of time, travel, availability of qualified personnel, and inequity of available services in rural areas. The study showed that VHVs deliver effective early intervention, are cost effective, time efficient, and can be a viable approach to strengthen the Part C system in delivering services to families with young children (Olsen, Fiechtl, & Rule, 2012). Similarly, Blaiser, Behl, Callow-Heusser, and White (2013) studied families of infants and toddlers who were D/HH and measured outcomes of teleintervention versus traditional in-person visits. In this randomized study, children in the teleintervention group scored statistically significantly better in expressive language. The teleintervention group scored similarly to the in-person-only group in receptive language and family outcomes. A more recent multisite comparison design study with a larger sample size also resulted in statistically significant language outcomes and cost savings for the teleintervention group (Behl et al., 2017). Cost savings associated with providing services via teleintervention increased as the intensity of service delivery increased.

Coaching: Fostering Increased Parent Engagement Through Teleintervention

Too often, professionals are reluctant to engage the parent as their child's primary language facilitator. Numerous studies, however, demonstrate that effective parent engagement leads to improved communication outcomes for children who are D/HH (DesJardin & Eisenberg, 2007; Moeller, 2000; Zaidman-Zait & Young, 2007). Even though the skills of the therapist are, at the very least, as important as the approach implemented by the parents (Miller & Rollnick, 2002), early interventionists and SLPs often do not have the background and training

Table 1
Eight Specific Indicators to Improve Part C's Annual Performance

Indicator 1

Timely Receipt of Services. OSEP requires reporting the percent of infants and toddlers with Individualized Family Service Plans (IFSPs) who receive the early intervention services on their IFSPs in a timely manner. The potential benefits of telerehabilitation include:

- Improving timely receipt of services by remotely increasing access to providers/services not available within a local community.
- More consistent delivery of services.
- Fewer cancellations.

Indicator 2

Settings. OSEP requires reporting the percent of infants and toddlers with IFSPs who primarily receive early intervention services in the home- or community-based settings. The potential benefits of telerehabilitation include:

- Maintaining provision of services within the home- or community-based setting by using technology.
- Supplying local providers with mobile videoconferencing technologies enables them to connect with remote providers from the home- or in community-based settings.
- Utilizing existing infrastructure (e.g., telehealth networks) to tap into the expertise of a provider not available within a local community enables the implementation of strategies and recommendations within the home- or community-based settings.

Photo courtesy of NCHAM

Indicator 3

Infant and Toddler Outcomes. OSEP requires reporting the percent of infants and toddlers with IFSPs who demonstrate improved:

- Positive social-emotional skills (including social relationships).
- Acquisition and use of knowledge and skills (including early language/ communication.
- Use of appropriate behaviors to meet their needs.

The potential benefits of telerehabilitation include:

- Improving infant and toddler outcomes by using technology to access providers/services not available within a local community.
- Consulting with parents and caregivers to enhance skill development during naturally occurring routines.
- Conducting professional development activities for providers.
- Providing training for child outcomes data collection and reporting.

Table 1
(continued)

Indicator 4

Family Outcomes. OSEP requires reporting of the percentage of families participating in Part C who report that early intervention services have helped the family:

- Know their rights.
- Effectively communicate their children's needs.
- Help their children develop and learn.

The potential benefit of telerehabilitation includes:

- Improving family outcomes by using technology to conduct ongoing provider training on effective consultative and coaching strategies so that families' experiences in early intervention lead to the desired outcomes.

Indicators 5 and 6

Indicator 5. Child Find Birth to 1, and Indicator 6. Child Find Birth to 3. OSEP requires reporting of the percentage of infants and toddlers, birth to 1, with IFSPs as compared to national data and the percentage of infants and toddlers, birth to 3, with IFSPs as compared to national data. The potential benefits of telerehabilitation include:

- Promoting child find efforts using telerehabilitation to facilitate development and implementation of public awareness activities and materials.
- Engaging in outreach activities with physicians and referring agencies.
- Connecting experts to explore best practices related to evaluation and assessment of children birth to 3.
- Providing immediate access to interpreters when families call with a referral through a contracted interpreter service.

Indicator 7

45-Day Timeline. OSEP requires reporting the percentage of eligible infants and toddlers with IFSPs for whom an evaluation, assessment, and initial IFSP meeting were conducted within Part C's 45-day timeline. The potential benefits of telerehabilitation include:

- Improving timely receipt of services by remotely increasing access to providers or services not available within a local community.
- Utilizing telerehabilitation to overcome challenges of personnel shortages (e.g., evaluators, service coordinators, developmental specialists, therapists), severe weather that prohibits travel, and access to interpreters.

Indicator 8

Part C Transition. OSEP requires reporting the percentage of all children exiting Part C who received timely planning to support transition to preschool and other appropriate community services by their third birthday. The potential benefit of telerehabilitation includes improving the timing of transition conferences by fostering meetings through remote access to conferences for service coordinators, other service providers, and families.

Photo courtesy of NCHAM

to be an effective coach and may not be comfortable working with parents in such a manner (Fleming, Sawyer, & Campbell, 2011; Houston & Bradham, 2011). Parent coaching is a central component of this service delivery model, as the format of teleintervention necessitates the active participation of the parent. During the telepractice/teleintervention session, the parent learns to become the primary facilitator of the child's communication, language, and behavior. The professional is not in the room with the child and cannot take control of the session. With teleintervention, it is virtually impossible for the parent to passively observe while the professional interacts with the child (Hamren & Quigley, 2012). Ultimately, the professional must develop a partnership with the parent, allowing the coaching relationship to emerge.

Although teleintervention is still a relatively new service delivery model for young children who are D/HH and their families, there are definite advantages and very few disadvantages.

The quality of the adult's (i.e, parent's) interaction skills with the child is the most important part of instruction and shows the greatest correlation to the child's development (Justice & Vukelich, 2008). Through the coaching relationship, the professional works to increase the parent's confidence and interaction skills by reinforcing appropriate listening and spoken language targets during play activities. This may be accomplished through the five components of the coaching process, as outlined by Doyle (1999):

1	The coach and parent cooperatively develop a plan that includes a purpose and an outcome.
2	During the observation step, an opportunity is provided for either the professional to observe the parent or the parent to observe the coach modeling a strategy.
3	The next action step allows for the parent to demonstrate their new skill.
4	This is followed by time to reflect as the coach encourages the parent to think about what happened during the session, what should have happened, and what changes could be made to meet the goals.
5	Through evaluation, the effectiveness of the coaching process is reviewed.

As the parent's confidence grows, the same speech, language, or listening strategies should be incorporated into the child's daily routines. For example, the parent may learn to appropriately model and expand language during a cookie-baking activity. By reinforcing listening and language targets during these regularly occurring activities within the home, the parent's skills become more habitual and can easily transfer to other commonly occurring activities, such as bath time, getting dressed, or setting the table for dinner. This coaching paradigm requires a partnership that emphasizes the role of the parent as the one who best knows his or her child's interests and temperament (Peterson, Luze, Eshbaugh, Jeon, & Kantz, 2007).

Teleintervention: Supporting Family-Centered Practices

Although teleintervention is still a relatively new service delivery model for young children who are D/HH and their families, there are definite advantages and very few disadvantages. Even families who live in a community where specialists are available may find that receiving services via teleintervention can be very beneficial. For example, some families may live only a short distance from the center or program but have other young children in the home. The process of packing up all the children and traveling to the center is no small undertaking. Teleintervention allows the family to stay at home with less disruption to the family routine.

Since the technology is available to record and store sessions, all the members of a family, as well as other professionals, can benefit from the early intervention strategies offered through teleintervention. The option to record a session allows it to be viewed at a later date. Those who did not attend the session can benefit by learning the strategies used in the session and observe the child's progress from week to week (NCHAM, 2012).

The shortage of early interventionists skilled in the family's chosen mode of communication may propel them toward a model of telepractice.

The shortage of early interventionists skilled in the family's chosen mode of communication may propel them toward a model of telepractice. Through teleintervention, parents may have greater access to professionals who can meet the communication needs of their child. Because the model incorporates a coaching partnership, the interaction may be different than that of traditional home visits. For example, when working with the young child, stranger anxiety may surface. Since the interventionist is able to coach the parent from a remote location, the child's anxious reaction to the interventionist can be circumvented (Hamren & Quigley, 2012). As a result of active engagement during teleintervention sessions, parents are better equipped to integrate speech and language goals into the child's typical routines.

Given the importance of intensive early intervention, teleintervention may prove to be a more efficient way to ensure consistency of services. 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 teleintervention, cancellations can be kept to a minimum. Even though the child or parent may not be feeling well, the session can proceed without the danger of sharing unwanted germs. For children who are medically fragile and/or may have a compromised immune system, this is an added comfort for parents. As a result of fewer interruptions to their intervention schedule, children are more likely to reach their communication goals.

Olsen, Fiechtl, and Rule (2012) demonstrated that coaching (i.e., discussing strategies with parents, listening to parents' opinions, demonstrating communication-facilitating strategies and activities, and providing feedback) occurred significantly more often during VHVs than in traditional face-to-face visits in the home. Likewise, Blaiser et al. (2013) reported that families in the teleintervention group scored statistically significantly better in parent engagement compared to the in-person-only group, as measured by the *Home Visit Rating Scales—Adapted and Extended* (Roggman et al., 2012). The aforementioned multisite study also demonstrated that the teleintervention group scored statistically significantly better on provider responsiveness and family engagement, with scores on other subscales being equal to traditional in-person home visits (Behl et al., in press).

The Family Outcomes Survey (The Early Childhood Outcomes Center, 2014) is a nationally recognized tool used to assess important early intervention outcomes pertaining to support, education, and community inclusion of families. Both Blaiser et al. (2013) and Behl et al. (2017) measured the extent to which teleintervention impacts these aspects of family centeredness. They found that families reported they felt equally as supported, educated, and included in their community as families who received in-person visits. These studies demonstrated the value of telepractice service delivery models in achieving the desired outcomes of parent coaching and family-centered services.

Models of Teleintervention for Children Who Are D/HH

Families of young children who are D/HH often face challenges securing appropriate services from qualified providers. Evidence continues to demonstrate the shortage of professionals with the necessary knowledge and skills to deliver evidence-based medical, clinical, and early intervention services to this special population (Houston, Munoz, & Bradham, 2011; Houston & Perigoe, 2010; Joint Committee on Infant Hearing, 2019; Moeller, White, & Shisler, 2006; Shulman, Besculides, Saltzman, Ireys, & White, 2010; White, 2008). 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 who are D/HH and their families (Behl, Houston, Guthrie, & Guthrie, 2010; McCarthy,

The project investigators sought to determine if teleintervention could result in delivering high-quality, intensive early intervention services while ensuring family satisfaction.

Munoz, & White, 2010; ***NOTE***: While telerehabilitation is a broader term that is used to describe services in allied health and related disciplines, the term telepractice will be used to describe services delivered by an SLP.).

In the fall of 2008, Sound Beginnings—an early intervention and preschool program for children who are D/HH housed on the campus of Utah State University—initiated a project designed to evaluate the overall feasibility of delivering services through a telepractice model. The faculty and staff involved in the project coined the term "teleintervention" to describe the early intervention services provided through distance technology (i.e., videoconference equipment). The project investigators sought to determine if teleintervention could result in delivering high-quality, intensive early intervention services while ensuring family satisfaction. For this project, families had chosen listening and spoken language as their desired outcome for their children; however, the teleintervention model could easily be used with any communication option (i.e., American Sign Language, Total Communication, Cued Speech, Auditory-Oral/Auditory-Verbal Therapy). The parents and caregivers of the children were carefully monitored to determine if they successfully improved their own language facilitation techniques.

Since the project required high-resolution audio and video, top-of-the-line videoconferencing equipment was placed in the family home. (***NOTE***: While this equipment was decided to be optimal for this project, practitioners can use less-expensive equipment, such as a laptop with a Web-based camera (webcam) and one of the online videoconferencing services. The compact videoconferencing units contained a video camera and 24-inch video monitor. With these units, parents could see and hear the sessions provided by the project SLP. At the university, the SLP used the same equipment, which provided high-quality video and audio, to observe and coach the parents through each session's activities.

In 2011, the Telepractice and eLearning Laboratory (TeLL) was established in the Audiology and Speech Center in the School of Speech-Language Pathology and Audiology at The University of Akron. Currently, TeLL is providing both auditory-verbal intervention and aural habilitation services to a range of children and their families. Most children enrolled who receive services are D/HH. However, children with normal peripheral hearing who have auditory processing disorders are also benefiting from these services.

In both programs, families receive weekly teleintervention sessions that last approximately 60-75 minutes. Typically, each session begins with a discussion of the speech, language, and listening goals targeted during the prior session and how previously demonstrated communication strategies had been integrated into the child's daily routines. The SLP and parents discuss any new communication behaviors that might be relevant to the child's progress, such as new or emerging speech sounds, words, or listening behaviors that had been noticed. Once these updates were completed, the SLP introduces the goals for that day's session, explaining the desired speech, language, listening, and interactive behaviors. Both the family and the SLP use similar toys and everyday materials to target the goals. After discussing the materials and activities that will most likely engage the child, the SLP demonstrates an activity before asking the parent to do it. The parent repeats the activity while the SLP observes. At this point in the session, the SLP's role becomes that of a coach. The SLP provides positive reinforcement and constructive feedback to the parent based on how the activity was implemented and how the communication strategies that promote listening and spoken language are being applied.

This same scenario was repeated as one activity ended and a new activity was initiated. Throughout the session, the parent and the SLP closely monitor the child's attention level. If the child begins to lose interest, the parent may say, "Let's do it one more time, and then

This method of intervention (store-and-forward approach to teleintervention) has been in use for many years by the Veterans Health Administration (VHA).

we'll get something else to play with!" By maintaining control of who ends each activity, the parent is often able to move through several activities that reinforce listening and spoken language without losing the child's interest or seeing the session deteriorate into a power struggle.

Following the activities, the parent is given ample opportunity to discuss any concerns about the child's progress, ask questions about short- or long-term communication goals, or seek input about troubleshooting the child's hearing technology (e.g., hearing aids and/or cochlear implants, FM systems). The SLP summarizes the goals and strategies that were modeled and practiced during the session. Based on the child's performance and developmental level, new or additional communication goals to be targeted in the home the following week are discussed.

The teleintervention model has been shown to be a viable service delivery model for supporting children who are D/HH acquiring spoken language. Children attain language outcomes that are consistent with or exceed developmental norms. Parents have become more confident in their role as their child's primary facilitator of language. (For a more complete description of the teleintervention project at Utah State University, see Behl, Houston, Guthrie, & Guthrie, 2010; for additional information about the TeLL at the University of Akron, see Brown, Fleming, & Houston, 2012; Galvan, Case, & Houston, 2014.)

Development of a Store-and-Forward Model of Teleintervention

ASHA's State Telepractice Requirements (2016) for the state of Ohio, along with several other states, refer to the store-and-forward method of teleintervention as *asynchronous electronic transmission*. With this method, stored clinical data, including video clips, audio files, photos, and/or written documents, are transmitted from one location to another and viewed by the clinician at a later time. This method allows for greater flexibility but puts additional responsibilities on the consumer.

This method of intervention has been in use for many years by the Veterans Health Administration (VHA). The VHA has been providing dermatological and retinal imaging services to veterans who are unable to gain access to specialty care through other means (Raugi et al., 2016; U.S. Department of Veterans Affairs, 2015). Through the use of VistA Imaging

Photo courtesy of NCHAM

software, the VHA transmits clinical images from remote locations to skin and eye care specialists. After reviewing the images, the specialists send their report and treatment recommendations to the veteran's primary care physician who oversees the follow up. A study completed by Raugi et al. (2016) on the impact of teledermatology implementation at the Mann-Grandstaff Spokane VA Medical Center showed the use of store-and-forward improved access to face-to-face dermatology care and decreased the time between requests for services and the completion of the consultation.

Additionally, the store-and-forward approach to teleintervention has been used in teleaudiology in various capacities. In 2015, Dille, McMillan, Helt, Konrad-Martin, and Jacobs studied the use of a new device—the ototoxicity identification device (OtoID)—developed to provide self-testing abilities to veterans undergoing chemotherapy treatments. Twenty-one veterans were given access to the device and could monitor their hearing during treatments and text the results to their audiologist for analysis. Results of the study were very positive and resulted in the approved use of the OtoID and positive correlations between the use of store-and-forward methods and personnel efficiencies.

Based on the needs of clients at the University of Akron and their inability to meet during regular business hours, the university utilized the store-and-forward model of teleintervention to provide auditory-verbal therapy to two families in 2016. Due to the work schedules of the parents, the previously described teleintervention model was not appropriate for this family, so a system was arranged in which the clinicians provided weekly lesson plans. These plans were much more detailed to allow for completion by the parents without real-time feedback from the clinicians. The parents completed the activities throughout the week when it was convenient for them and filmed the activities, so they could be sent to the clinicians for review.

To ensure equivalent amounts of intervention, a weekly timeline was established. Each week, a lesson plan was sent to the parents on a designated day (i.e., Tuesday), and they were asked to complete the activities and upload the videos within 5 days of receiving the lesson plan (i.e., Sunday). This gave the clinicians 2 days to review the video, provide feedback, and send the new lesson plan to the family.

Although this method provided a large amount of flexibility and promoted carryover by completing the activities in the children's natural environment, it presented several challenges. Among these were high amounts of responsibility put on the parents to upload videos and complete activities and lack of clinician control related to the length and quality of the video and activities. Therefore, when considering this model of intervention, it is important to consider the skills of the parent or individual carrying out the treatment, their level of reliability when it comes to consistently uploading videos, and the amount and timing of feedback that is needed for client success.

Setting Up Equipment

When setting up for teleintervention, several technical factors must be considered. Along with access to a computer with a microphone, both the clinician and the clients must have a webcam with at least 3 megapixels and 30 frames per second to obtain high-definition video. According to a review of clinical videoconferencing published within ASHA's practice portal on telepractice, "A minimum bandwidth of 384 Kbps was needed to establish adequate audio and visual clarity" (Jarvis-Selinger et al., 2008).

Once these requirements are met, the clinician must determine which videoconferencing platform will be used to ensure both ease of access and Health Insurance Portability and Accountability Act (HIPAA) compliance, as well as client confidentiality. While the University of

Once these requirements are met, the clinician must determine which videoconferencing platform will be used to ensure both ease of access and Health Insurance Portability and Accountability Act (HIPAA) compliance, as well as client confidentiality.

Some parents may not feel comfortable with teleintervention and prefer a more traditional, in-home service delivery model. Those families will likely decline participating in teleintervention. They may, however, be open to starting services at the center or in the home and slowly moving to a teleintervention model.

Akron utilizes Cisco WebEx to connect with clients, other available options include AdobeConnect, GoToMeeting, and Zoom.

When considering services that are free to the public, the only option currently available is FaceTime. Skype has not been approved for use when discussing protected health information (PHI). As with in-person intervention, client privacy and confidentiality must be ensured when choosing and setting up teleintervention software. If a program is unsure how to remain compliant with HIPAA and other state and federal regulations, ASHA recommends that they consult an expert prior to beginning intervention (ASHA, n.d.)

Provider's Perspective

Once the equipment is in place and functioning, the sessions focus less and less on the technology and more on the intervention. While some practitioners may have greater skills with technology, most of the technology—from the more expensive videoconferencing equipment to the tablet or laptop and webcam—is relatively simple to use. Tutorials on how to set up and use this technology are available online from many manufacturers or service providers (i.e., Vidyo, VSee, ooVoo, Zoom, WebEx, etc.). Regardless of how efficient a provider may become using the equipment, it is critical to have support from specialists in telecommunication systems. These professionals are able to help troubleshoot issues when problems arise and keep providers informed about new trends and products that potentially could enhance the program's telepractice.

Photo courtesy of NCHAM

While the technology is rather simple to use, the potential for problems does exist. For example, the parents may not have access to a high-speed Internet connection. The available bandwidth of the Internet connection is a critical component. A "dial-up" connection is considerably slower than a high-speed broadband connection. Other factors may affect bandwidth, such as a high volume of users on the service being used at the time. Beyond the specific equipment employed, the available bandwidth of the Internet connection is the most important factor that will impact teleintervention.

Some parents may not feel comfortable with teleintervention and prefer a more traditional, in-home service delivery model. Those families will likely decline participating in teleintervention. They may, however, be open to starting services at the center or in the home and slowly moving to a teleintervention model. Some professionals may recognize parenting or other behavior management issues that should be addressed through a more traditional service delivery model before suggesting that the family consider teleintervention.

Some professionals may feel intimidated by the technology. For providers who are reluctant to use technology for service delivery, observing other centers or practitioners who are currently providing teleintervention may be helpful. Program or center administrators should carefully choose the providers who will be delivering teleintervention services and the families who will receive them.

Professional Resources to Support Teleintervention

NCHAM continues to support teleintervention as a promising strategy to ensure access to early intervention services for children who are D/HH and their families. In early 2010, NCHAM invited professionals who were using this technology to provide family-centered services to form a "learning community" to explore the potential of distance technologies.

The purpose of the learning community is to share experiences, identify challenges, and systematically and collaboratively address relevant issues. Broadly defined, a learning community is a group that shares a common interest and works together to enhance a common core of knowledge. The professionals participating in the learning community represent several disciplines:

- Early interventionists
- SLPs
- Audiologists
- Teachers of the deaf
- Center/program administrators
- Physicians
- Listening and spoken language specialists (LSLSs) who are certified auditory-verbal practitioners (e.g., Cert. AVTs, Cert. AVEds)

The learning community participants represent four programs that serve children who are D/HH from birth to 3 years and their families. Each of these programs utilizes a listening and spoken language approach to communication (i.e., auditory-verbal). One early intervention program serves children with developmental delays and other disabilities. When the learning community was formed, efforts were made to identify early intervention programs providing teleintervention services utilizing other communication methodologies, such as simultaneous communication, Total Communication (TC), and/or American Sign Language (ASL). No programs offering these communication approaches were identified at the time.

The purpose of the learning community is to share experiences, identify challenges, and systematically and collaboratively address relevant issues.

As of 2018, the number of programs represented in the teleintervention learning community has grown from 6 to over 25, reflecting the use of teleintervention to deliver not only listening and spoken language therapies but total communication and sign language instruction to parents. The participants continue to report a range of teleintervention experiences. Some programs have been delivering services in this manner for several years; while others are just beginning. The programs utilize several types of teleintervention hardware and software. Some use high-quality, expensive equipment, such as Tandberg, Polycom, or Sony systems. Others use voice-over Internet protocol (VoIP) programs, such as FaceTime, Vidyo, Google Talk, Zoom, or ooVoo, on notebook, tablets, or desktop computers. Through active participation, learning community members learn from each other by identifying the challenges to implementing and maintaining a comprehensive teleintervention program. The learning community provides a venue to share successful strategies and to problem-solve barriers that emerge.

In the summer of 2011, *The Practical Guide to the Use of Teleintervention in Providing Listening and Spoken Language Services to Infants and Toddlers Who Are Deaf or Hard of Hearing* was compiled by the learning community. This is a user-friendly resource published and supported by NCHAM. (***NOTE:*** The guide can be accessed at http://www.infanthearing.org/ti-guide/.) The teleintervention guide is intended for program administrators, practitioners, and families interested in this model of service delivery. While not intended to be a comprehensive teleintervention instruction manual, the guide does provide:

- Practical information about the benefits and challenges.
- Required technologies.
- Strategies for communicating with families and conducting sessions.

- An overview of privacy and security issues.
- Videos of teleintervention sessions.
- Sample documents, such as consent forms and sample letters.

Recognizing the need for introductory training of administrators, providers, and families, NCHAM developed free online interactive courses. (These courses can be accessed at http://www.infanthearing.org/ti101/.)

Other general telehealth resources are equally as important, especially in regards to topics, such as insurance reimbursement, licensure, security, and privacy. The telehealth resource centers (http://www.telehealthresourcecenter.org/) provide current information that define policies at both the state and national levels. Organizations, such as ASHA's Telepractice Special Interest Group (SIG 18) and the American Telemedicine Association (ATA), are particularly valuable in terms of connecting with others involved in telepractice, as well as staying current on policies.

Since therapy decisions are based on the individual needs of each patient, telepractice may not be suitable for all children or families.

Professional Issues in Telepractice

ASHA (2010) continues to detail a range of professional issues that will potentially impact practitioners who are providing services through telepractice. While not an exhaustive list, those issues include:

- Client selection
- Ethical considerations
- Privacy and security regulations
- Licensure
- Reimbursement for services

Client Selection

Since therapy decisions are based on the individual needs of each patient, telepractice may not be suitable for all children or families. Each situation should be assessed for candidacy before committing to telepractice services. The clinician should carefully consider:

- The patient's age, culture, education level.
- Physical/sensory characteristics (such as hearing and visual abilities, physical endurance, and manual dexterity.
- Communication characteristics (such as the availability of an interpreter, if needed; the client's speech intelligibility; etc.).
- Behavioral and/or cognitive characteristics (such as their ability to stay focused on a task, willingness of the family/caregivers to receive therapy via telepractice, etc.).
- The patient's access to resources (such as the availability of technology or a high-speed Internet connection).

Ethical Considerations

ASHA (2016a) requires that SLPs and audiologists providing telepractice services abide by the ASHA Code of Ethics. Some of these specific principles are shown in *Table 2*.

Table 2
ASHA Code of Ethics

Principle of Ethics I: Rule N
Individuals who hold the Certificate of Clinical Competence (CCC) shall not provide clinical services solely by correspondence but may provide services via telepractice consistent with professional standards and state and federal regulations.
Principle of Ethics II: Rule H
Individuals shall ensure that all technology and instrumentation used to provide services or to conduct research and scholarly activities are in proper working order and are properly calibrated.
Principle of Ethics IV: Rule R
Individuals shall comply with local, state, and federal laws and regulations applicable to professional practice, research ethics, and the responsible conduct of research.

Privacy & Security Regulations

The HIPAA of 1996 addresses a patient's PHI and requires that services delivered via telepractice must protect the privacy of the clients served using secure systems for electronic information. Providers must ensure the same level of confidentiality in delivering services through teleintervention as they do when providing services onsite. For example, the teleintervention provider should be located in a private room to prevent unauthorized persons from viewing the session. Providers implementing teleintervention must ensure that video recordings of sessions are secure from being viewed by unauthorized persons.

Providers must ensure the same level of confidentiality in delivering services through teleintervention as they do when providing services onsite.

Security is often raised as a concern in regards to possible "hacking" or otherwise gaining access to the two-way teleconferencing exchange. Hacking, computer viruses, and/or worms are all threats to security. While some technologies may be less susceptible to security issues, none are immune. Home locations are likely to be more susceptible to security issues than locations that invest heavily in information technology support.

The HIPAA Security Rule specifically states,"Because 'paper-to-paper' faxes, person-to-person telephone calls, video teleconferencing, or messages left on voicemail were not in electronic form before the transmission, those activities are not covered by this rule" (p. 8342). If a provider records a teleintervention session and saves a copy, however, the saved version would be subject to Security Rule provisions for stored data. The treatment session and all related information and documentation are subject to the Privacy Rule provisions. *Table 3* lists privacy recommendations that address the primary aspects of teleintervention that are susceptible to privacy threats.

Providers must abide by HIPAA, FERPA, and Part C regulations in the provision of teleintervention services—be it the exchange of written reports, observations

Table 3
Privacy Recommendations

Observing "Live" Teleintervention Sessions

Just as practitioners would obtain consent from families for students or other providers under Part C regulations to observe a traditional therapy session, informed consent must be obtained from families prior to anyone observing a teleintervention session. Verbal consent may be sufficient if observers are students or other Part C providers who fall in the category of "participating agencies." Signed informed consent would be required for anyone else to observe a teleintervention session.

Recording Teleintervention Sessions

It is recommended that providers obtain signed informed consent from the family to record sessions. This ensures that the family is aware that recordings exist, and that they can obtain copies of recordings. It is important to abide by privacy regulations when sharing recordings of teleintervention sessions with other providers. For example, video recordings may be shared with other "participating agencies" without signed consent, such as another Part C early intervention provider. However, under Part C regulations, video recordings may not be shared with others, such as a physician, without signed informed consent.

Sharing Recordings with Families

Families may have access to their own child's teleintervention records, including video recordings, without signed informed consent. In fact, video recordings are one of the benefits of teleintervention, allowing families to share their child's progress and coaching strategies with other family members. It is important to secure access to these recordings just as you secure access to written records or verbal communications. A password-protected, encrypted site should be used.

of sessions by others, or actual video recordings of sessions. However, HIPAA does not specify the methods of protection, and currently there is no federal agency for the Internet that regulates privacy. "Net neutrality" means Internet use is unrestricted, and privacy is controlled via secure websites.

Licensure

Licensure remains a challenge for telepractice providers in most states. According to ASHA (2012), only 14 states and the District of Columbia's licensure boards have addressed telepractice in their legislation or regulatory language. Among those states, there are varying provisions, statutes, regulations, and policies regarding the use of telepractice. Considerable variability exists among states in terminology and the specificity of existing regulations.

Unless the state has an exemption provision within its licensure laws, a professional must be licensed in the state where the client is located, as well as the state where the therapist is providing services.

Unless the state has an exemption provision within its licensure laws, a professional must be licensed in the state where the client is located, as well as the state where the therapist is providing services (Cohn & Cason, 2012). If a professional practices without a license in a state where it is required, he/she could be subject to the "practicing without a license" penalty provision of that state's licensing laws (Carson & Brannon, 2011). Since providing telepractice services across state lines often requires licensure in both states, it is often cost prohibitive. As a result, providers frequently limit their services to their home state.

To determine telepractice license requirements and restrictions, the professional should investigate the state's practice act, board regulations, and all relevant board opinions in both the state where they reside and the state where the client is receiving services. If telehealth/telepractice is not mentioned in the practice act of the state, and published information on the topic is not available, the professional should contact the state board for further direction (Carson & Brannon, 2011). It is the responsibility of the professional to be aware of the scope of practice laws and regulations and to abide by those laws and regulations for each state in which they render services (Carson & Brannon, 2011).

An exception exists within the U.S. Department of Defense (DOD) and the Veterans Health Administration due to the Service Members Telemedicine & eHealth Portability Act (STEP; H.R. 1832, 2011). This legislation allows service members to be treated at their location, including in their homes, by healthcare professionals (DOD civilian employees and personal services contractors) through the use of telemedicine and eHealth without obtaining additional state licenses (Thompson, 2012).

Risk management. Professionals who deliver rehabilitation services must carry adequate professional liability insurance in every state and jurisdiction that involves their practice. If they use telepractice as a service delivery method, they must verify that their coverage is adequate. It is imperative that they understand the terms and conditions of their policy, since a violation of the terms will jeopardize their coverage (Denton, 2003). In some cases, telepractice as a service delivery method is disallowed. This is the case when a policy defines a clinical encounter as an in-person encounter or prohibits treatment solely by correspondence (Denton, 2003).

Reimbursement for Services

Obtaining reimbursement for services continues to be a challenge for providers who are utilizing telepractice models and an obstacle to the progression and adoption of telepractice service delivery models (Brown, Brannon, & Romanow, 2010). Romanow and Brannon (2010) describe some of these challenges with the added fact that Medicare and Medicaid either do not allow telepractice or greatly restrict reimbursement for audiological and speech-language services provided through this model. While this is disheartening, some states have modified

their state regulations regarding Medicaid or have passed legislation that defines how reimbursement can occur. Recognition by the Centers for Medicare and Medicaid Services could be possible in the future for telespeech and teleaudiology with the passage of the Patient Protection and Access to Care Act (PPACA) in 2010. This legislation created the Center for Medicare and Medicaid Innovation (CCI). CCI funds pilot programs, including the Children's Health Insurance Program, in an effort to discover service delivery models that improve care and save money for federally funded programs (Brown, 2011). Practitioners should investigate if and how these services have been addressed in their state.

Photo courtesy of NCHAM

Future Directions

The use of telecommunication and distance technology has become more pervasive in providing healthcare and early intervention services to young children who are D/HH and their families. This technology continues to evolve, becoming less expensive and available on an expanding range of computing or mobile devices. Program administrators and practitioners will be utilizing these tools even more to ensure greater access to appropriate services. Parents will be requesting and seeking out these programs, especially when well-trained early interventionists or other practitioners are not available in their communities. For EHDI and Part C coordinators, embracing models of telerehabiliation or teleintervention will no longer be an option. In fact, these models may prove to be essential components of EHDI and Part C programs in a new era of technology-driven medical and intervention services. While further research is needed, a growing body of evidence in audiology and speech-language pathology supports positive outcomes with telepractice. Ultimately, the telepractice service delivery model is another valuable tool that can be utilized to ensure state-level EHDI and Part C early intervention programs successfully accomplish their 1-3-6 goals.

Resources

- American Occupational Therapy Association. Position Paper on Telerehabilitation. Available from ajot.aotapress.net/content/59/6/656.full.pdf
- American Physical Therapy Association. Position Paper on Telehealth. Available from apta.org/AM/Template.cfm?Section=Home&CONTENTID=67435& TEMPLATE=/CM/ContentDisplay.cfm
- American Speech-Language-Hearing Association. Position Statement on Telepractice. Available from asha.org/docs/html/PS2005-00116.html
- American Telemedicine Association. A Blueprint for Telerehabilitation Guideline. Available from americantelemed.org/home/2012/12/21/a-blueprint-for-telerehabilitation-guidelines
- Center for Telehealth and eHealth Law (CTel). Available from http://ctel.org/
- International Journal of Telerehabilitation. Available from http://telerehab.pitt.edu/ojs/index.php/telerehab
- Journal of Telemedicine and Telecare. Available from jtt.rsmjournals.com/
- National Center for Hearing Assessment and Management (NCHAM). A Practical Guide to the Use of Teleintervention in Providing Listening and Spoken Language Services to Infants and Toddlers Who Are Deaf or Hard of Hearing. Available from http://www.infanthearing.org/ti-guide/index.html
- Rehabilitation Engineering Research Center for Telerehabilitation. Available from http://www.rerctr.pitt.edu
- Telemedicine and eHealth. Available from http://www.liebertpub.com/TMJ

References

Allan, R. (2006). *A brief history of telemedicine.* Penton Media. Available from electronicdesign.com/print/components/a-brief-history-of-telemedicine

American Speech-Language-Hearing Association. (2005a). *Audiologists providing clinical services via telepractice: Position statement.* Available from www.asha.org/policy

American Speech-Language-Hearing Association. (2005b). *Speech-language pathologists providing clinical services via telepractice: Position statement.* Available from www.asha.org/policy

American Speech-Language-Hearing Association. (2010). *Professional issues in telepractice for speech-language pathologists (professional issues statement).* Available from www.asha.org/policy

American Speech-Language-Hearing Association. (2012). *State provisions update for telepractice.* Retrieved from asha.org/Practice/telepractice/StateProvisionsUpdateTelepractice

American Speech-Language-Hearing Association. (2016a). *Code of ethics [Ethics].* Available from asha.org/policy/.

American Speech-Language-Hearing Association. (2016b). *State telepractice requirements.* Retrieved from asha.org/Advocacy/state/State-Telepractice-Requirements/

American Speech-Language-Hearing Association. (n.d.). *Telepractice.* Retrieved from http://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934956&section=Key_Issues

Baker, D. C., & Bufka, L. F. (2011). Preparing for the telehealth world: Navigating legal, regulatory, reimbursement, and ethical issues in an electronic age. *Professional Psychology: Research and Practice*, *42*(6), 405-411.

Behl, D., Houston, K. T., Guthrie, W. S., & Guthrie, N. (2010). Teleintervention: The wave of the future fits families' lives today. *Exceptional Parent*, *40*, 23-28.

Behl, D. D., Blaiser, K., Cook, G., Barrett, T., Callow-Heusser, C., Brooks, B. M., Dawson, P., Quigley, S., & White, K. (2017). A multisite study evaluating the benefits of early intervention via telepractice. *Infants & Young Children*, *30*(2), 147-161.

Blaiser, K. M., Behl, D., Callow-Heusser, C., & White, K. R. (2013). Measuring costs and outcomes of teleintervention when serving families who are deaf/hard of hearing. *International Journal of Telerehabilitation*, *5*(2), 3-10.

Bond, M., Elston, J., Mealing, S., Anderson, R., Weiner, G., Taylor, R. S., . . . Stein, K. (2009). Effectiveness of multi-channel unilateral cochlear implants for profoundly deaf children: A systematic review. *Clinical Otolaryngology*, *24*(3), 199-211.

Brown, J. (2011). ASHA and the evolution of telepractice. *Perspectives on Telepractice*, *9*(1), 4-9.

Brown, J., Brannon, J., & Romanow, K. (2010). Reimbursement for telespeech. *Perspectives on Voice and Voice Disorders*, *20*(1), 16-21.

Brown, K., Fleming, A., & Houston, K. T. (2012). Service delivery for children and adults with cochlear implants in the 21st century: Telepractice. *Cochlear Implant Online.* Available at cochlearimplantonline.com/site/service-delivery-for-children-and-adults-with-cochlear-implants-in-the-21st-century-telepractice/

Cason, J. (2011). Telerehabilitation: An adjunct service delivery model for early intervention services. *International Journal of Telerehabilitation*, *3*(1), 19-28.

Cason, J., & Brannon, J. A. (2011). Telehealth regulatory and legal considerations: Frequently asked questions. *International Journal of Telerehabilitation*, *3*(2), 15-18. Doi: 10.5195/ijt.2011.6077.

Centers for Disease Control and Prevention. (2010). Identifying infants with hearing loss—United States, 1999-2007. *Morbidity and Mortality Weekly Report (MMWR)*, *59*, 220-223. Retrieved from cdc.gov/ncbddd/hearingloss/documents/EHDI_MMWR_2010.pdf

Cohn, E. R., & Cason, J. (2012). Telepractice: A wide-angle view for persons with hearing loss. *The Volta Review*, *112*(3), 207-226.

Constantinescu, G. (2012). Satisfaction with telemedicine for teaching listening and spoken language to children with hearing loss. *Journal of Telemedicine and Telecare*, *18*, 267-272.

Denton, D. R. (2003). Ethical and legal issues related to telepractice. *Seminars in Speech and Language*, *249*(4), 313-322.

DesJardin, J. L., & Eisenberg, L. S. (2007). Maternal contributions: Supporting language development in young children with cochlear implants. *Ear and Hearing*, *28*(4), 456-469.

Dille, M. F., McMillan, G. P., Helt, W. J., Konrad-Martin, D., & Jacobs, P. (2015). A store-and-forward tele-audiology solution to promote efficient screenings for ototoxicity during cisplatin cancer treatment. *Journal of the American Academy of Audiology*, *26*(9), 750-760. doi:10.3766/jaaa.15028

Dixon, B. E., Hook, J. M., & McGowan, J. J. (2008). *Using telehealth to improve quality and safety: Finding from the AHRQ portfolio* (Prepared by the AHRQ National Resource Center for Health IT under Contract No. 290-04-0016). AHRQ Publication No. 09-00120EF. Rockville, MD: Agency for Heathcare Research and Quality.

Doyle, J. S. (1999). The business coach: A game plan for the new work environment. In K. Hamren & S. Quigley, Implementing coaching in a natural environment through distance learning. *The Volta Review*, *112*(3), 403-407.

Fleming, J. L., Sawyer, B. L., & Campbell, P. H. (2011). Early intervention providers' perspectives about implementing participation-based practices. *Topics in Early Childhood Special Education*, *30*(4), 233-244.

Fong, B., Fong, A. C. M., & Li, C. K. (2011). *Telemedicine technologies: Information technologies in medicine and telehealth.* John Wiley & Sons: United Kingdom.

Hamren, K., & Quigley, S. (2012). Implementing coaching in a natural environment through distance learning. *The Volta Review*, *112*(3), 403-407.

Houston, K. T. (2014). *Telepractice in speech-language pathology.* San Diego: Plural Publishing.

Houston, K. T., & Bradham, T. S. (2011). Parent engagement in audiologic habilitation: Increasing positive outcomes for children with hearing loss. *The ASHA Leader*, *16*(8), 5-6.

Houston, K. T., Munoz, K. F., & Bradham, T. S. (2011). Professional development: Are we meeting the needs of state EHDI programs? *The Volta Review*, *111*(2), 209-223.

Houston, K. T., & Perigoe, C. B. (Eds.). (2010). Professional preparation for listening and spoken language practitioners. *The Volta Review*, *110*(2), 86-354.

Hughes, M., Goehring, J., Baudhuin, J., & Diaz, G. (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.

Jarvis-Selinger, S., Chan, E., Payne, R., Plohman, K., & Ho, K. (2008). Clinical telehealth across the disciplines: Lessons learned. *Telemedicine and eHealth*, *14*, 720-725.

Joint Committee on Infant Hearing. (2019). Year 2019 Position Statement: Principles and guidelines for Early Hearing Detection and Intervention programs. *Journal of Early Hearing Detection and Intervention, 4*(2), 1-44.

Justice, L., & Vukelich, C. (Eds.). (2008). *Achieving excellence in preschool literacy instruction.* New York: Guilford Press.

Krumm, M., & Vento, B. (in press). Applications in teleaudiology. In S. Kumar and E. Cohn (Eds.), *Telerehabilitation*. London, UK: Springer.

Mashima, P. A., & Doarn, C. R. (2008). Overview of telehealth activities in speech-language pathology. *Telemedicine and e-Health*, *14*(10), 1101-1117.

Miller, W., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for change (2nd ed.).* New York: Guilford Press.

McCarthy, M., Munoz, K., & White, K. R. (2010). Teleintervention for infants and young children who are deaf or hard of hearing. *Pediatrics*, *126*, S52-S58.

Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics*, *106*, 1–9.

Moeller, M. P., White, K. R., & Shisler, L. (2006). Primary care physicians' knowledge, attitudes, and practices related to newborn hearing screening. *Pediatrics*, *118*(4), 1357-1370.

National Center for Hearing Assessment and Management (NCHAM). (2010). *Telehealth survey of EHDI coordinators.* Available at http://www.infanthearing.org/telehealth/index.html

National Center for Hearing Assessment and Management (NCHAM). (2012). *A practical guide to the use of teleintervention in providing spoken language services to infants and toddlers who are deaf and hard of hearing.* Available at http://www.infanthearing.org/ti-guide/index.html

Olsen, S., Fiechtl, B., & Rule, S. (2012). An evaluation of virtual home visits in early intervention: Feasibility of "virtual intervention." *The Volta Review*, *112*(3), 267-281.

Peterson, C. A., Luze, G. J., Eshbaugh, E. M., Jeon, H. J., & Kantz, K. R. (2007). Enhancing parent-child interactions through home visiting: Promising practice or unfulfilled promise. *Journal of Early Intervention*, *29*, 119-140.

Raugi, G. J., Nelson, W., Miethke, M., Boyd, M., Markham, C., Dougall, B., & Comer, T. (2016). Teledermatology implementation in a VHA secondary treatment facility improves access to face-to-face care. *Telemedicine & eHealth*, *22*(1), 12-17. doi:10.1089/tmj.2015.0036

Romanow, K., & Brannon, J. A. (2010, November). Telepractice reimbursement is still limited. *The ASHA Leader*.

Rushbrooke, E., & Houston, K. T. (Eds.). (2016). *Telepractice in audiology.* Plural Publishing: San Diego.

Shulman, S., Besculides, M., Saltzman, A., Ireys, H., & White, K. R. (2010). Evaluation of the universal newborn hearing screening and intervention program. *Pediatrics*, *126*, S19-S27.

Sparreboom, M., van Schoonhoven, J., van Zanten, B. G. A., Scholten, R. J. P. M., Mylanus, E. A. M., Grolman, W., . . . Maat, B. (2010). The effectiveness of bilateral cochlear implants for severe-to-profound deafness in children: A systematic review. *Otology & Neurotology*, *31*, 1062-1071.

Spooner, S. A., & Gotlieb, E. M. (2004). Telemedicine: Pediatric applications. *Pediatrics*, *113*(6), e639-e643. Available from http://www.pediatrics.org/cgi/content/full/113/6/e639

Swanepoel, D. W., & Hall, J. W. (2010). A systematic review of telehealth applications in audiology. *Telemedicine and e-Health*, *16*(2), 181-200.

Theodoros, D. (2011). Telepractice in speech-language pathology: The evidence, the challenges, and the future. *Perspectives on Telepractice*, *1*(1), 10-21. Doi: 10.1044/tele.1.1.10.

Thompson, G. (2012, February 24). *Thompson sends letter to defense secretary urging full utilization of STEP Act in achieving goals of recently released DoD-VA joint strategic plan.* Retrieved from thompson.house.gov/press-release/thompson-sends-letter-defense-secretary-urging-full-utilization-step-act-achieving ecetary-urging-full-utilization-step-act-achieving

Turchetti, G., Bellelli, S., Palla, I., & Forli, F. (2011) Systematic review of the scientific literature on the economic evaluation of cochlear implants in paediatric patients. *Acta Otorhinolaryngologica Italica*, *31*, 311-318.

U.S. Department of Veterans Affairs. (2015). *VA telehealth services: Store-and-forward telehealth.* Retrieved from telehealth.va.gov/sft/

Welsh, T. S. (1999). *Telemedicine.* Telemedicine Network. Available from ocean.st.usm.edu/~w146169/teleweb/telemed.htm

Wesarg, T., Wasowski, A., Skarzynski, H., Ramos, A., Gonzalez, J., Kyriafinis, G., Junge, F, Novakovich, A., Mauch, H., & Laszig, R. (2010). Remote fitting in nucleus cochlear implant recipients. *Acta Oto-Laryngologica*, *130*, 1379-1388.

White, K. R. (2008). Newborn hearing screening. In J. R. Madell & C. Flexer (Eds.), *Pediatric audiology: Diagnosis, technology, and management* (pp. 31-41). New York: Thieme.

Zaidman-Zait, A., & Young, R. A. (2007). Parental involvement in the habilitation process following children's cochlear implantation: An action theory perspective. *Journal of Deaf Studies and Deaf Education*, *13*(2), 195-214.